SUSTAINABLE TRANSPORT, SUSTAINABLE DEVELOPMENT

INTERAGENCY REPORT | SECOND GLOBAL SUSTAINABLE TRANSPORT CONFERENCE

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NOTE

This interagency report on sustainable transport was prepared as a background document for the second Global Sustainable Transport Conference, taking place from 14 to 16 October 2021 in Beijing, China (hybrid format)[1]. It was prepared by the Conference Secretariat, the United Nations Department of Economic and Social Affairs (DESA), in close collaboration with other UN agencies, including the International Civil Aviation Organization (ICAO), the International Labour Organization (ILO), the International Maritime Organization (IMO), the United Nations Conference on Trade and Development (UNCTAD), the United Nations Development Programme (UNDP), the United Nations Economic Commission for Europe (UNECE), the United Nations Environment Programme (UNEP), United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), the United Nations Economic and Social Commission for Western Asia (UNESCWA), the United Nations Human Settlements Programme (UN-Habitat), the United Nations Industrial Development Organization (UNIDO), the United Nations Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLLS), the World Tourism Organization (UNWTO), the World Health Organization (WHO), and the World Bank.

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Foreword

The clock is ticking on our 2030 timeline to achieve the Sustainable Development Goals (SDGs), and to meet the objectives of the Paris Climate Change Agreement.

Years of progress towards eradicating poverty, ending hunger, empowering women, strengthening education and improving public health have been set back by the COVID-19 pandemic. At the same time, climate change continues inexorably: global average temperatures in 2020 were 1.2°C above pre-industrial levels, inching perilously close to the desired limit of 1.5°C.

Two years into the UN Decade of Action for the SDGs, we must recognize that accelerated progress is needed *simultaneously* across multiple goals and targets. We must therefore make a focused, global effort in areas where there are deep, systemic links across the economic, social, and environmental dimensions of sustainable development.

One of these crucial areas is sustainable transport.

Recognizing its importance, the United Nations General Assembly called for a second Global Sustainable Transport Conference, which is taking place in Beijing, China, over 14-16 October 2021 – due to the pandemic, about a year and a half later than originally planned.

Since the first sustainable transport Conference, held five years ago in Ashgabat, Turkmenistan, there has been an increasing appreciation of the importance of sustainable transport in a world linked ever closer by globalization and digitalization.

Transport is vital for promoting connectivity, trade, economic growth and employment. Yet it is also implicated as a significant source of green-house gas emissions. Resolving these trade-offs are essential to achieving sustainable transport and, through that, sustainable development.

Innovations, driven by new technologies, evolving consumer preferences and supportive policy-making, are changing the transport landscape. While science holds tremendous potential for hastening the transformation to sustainability, some new technological innovations also come with the risk that they could further entrench inequalities, impose constraints on countries in special situations, or present additional challenges for the environment.

The forthcoming second United Nations Global Sustainable Transport Conference will be a landmark moment for stakeholders from across the world to discuss challenges and opportunities, good practices, and solutions.

This report, prepared by my Department of Economic and Social Affairs in collaboration with an extensive network of United Nations agencies, presents the substantive background to those discussions and proposes some options for the way forward. I thank these agencies and their experts for the fruitful partnership.

I trust this report will stimulate fresh thinking on the subject, and prompt decisive action through local and national efforts, multi-stakeholder collaborations and international cooperation.

Mr. Liu Zhenmin,
Under-Secretary-General,
United Nations Department of Economic and Social Affairs

Executive summary

Sustainable transport—with its objectives of universal access, enhanced safety, reduced environmental and climate impact, improved resilience, and greater efficiency—is central to sustainable development. Apart from providing services and infrastructure for the mobility of people and goods, sustainable transport is a cross-cutting accelerator, that can fast-track progress towards other crucial goals such as eradicating poverty in all its dimensions, reducing inequality, empowering women, and combatting climate change. As such, it is vital for achieving the 2030 Agenda for Sustainable Development, and the Paris Climate Change Agreement.

Such goals can be realized only if the interlinkages between sustainable transport and the Sustainable Development Goals (SDGs) and their targets are well understood and intentionally leveraged to resolve trade-offs and to benefit from potential synergies. This will not only require the historical fragmentation within the transport sector to be overcome but will also call for increased collaboration across diverse actors at all levels.

There is an urgent need for transformative action that will accelerate the transition to sustainable transport at the global level. The onset of the COVID-19 pandemic has further impeded the already slow progress towards the SDGs, especially as climate change has continued inexorably. It is estimated that an additional 120 million people were pushed into extreme poverty across the world in 2020. Over the same year, the mean global temperature rose to 1.2°C above pre-industrial levels, perilously close to the 1.5 degrees aspiration of the Paris agreement.

Progress to date with regard to sustainable transport has been insufficient. Over a billion people still lack access to an all-weather road, and only about half the world's urban population have convenient access to public transport. The SDG road safety target - which aimed to halve, by 2020, the number of global deaths and injuries from road traffic accidents - has not been met, with road traffic injuries being the leading cause of death among young people aged 15 to 29. Transport is responsible for around a quarter of direct CO_2 emissions from fossil fuel combustion. Building the resilience of transport systems and infrastructure has become more challenging due to increasingly frequent and more intense extreme weather events.

Vulnerabilities are unevenly distributed across countries and population groups, presenting specific challenges to the overarching objective of 'leaving no one behind'. Countries in special situations, namely least developed countries (LDCs), land-locked developing countries (LLDCs), and small island developing States (SIDS), face myriad challenges in the pursuit of sustainable development, with transport often being a key element of these. All countries in special situations are especially dependent on transport networks and also highly vulnerable to factors such as insufficient infrastructure investment and limited capacity, poor cross-border connectivity, and greater exposure to climate change and extreme weather events. Across countries, it is the poor, women, children and youth, older persons, inhabitants of rural areas or informal urban settlements, and persons with disabilities who face the most difficulties in benefiting from -or even accessing -mobility services and thus risk being left behind.

The COVID-19 pandemic has reaffirmed the central role of transport in sustainable development, emphasizing existing challenges and creating new ones, while also indicating some potential pathways towards sustainability. Its impacts on the transport sector, especially pronounced in the early months of the pandemic were unprecedented: for example, global average road transport in March 2020 fell by half relative to the same period in 2019. Passenger air traffic demand

fell by two-thirds in 2020 relative to 2019 and in many cities, there were massive declines in public transport ridership and revenue. Global merchandise trade fell about 5% in 2020 relative to 2019, reflected in falls in the number of freight shipments and in international shipping rates. Incomes, jobs, and livelihoods in transport and associated sectors were immediately affected: one estimate put the loss in global GDP from the tourism sector in 2020 at US$ 2.4 trillion. There were increasing concerns about the quality of work, safety, wages, and social protection among people still working, for example public transit workers and seafarers unable to dis-embark from ships at the end of their normal tours of duty. An increase in tele-commuting and greater reliance on active transport modes, such as walking and cycling, were also observed. Reduced transport activity also led to sharp declines in green-house gas emissions, urban traffic congestion and road traffic accidents.

While transport-related activities are now recovering in many sectors and regions, the pace is uneven and uncertain. Merchandise exports are now estimated to rise about 8% in 2021 relative to 2020; passenger air traffic has also recovered somewhat, although total demand in June 2021 was 40% below that of June 2019. Global energy-related emissions, which were down about 6% in 2020 relative to 2019 are also returning rapidly to pre-pandemic levels across a number of sectors. Rapid recoveries in some regions and increases in e-commerce have also led to unanticipated bottlenecks, for example in the availability of shipping containers, contributing to escalating freight rates and surcharges. Forward-looking predictions embody significant levels of uncertainty due to the continuing prevalence of the pandemic and the longer-term changes in policy and behaviour that may be underway. Although the post-pandemic period offers an opportunity to move towards sustainable transport worldwide, it will also necessitate new business and planning models.

The Decade of Action on the SDGs presents an opportunity to supercharge the sustainability transition, while taking into account the lessons learned from the COVID-19 pandemic, and the long-run trends that will have a significant bearing on outcomes, for example demographic change, urbanization, globalization, the increasing frequency and intensity of extreme weather events, digitalization and rapid technological change. Commitments and pledges towards carbon neutrality made by different actors may also presage a relatively rapid transition to low carbon modes and fuels, accompanied by changes in the supporting infrastructure as well as a rapid phasing out of many current vehicle types. At the same time, transitions such as these risk exacerbating inequalities or adversely impacting the environment. They must therefore be accompanied by measures to maintain and expand equitable access to transport services as well as those that mitigate environmental impacts across vehicles' entire product cycle.

Transformation towards sustainable transport calls for integrated approaches that bring together multiple stakeholders around shared objectives. Such approaches should promote holistic, end-to-end analysis of different dimensions, including vulnerability risks and environmental impacts, that can help in the systemic identification and development of integrated solutions. Sustainable solutions are often multimodal in that they integrate the relative advantages of different transport modes in an optimal fashion. Implementation frequently calls for the coherent deployment of instruments from different fields: governance; science, technology, and innovation (STI), economy and finance; and individual and collective action.

Scientific advances and the rapid deployment of new technologies are essential for the transition to sustainable transport at the scale and speed required. Built-in safety features, environmentally friendly fuels and engines, widespread digitalization, apps that process real time information, autonomous vehicles and intelligent transport systems have become central features of the transport innovation landscape. However, large gaps persist between countries and between urban and rural areas and these could widen unless deliberate efforts are made to close them, for example, by increasing technological cooperation. At the same time, integrated assessments of economic, social, and environmental impacts and of the risks associated with

new technologies are important for potentially adverse impacts are to be mitigated. Continuing research is needed not only to refine existing solutions, but also to generate new ones for the more intractable issues, such as harder-to-abate emissions from particular transport modes.

Innovations are needed in governance at the institutional and policy levels, and these must work to support and motivate coherent multi-stakeholder action. International agreements and standards have an important role to play, in advancing sustainable transport, as do legislation and regulation at national (and in some cases, sub-national) levels. Other measures include non-government certification schemes, voluntary standards, harmonization, sustainable procurement, and other non-market incentives such as congestion pricing. Integrated planning across ministries and geographic regions along with multi-stakeholder engagement through open dialogue, inclusive decision making, and participatory implementation are also essential.

Financing for sustainable transport comes from a range of multilateral, private and public sources, and can be directed towards a variety of initiatives, with different social and economic return rates, risk profiles, and other metrics for assessment. Aggregated and comprehensive estimates of the financing needs for sustainable transport are not available: however, there is consensus that resources raised through different channels should work together in complementary ways, such as through public-private partnerships and blended finance. Governments have a central role in enabling investments through the provision of sound legal and regulatory frameworks accompanied by proper governance structures and transparent practices. Governments should also adopt appropriate accountability measures and prepare a pool of bankable projects.

All the 'means of implementation', as indicated in SDG 17, are essential to advancing sustainable transport, especially in developing countries. Capacity shortfalls impede progress in many areas, for example in integrated transport planning, and in project development and implementation. Skills related to emerging technologies, are expected to become increasingly important. There is a cross-cutting need for knowledge sharing and the development of capacities to gather and analyze reliable real-time data and statistics, and for these to be made available for transport planning, risk assessments and monitoring.

Recovery from the pandemic will be a chance for all actors to rethink passenger and freight transport and come up with integrated solutions which can not only withstand possible future crises, but also support the achievement of the 2030 Agenda and the Paris Agreement. In the immediate term, ensuring the sustainable rebuilding and smooth flow of international supply chains and facilitating cross-border movement of people and goods, including medical supplies, should remain a priority for the benefit of global response to the COVID-19 pandemic and subsequent global economic recovery. The transport sector should also be supported in improving its epidemic prevention and response capabilities and ensure safety and health of transport workers, including seafarers. Recovery plans and stimulus packages should include targets and criteria for sustainable and resilient transport systems in the spirit of 'building back better' and these should also be integrated into longer-term national plans for sustainable development and climate action, eventually being accounted for in Voluntary National Reviews (VNRs) and Nationally Determined Contributions (NDCs).

The transformation to sustainable transport must be accelerated through increased national efforts, multi-stakeholder partnerships and international cooperation. We have under a Decade left to achieve the SDGs and to limit the catastrophic consequences of climate change. It is thus more urgent than ever to hasten this transformation. Efforts by all actors will be required. For many of the challenges, integrated, sustainable approaches and solutions already exist. To implement them, however, a departure from 'business-as-usual' is needed.

SUSTAINABLE TRANSPORT, SUSTAINABLE DEVELOPMENT

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CHAPTER I

The importance of sustainable transport for the 2030 Agenda and the Paris Agreement

Sustainable transport is central to sustainable development. With impacts across a range of sustainable development goals (SDGs), it is key to achieving the 2030 Agenda for sustainable development and the Paris Agreement on Climate Change. While many conventional transport systems are changing, significant challenges remain in making a full transition towards sustainable transport. This transformation, which can be advanced only through collaborative action across a range of stakeholders, is made all the more urgent by the COVID-19 pandemic and the worsening climate crisis. The Decade of Action and Delivery for the SDGs provides a unique opportunity to rethink passenger and freight transport and to come up with sustainable solutions to accelerate the achievement of the 2030 Agenda and the Paris Agreement.

1. SUSTAINABLE TRANSPORT: AN INCREASING MOMENTUM FOR ACTION

DEFINITION AND KEY ELEMENTS

In its 2016 report,[2] the Secretary-General's High-level Advisory Group defined sustainable transport as "the provision of services and infrastructure for the mobility of people and goods—advancing economic and social development to benefit today's and future generations—in a manner that is safe, affordable, accessible, efficient, and resilient, while minimizing carbon and other emissions and environmental impacts." Sustainable transport is therefore not an end in itself, but a means to achieve sustainable development.

The 2016 report, with its definition of sustainable transport, was able to bring together both positive and negative impacts associated with transport, thereby facilitating an integrated approach that is crucial for the achievement of the 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change. The report also emphasized that proactive measures would be needed to attain the full benefits of such an integrated approach, realizing the positive impacts while avoiding or mitigating the negative ones.

Sustainable transport enables the mobility of people and goods; it contributes to poverty eradication and inequality reduction by generating jobs, enabling access to jobs, and supporting livelihoods (see Boxes 1 and 2).

Sustainable transport has many other benefits: it can ensure food security; improve access to important services, such as health, education, and finance; enable inclusive economic growth; empower women and vulnerable groups; and further the health and well-being

BOX 1

Poverty reduction through improved rural connectivity

In Ethiopia, improved road access (all-season, motorable rural roads rather than paths and trails) reduced poverty by 6.9 percentage points and increased consumption growth by 16.3 percentage points, according to longitudinal household data for 15 villages.[4]

In Pakistan, World Bank data identified strong correlations between poverty and poor rural connectivity, showing that, on average, the lowest income quintile has poorer access to education and health services. In 2005, 20% of villages in Pakistan were not yet connected by all-season roads, and this lack of connectivity was correlated with lower school attendance (particularly for girls), less immunization, and poorer maternal health statistics.[5]

Various impact evaluations have demonstrated comparable impacts of feeder roads on educational enrolment, literacy, market access, non-agricultural work, and economic diversification in Bangladesh,[6] Morocco,[7] and Vietnam.[8]

BOX 2

Poverty reduction through subsidized public transport

A vital service, public transport is strategically important for the economic and social life of cities. Millions of people rely on public transport for mobility, to access their jobs and other services, and also as a source of work. The poor, persons with disabilities, older persons, women, and youth, rely heavily on public transport for their access and mobility needs.[9]

In Latvia, persons with disabilities, orphans, and other vulnerable groups can benefit from subsidized public transport services. Families with three or more children can receive a 25% discount for public transport costs. Studies have shown that the public transport subsidy scheme has contributed to lowering the risk of poverty for families with three or more children.[10]

In India, the government of Delhi provides free travel to all women on Delhi Transport Corporation (DTC) and cluster buses. The 'Single Journey Free Travel Pass', issued by bus conductors, is also enabling lower income groups to achieve better safety and improved productivity.[11]

of all (see Box 3). It can also support the realization of human rights. Sustainable transport enables connectivity at all levels, allows for community interaction, helps integrate markets and economies, enhances rural–urban linkages, and facilitates international trade. It underpins regional and global supply chains and improves their efficiency; it contributes to trade competitiveness, and can boost resilience to systemic and external disruptions, including economic shocks, pandemics, and climate-related disasters and extreme weather events. Countries in special situations, such as land-locked developing countries (LLDCs) and small island developing states (SIDS), are particularly dependent on achieving connectivity through sustainable transport because of their geography and location (see C3).

At the same time, transport activity can have several negative consequences which require mitigation. Close to a quarter of energy-related global greenhouse gas (GHG) emissions are generated by the transport sector, and

BOX 3

Positive economic and social impact of road rehabilitation

Investments in transport infrastructure can have positive ripple effects. The Kiribati Road Rehabilitation Project cut time spent on traveling by residents of South Tarawa, the capital and hub of Kiribati, by 50% and improved both air quality and the health outcomes of the local communities. The decrease in dust levels associated with the project motivated small entrepreneurs (mainly women) to open food stalls along the main road and causeways. A 50% increase in registered food stall owners from 2017 to 2018 has been reported. Vehicle operating costs were reported to be lower in 2018 than in 2011 before the road reconstruction. Bus companies are spending less on maintenance and repairs (bearings, shock absorbers, tires).[12]

these emissions are projected to grow substantially in the years to come, further exacerbating climate change. Air and noise pollution, which are most pronounced in urban centres, and a lack of infrastructure for non-motorized modes of transport, such as walking and cycling, continue to directly impact health and well-being;[13,14] deaths and injuries from road traffic accidents continue to rise. Moreover, the enhanced connectivity can also facilitate the rapid spread of communicable diseases, illicit trafficking of people, contraband, and endangered species,[15] and support global terrorism and modern-day piracy.[16]

Where infrastructure, systems, and services are still missing or inadequate, for example in many developing countries, the benefits of transport cannot be accessed. Remote rural areas are especially disadvantaged, as they often have poor links to regional and national transport networks. Even where transport infrastructure and systems do exist, they may not provide safe, affordable, and convenient access for all, particularly for the poor, women and girls, older persons, and persons with disabilities. Existing transport networks can also face other challenges, such as congestion, poor maintenance, safety issues, and lack of resilience to extreme weather events and climate change. (See chapter 2 for more information on transport-related challenges).

The multi-stakeholder Sustainable Mobility for All initiative (SuM4All), which comprises many different actors from the transport sector, has articulated a similar concept of sustainable mobility. This builds on four objectives: universal access, efficiency, safety, and green mobility.

Both concepts emphasize the need to enable access for all, including the poor, women, youth, older persons, indigenous peoples, persons with disabilities and other groups, in both urban and rural areas, with the goal of 'leaving no one behind'.

INCREASING MOMENTUM FOR ACTION ON SUSTAINABLE TRANSPORT

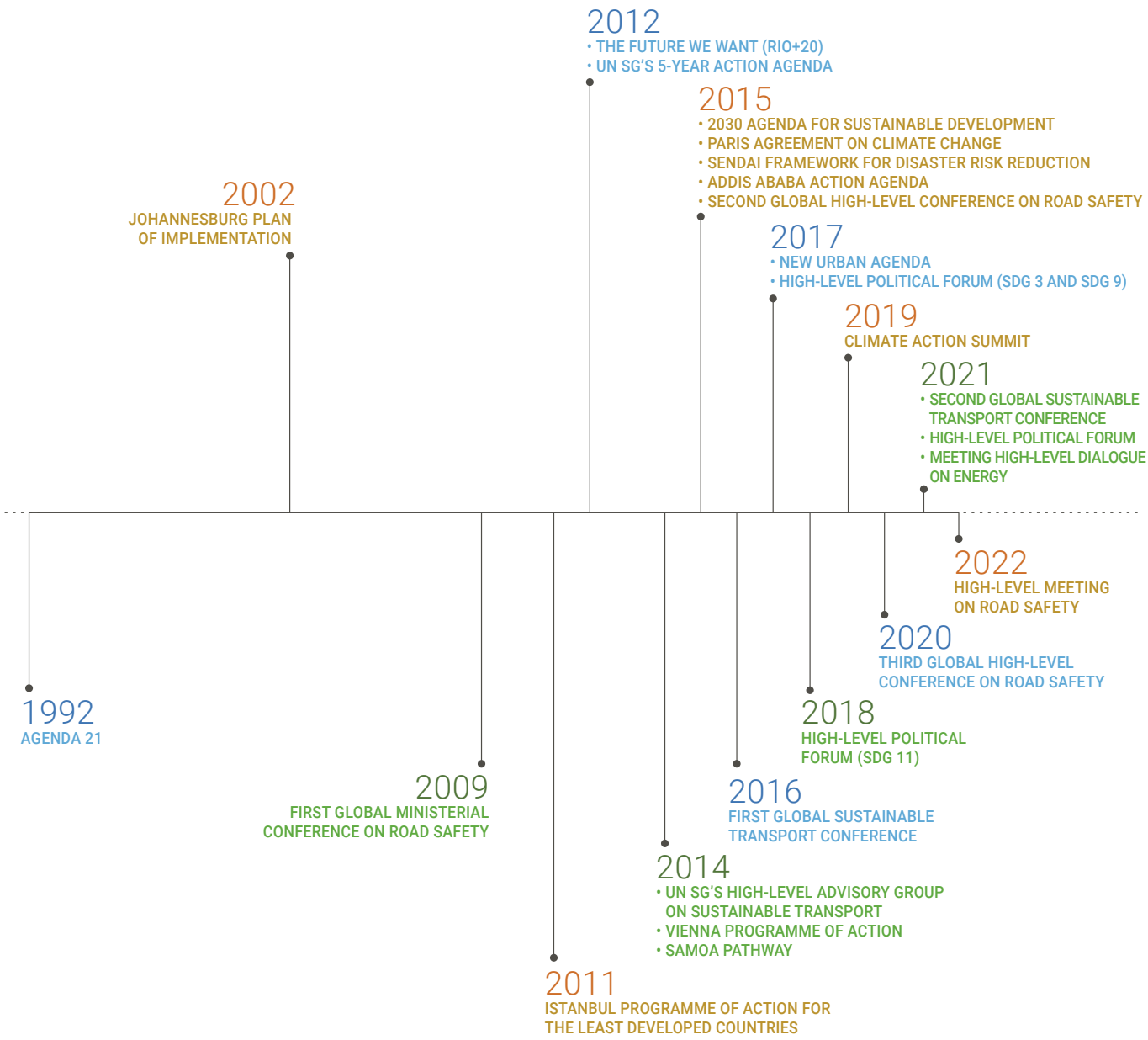
Sustainable transport has been gaining increasing momentum in global discussions and international forums.

The role of transport in sustainable development was recognized at the 1992 United Nations Earth Summit in Rio de Janeiro, Brazil, and was emphasized in its outcome document, Agenda 21. Subsequently, at the 2002 World Summit on Sustainable Development in Johannesburg, South Africa, the role of transport was once again captured in the outcome document, the Johannesburg Plan of Implementation (JPoI). The 2012 United Nations Conference on Sustainable Development (Rio +20), in its outcome document, *The Future We Want,* unanimously agreed that transportation and mobility are central to sustainable development.

In 2015, world leaders came together in New York and adopted the 2030 Agenda for Sustainable Development, including 17 SDGs, which call for bold, ambitious action for the well-being of people and the planet and defined the trajectory for building a sustainable future. While there is no single dedicated SDG for transport, it is reflected in several SDG targets and recognized as an enabler and a necessary condition for achieving many of the SDGs. The SDGs thus provide crucial elements that can be built upon, including access to safe, affordable, and sustainable transport systems for all, energy efficiency, road safety, resilient infrastructure development, the promotion of health, and the tackling of climate change.

The former UN Secretary-General Ban Ki-moon recognized sustainable transport as one of the pillars of his 5-Year Action Agenda and in August 2014 launched a High-Level Advisory Group on Sustainable Transport (HLAG-ST), representing all modes of transport, including road, rail, aviation, and water-borne. HLAG-ST submitted its policy recommendations to the Secretary-General in its global sustainable transport outlook report entitled Mobilizing sustainable transport for development[17] in October 2016.

The importance of sustainable transport, including for countries in special situations, is also recognized by the international community through other instruments, such as the Istanbul Programme of Action for the Least Developed Countries, the Vienna Programme of Action for the Landlocked Developing Countries (VPoA), the SAMOA Pathway for Small Island Developing States, the Sendai Framework for Disaster Risk Reduction, the Addis Ababa Action Agenda, and the New Urban Agenda. Sustainable



transport will also be key to meeting the targets of the Paris Agreement on Climate Change. At G20 meetings, discussions around quality infrastructure, connectivity, and resilience invariably encompass the issue of sustainable transport.

In addition, diverse international transport-related Conventions, regulations, and agreements[18] have been reached over the years (see Annex 2), and various multi-stakeholder initiatives and other sources of support have been established for countries and other stakeholders to achieve the aspirations for sustainable transport (see Annex 1, for some examples), further advancing the sustainable transport agenda.

With regard to monitoring and review, the 2017, 2018, and 2021 sessions of the High-level Political Forum on sustainable development (HLPF)[19] reviewed progress made with regard to transport-related SDG targets 3.6, 9.1, and 11.2.

The global commitment to sustainable transport was also spotlighted in the first ever Global Sustainable Transport Conference, convened by the UN Secretary-General on

26–27 November 2016 in Ashgabat, Turkmenistan. The Conference outcome consisted of: (1) the 'Ashgabat Statement on Commitments and Policy Recommendations'; (2) a report of the Conference; and (3) a compilation of partnerships, voluntary commitments, and initiatives to support sustainable transport. Participants reaffirmed "the role of sustainable transport in connecting people and communities to jobs, schools and health care and in the delivery of goods and services to rural and urban communities, thus providing all with equal opportunities and leaving no one behind".[20]

Much has changed following the Ashgabat conference. Since 2019, prior insufficient progress on the SDGs, the COVID-19 pandemic, and a worsening climate crisis have all underscored the urgency of accelerating the transformation to sustainable transport. Several factors are poised to drive longer-term changes in the demand for, and supply of, transport services, such as for example, individual and societal experiences during the pandemic, rapid digitalization, technological innovations, and strengthened commitments to carbon neutrality.

The upcoming second United Nations Global Sustainable Transport Conference,[21] scheduled to take place from 14 to 16 October 2021, therefore comes at an opportune moment to take stock of progress, identify ways forward, and catalyze action within a very different context from that of 2016. It will build on the Ashgabat Conference, and other related events, such as the 2019 Climate Summit,[22] the third Global High-Level Conference on Road Safety held in 2020,[23] and the 2021 High-level Dialogue on Energy.[24] The Conference will also contribute to forthcoming meetings such as the 26th Conference of the Parties (COP26) on climate change and the High-level Political Forum on Sustainable Development (HLPF) in 2022.

2. ATTAINING THE SDGs THROUGH SUSTAINABLE TRANSPORT

Since its inception, the 2030 Agenda for Sustainable Development with its 17 SDGs has been viewed as integrated and indivisible. This understanding has led to scientific assessments of the nature and strength of the interlinkages across goals and targets to determine the areas of strategic importance for implementation and to demonstrate where well-designed interventions can potentially amplify impacts across multiple parts of the 2030 Agenda, including the climate goals. However, accelerated progress in these areas is possible only if the systems connecting across the SDG goals and targets are transformed in ways that can resolve trade-offs and deliver on potential synergies, as recently emphasized by the Global Sustainable Development Report (GSDR) 2019.[25] The GSDR identified six 'entry points' where action is essential for systemic transformation towards sustainable development. Several of these—human well-being and capabilities, energy, cities, food systems—are closely related to sustainable transport and underscore its potential as a cross-sectoral accelerator of the achievement of the SDGs and successful climate action.

More specifically, some SDGs are directly connected to sustainable transport through specific targets and indicators, such as SDG target 3.6 on road safety, SDG target 9.1 on infrastructure, and SDG target 11.2 on providing access to safe, affordable, accessible, and sustainable transport systems for all and expanding public transport. Many other SDGs are indirectly connected through the enabling role of sustainable transport. For example, it is estimated that sustainable and resilient infrastructure—including but also going beyond transport—will have an impact on the achievement of up to 92% of all SDG targets.[26] Likewise, the attainment of other SDGs and related targets can facilitate the building of sustainable transport systems and improve access to them by, for example, raising household incomes, improving capacities for data use, and policy coherence, as well as by deploying innovative technology solutions to mitigate climate and other environmental impacts. The interlinkages between sustainable transport and different SDGs and targets, in addition to the interdependencies among countries and stakeholders, must be considered in planning, investment, and implementation actions by multiple stakeholders to accelerate progress towards attaining the SDGs and climate objectives.

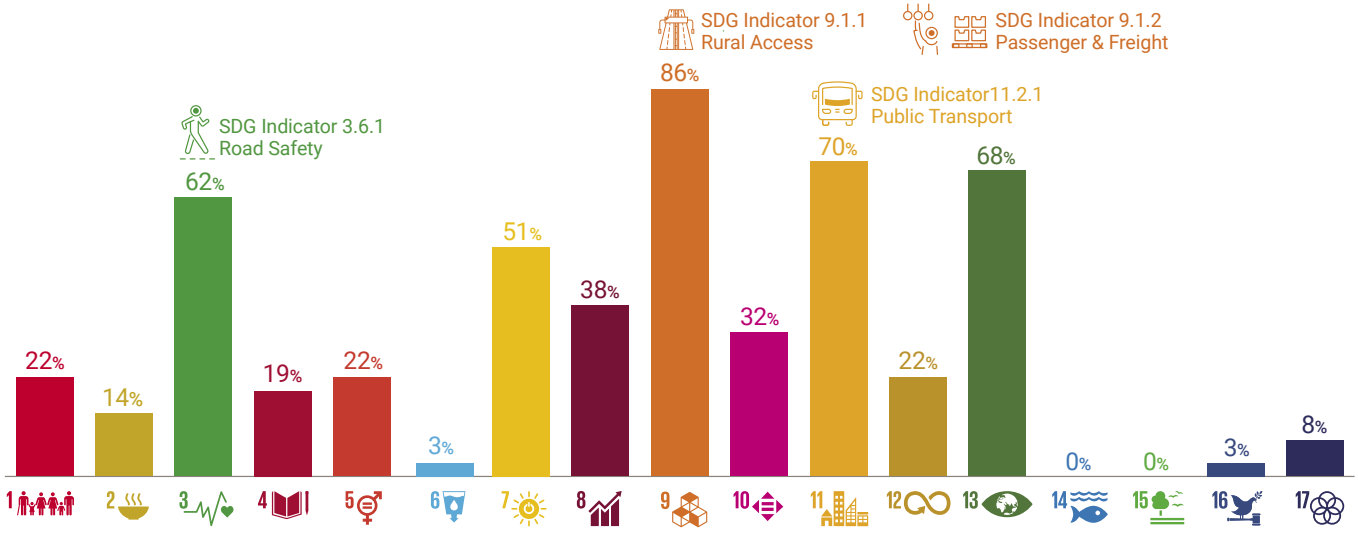
Several countries have leveraged the connections between transport and the SDGs, including SDG13 on climate action. Figure 1 illustrates how countries have connected transport infrastructure and services to different SDGs, as reflected in their voluntary national reviews (VNRs) submitted to the High-level Political Forum (HLPF) in 2021. The top interlinkages reported were between transport and SDG 9 (infrastructure), SDG 11 (cities), SDG 13 (climate action), SDG 3 (health), and SDG 7 (energy). Most VNRs focused on progress in urban transport, railway, shipping, and aviation, while relatively fewer reported on active mobility and rural transport. Many VNRs also pointed to the impacts of the COVID-19 pandemic on transport emissions, public transport ridership, unemployment, economic loss, and new ways of combating the pandemic. Around half of the VNRs submitted included references to transport sustainability impacts.

The integrated nature of the SDGs means that achieving significant progress towards sustainable transport will not only depend on progress in other areas but will also have impacts on them, for instance, renewable energy and energy efficiency, as well as urban planning, infrastructure, and technology development. Indeed, the transition of electricity generation away from fossil fuels is critical to ensuring that the adoption of electric vehicles results in a reduction in GHG emissions. Moreover, the use of biofuels in transport must be considered along with their potential negative impacts on food security and their contribution to deforestation.

Making transport infrastructure and services inclusive and sustainable also requires the involvement of, and interaction among, different stakeholders, such as policymakers, transport engineers and economists, social scientists, health professionals, urban and regional planners, and the private sector. Also required is an in-depth understanding of the transport needs of different population groups whose diverse voices and inputs should be actively sought and included in ongoing and future activities. Sound transport planning and policy must thus take into account multiple interdependencies across sectors and levels, while also facilitating the collaboration among different actors. Actors from outside the transport sector can also be involved if their own objectives can be facilitated through the achievement of sustainable transport. At the global level, one example of such involvement could be with the human rights–related Special Rapporteurs on, say, persons with disabilities,

FIGURE 1

Percentage of voluntary national reviews connecting transport with different SDGs (2021)



Source: SLOCAT (2021)[27]

violence against women, the right to development, or everyone's right to the highest attainable standard of physical and mental health.

To manage trade-offs and leverage synergies among the 17 SDGs, there is a continuing need to more systematically identify their interactions, including between transport-related SDG targets and other goals and targets.[28] At the same time, implementation arrangements should help overcome fragmentation within and across sectors, including by providing incentives for multi-stakeholder knowledge sharing and collaboration. The Compendium of National Institutional Arrangements for Implementing the 2030 Agenda for Sustainable Development[29] indicates that many countries are integrating the SDGs into national sustainable development plans and strategies, adopting a whole-of-government approach and establishing multi-stakeholder consultation mechanisms. This trend should be supported and also directed towards sustainable transport.

Countries could start mapping existing policies, institutions, and key stakeholders in the context of challenges and opportunities for delivering on sustainable transport. These efforts should be integrated into national plans and strategies for achieving the SDGs and into the Nationally Determined Contributions (NDCs). The economic and social development plan 2016–2020 of Bolivia, for example, clearly identifies sustainable transport as a prerequisite for ensuring full access to good quality, sustainable basic services; it includes concrete goals for multimodal transport solutions and also shares expected results.[30] The NDC of Jordan aims to: increase the share of public transport from 13 to 25% by 2025; reduce vehicle fuel consumption and emissions; and reduce motorized vehicle travel, particularly in densely populated areas.[31] In many countries, COVID-19 stimulus and recovery plans could offer additional opportunities for action.

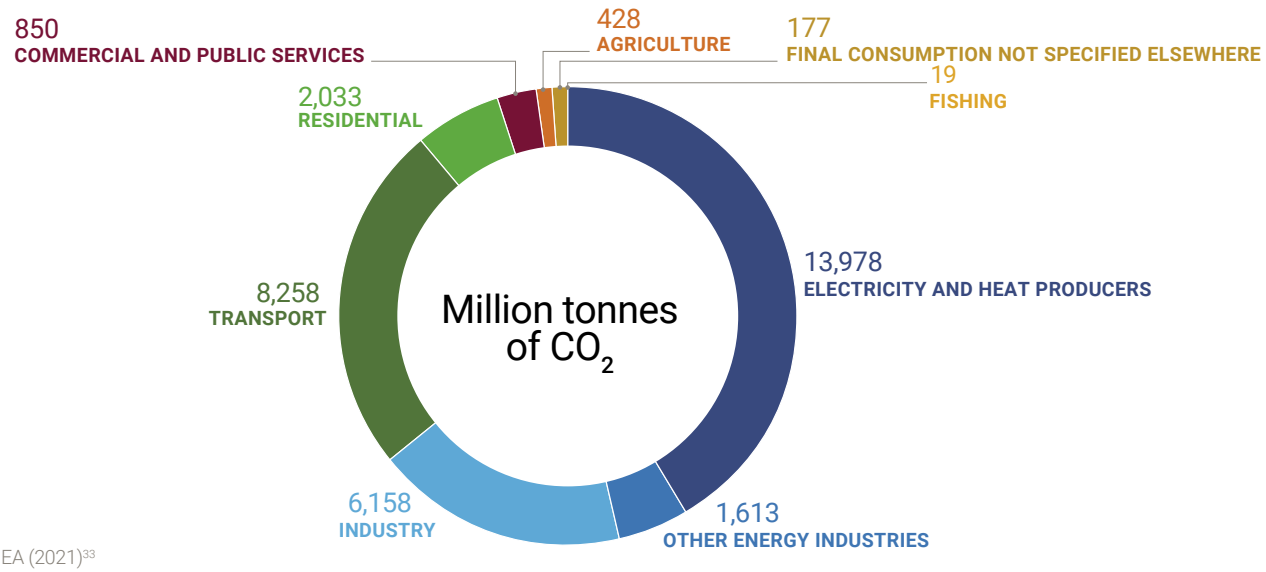
3. CLIMATE CHANGE MITIGATION AND ADAPTATION

Flows of people, goods, and information have increased dramatically over recent decades and will continue to rise alongside associated increases in demand for sustainable transport (see also chapter 2.2). At the same time, the dire impacts of climate change are already apparent and expected to worsen, at least in the short term.[32]

The transport sector remains a significant contributor to GHG emissions and climate change, while at the same time being vulnerable to climate-related extreme weather and disasters, albeit with different levels of risk

FIGURE 2

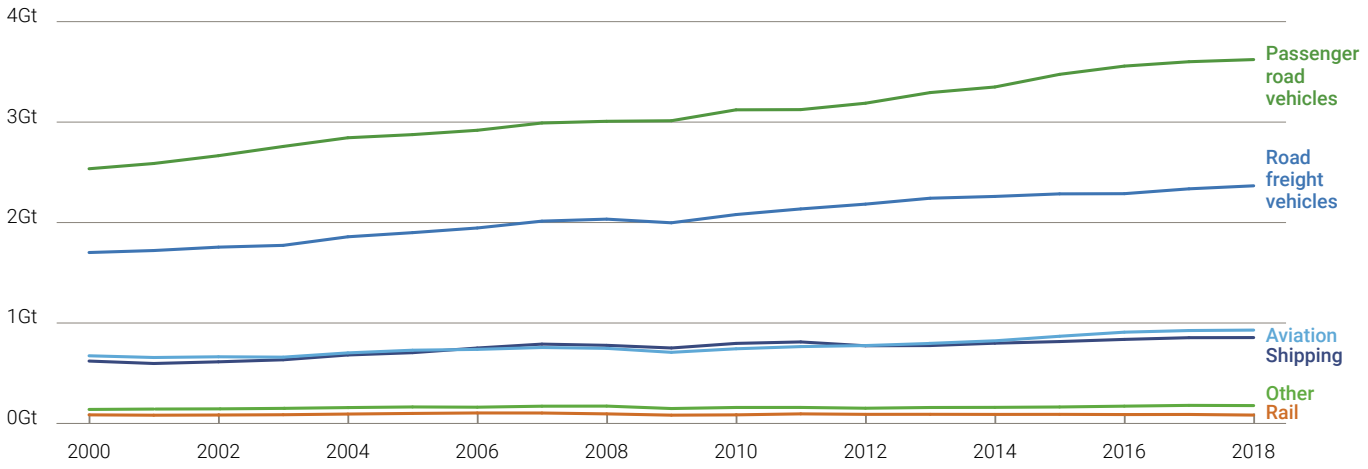
CO_2 emissions by sector (2018)



Source: IEA (2021)[33]

FIGURE 3

Transport sector CO_2 emissions by mode (2000-2018)



Source: IEA (2021)[34]

and exposure across modes and geographical localities. The ways in which transport systems evolve and adapt will thus be crucial to supporting resilience to climate impacts, which is central to achieving sustainable transport.

THE TRANSPORT SECTOR AS A MAJOR CONTRIBUTOR TO CLIMATE CHANGE

In 2020, the transport sector was responsible for 24% of direct CO_2 emissions from fuel combustion (see Figure 2).[35] It also accounted for 57% of global oil demand and 28% of total energy consumption.[36]

Figure 3 shows the development of CO_2 emissions for different transport modes for the 2000–2018 time period, with passenger road vehicle transport being by far the largest contributor. In contrast, rail accounted for only about 0.3% of direct CO_2 emissions.[37] Active modes, such as walking and cycling, remain among the most sustainable, low-carbon transport modes, in particular for shorter distances in urban areas.

Emissions from transport have increased rapidly, although with variations across different transport modes and regions.

For the 2000–2019 period, aviation emissions rose by an annual average rate of 2%, which was associated with an average annual increase of 5% in commercial passenger flight activity.[38] International shipping, which carries over 80% of the world merchandise trade, saw emissions rise by about 0.85% on an annual average basis between 2010 and 2019. The GHG emissions of shipping as a whole (international, domestic, and fishing) stood at close to 3% of the total global figure in 2018.[39] While emissions from aviation and shipping have recently been increasing at a faster rate than those of any other transport mode, energy demand and emissions have also continued to rise across all modes of road transport (cars, trucks, buses, and two- and three-wheelers), with increases being particularly rapid in heavy-duty road freight transport.[40]

Between 2010 and 2019, transport CO_2 emissions rose in all regions, except Europe, where they fell 2%, a drop attributed to advanced fuel economy regulations and advancing initiatives on sustainable urban mobility (see Figure 4). Developing regions showed the fastest rates of growth, with Asia being the largest emitter in absolute terms in 2019.[41]

Under various business-as-usual scenarios,[42] transport emissions are projected to continue to grow rapidly. Given that some transport volumes (combined passenger and

freight) are projected to double or triple by 2050, deep cuts in emissions will be required to steer the transport sector toward a sustainable outcome.[43]

IMPACT OF CLIMATE CHANGE AND EXTREME WEATHER EVENTS ON SUSTAINABLE TRANSPORT

Transport emissions contribute to climate change, but transport systems are also highly vulnerable to the effects of climate change, such as extreme weather events and natural disasters, with impacts that increase the potential for significant human and economic losses. These include: accelerated coastal erosion; flooding, port, and coastal road inundation/submersion; access to docks and marinas being restricted; deterioration of the condition and structural integrity of road pavements, bridges, and railway tracks. When mobility is compromised, freight transport and supply chains are interrupted, including for vital products like food and medicine, and populations can lose access to jobs, healthcare, and other basic services (See Box 4).

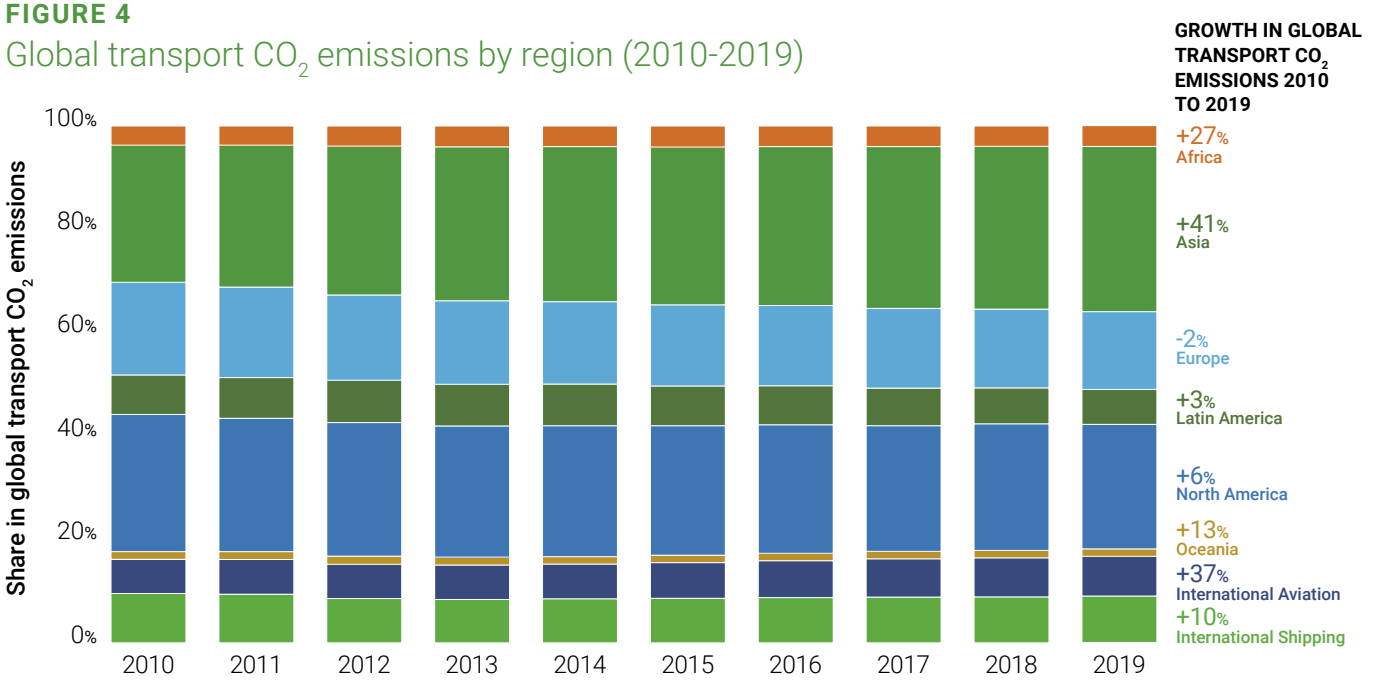
BOX 4

Climate extremes and supply chain disruptions: Flooding in Thailand

In 2011, Thailand was deluged by rain for months. The downpours saturated the landscape, causing flooding that covered over than two-thirds of the country and affecting more than 13 million people. There were 680 deaths,[45] and the economy was devastated due to the impacts on transport systems and related supply chains; particularly affected was the road network.[46] Because of the country's role in the global manufacturing of certain products like automobiles and electronics, the disaster impacts were not limited to Thailand. According to the United Nations Office for Disaster Risk Reduction (UNDRR), global industrial production was reduced by 2.5%, and the ensuing damage cost the world's top three non-life insurance companies 5.3 billion US dollars ($) in claims—an amount greater than the cost of Japan's massive earthquake and tsunami earlier the same year. While the floods impacted a number of industries, electronics manufacturers and auto companies were particularly hard hit: Western Digital, producer of one-third of the world's hard disk drives, lost 45% of its shipments, while Toyota, Honda, and Nissan lost 240,000, 150,000, and 33,000 cars, respectively. These losses were, in turn, reflected in these companies' bottom lines. For the two worst-hit car makers, net profits declined by over 50% from 2010 levels.[47]

FIGURE 4

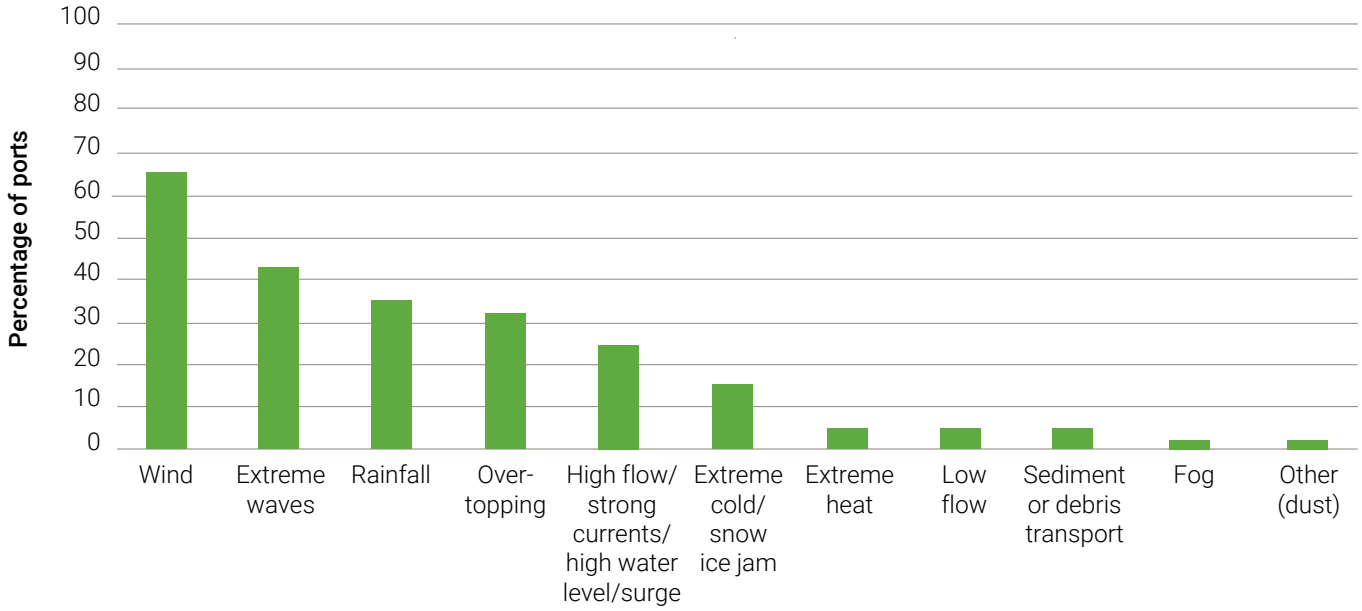
Global transport CO_2 emissions by region (2010-2019)



Source: SLOCAT (2021)[44] [*Note: regions are not aligned with UN regions]

FIGURE 5

Percentage of ports reporting extreme weather events (2019)



Source: International Association of Ports and Harbors (2020)[48]

As over 80% of global merchandise trade is carried by sea,[49] disruption to ports, for example, caused by extreme weather events, can have important knock-on effects on the rest of the economy as they constitute "choke points" in international and national commerce, and are vital to maintaining functioning supply chains. A 2019 survey of 53 ports ranked the main extreme weather incidents affecting ports worldwide where there were significant or critical effects in terms of port closure or downtime (see Figure 5). Extreme weather events are expected to become more likely with climate change.

The economic damage to transport infrastructure from climate-related events is significant. A 2019 global multi-risk analysis of road and railway infrastructure assets estimated that around 27% of all global road and railway assets are exposed to at least one hazard and about 7.5% of all assets are exposed to a 1 in 100-year flood event. The global annual direct cost of damage to road and railway assets from extreme weather is estimated to range from $3.1–22 billion, of which around 73% is expected to be caused by surface and river flooding.[50] Another recent study estimates that the total value of assets exposed to episodic coastal flooding by 2100 could increase to 12–20% of global gross domestic product (GDP), if no adaptation measures are taken.[51]

4. A DIVERSITY OF STAKEHOLDERS AND INITIATIVES

The cross-cutting nature of sustainable transport presents opportunities for partnerships among a wide array of stakeholders in the public, private, national, and international domains in support of achieving the 2030 Agenda and the Paris Agreement. Partnerships are especially critical, given the need to integrate the social, economic, technological, and environmental aspects of sustainable transport, which are related to different stakeholders and institutions.

Transport and other sector policymakers, local governments, private sector representatives, and communities thus need to collaborate in their efforts

BOX 5

Examples of inter-ministerial and multi-level collaboration

The United Arab Emirates (UAE) Government Accelerators are a platform for cross-sectoral government teams to achieve ambitious goals in a short period of time. One of the accelerators set the goal to reduce traffic accident deaths on the five most dangerous roads in the country within 100 days. By the end of the challenge, the death rate had been reduced by 63% over the corresponding two-month period of the previous year, and 24 lives were saved. This solution is now being rolled out across the other main roads in the country.[52]

The Government of Canada has signed bilateral agreements with provinces and territories regarding several transport-related SDGs, including green infrastructure (SDG 9), labour markets (SDG 8), and urban transportation (SDG 11).[53]

BOX 6

Interagency cooperation: Addressing various SDGs through sustainable transport measures

The total number of fishing vessels in the world is estimated to be around 4.6 million. Fishing is one of the most dangerous professions in the world, with thousands of fishers estimated to lose their lives every year. The International Maritime Organization (IMO) has thus been working for many years, alongside the International Labour Oganization (ILO), Food and Agricultural Organization (FAO), and other stakeholders, to enhance fishing vessel safety, save lives, improve the conditions and knowledge of the workers at sea, and contribute to efforts against illegal, unreported, and unregulated (IUU) fishing (related to SDGs 3, 4, 8, 10, 12, and 14). For example, the 2012 Cape Town Agreement is an internationally binding instrument that includes mandatory international requirements for stability and associated seaworthiness, machinery and electrical installations, life-saving appliances, communications equipment, and fire protection, as well as fishing vessel construction. It aims to facilitate better control of fishing vessel safety by flag, port, and coastal States. It is also expected to help combat IUU fishing. The treaty will enter into force after at least 22 States have expressed their consent to be bound by it. There were16 Contracting States in 2021.[54]

to move the sustainable transport agenda forward and to avoid working in silos (see Boxes 5 and 6 for examples).

The transport sector itself, however, remains quite fragmented, with different stakeholders being active in, or responsible for, different parts of the transport agenda; for example, within the UN system, different specialized agencies are responsible for different parts of the transport agenda, such as the International Civil Aviation Organization (ICAO) on civil aviation, the International Maritime Organization (IMO) on shipping, the United Nations Conference on Trade and Development (UNCTAD) on transport linked to trade, the United Nations Economic Commission for Europe (UNECE) on inland transport, and the UN Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States (UN-OHRLLS) on transport as it relates to countries in special situations. These entities, though specialized and with a unique focus, should continue to expand cooperation to resolve challenges where a collaborative solution is more effective and efficient.

Recent initiatives have sought to bring together different stakeholders, notably with a view to supporting the implementation of the 2030 Agenda and the Paris Agreement. One example is the Sustainable Mobility for All initiative (SuM4All)[55], which was launched at the 2016 Climate Action Summit convened by the UN Secretary-General and aims to unify different transport stakeholders and get them to act collectively to help transform the transport sector. Its key signature report, *Global Roadmap of Action Toward Sustainable Mobility* (GRA),[56] and its recently released GRA in Action Series,[57] represent efforts to define a path towards sustainable mobility, including in support of achieving the SDGs and climate action: they are a series of action plans for implementation over time, adapted to individual country contexts and based on solid diagnostics.

Also worth noting in this context is the Transport Pathway Action table of the Marrakech Partnership for Global Climate Action, which comprises a number of action areas on, for example, resilient transport systems,

infrastructure, and vehicles; it sets out related recommendations for different stakeholders, as well as milestones towards 2050.[58]

Other examples of regional and global partnerships and initiatives include the Transport, Health and Environment Pan-European Programme (THE PEP),[59] the Partnership on Sustainable, Low Carbon Transport (SLoCaT),[60] which promotes sustainable low-carbon transport, and the recent "Action towards Climate-friendly Transport (ACT)" initiative,[61] a coalition of one hundred organizations which joined forces at the September 2019 Climate Action Summit of the Secretary-General to work together to decarbonize the transport sector. All mobilize a wide range of stakeholders. Modal-focused multi-stakeholder partnerships are also emerging, such as the Getting to Zero Coalition, which aims to attain the IMO target of reducing GHG emissions from shipping by at least 50% by 2050, and the Aviation Partnerships for Sustainable Development initiative,[62] which, among others, aims at strengthening synergies and minimizing trade-offs between air transport and the SDGs, especially in countries in special situations. Finally, some initiatives are led by and/or involve the private sector, like Movin'On, which holds annual World Summits on Sustainable Mobility.[63]

These are positive developments, but more efforts are required—especially in view of the Decade of Action and Delivery for Sustainable Development—to overcome fragmentation of the sector and allow the transport community to work coherently and in a coordinated manner towards a sustainable transport transformation that leaves no one behind. In this context, and as previously suggested by the Secretary-General's High-level Advisory Group on Sustainable Transport, the United Nations could, for example, support a coalition or partnership network to strengthen coherence and accelerate action to support transformative change by mobilizing cooperative action among the relevant UN organizations and stakeholders outside the UN system that are key to scaling up sustainable transport.

CHAPTER II

Sustainable transport: Progress and challenges

1. STATUS UPDATE – THE SDGS, CLIMATE CHANGE, AND THE COVID-19 PANDEMIC

The 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change embody the world's commitment to achieving an inclusive, sustainable path for people and the planet. By the end of 2019, however, it was already clear that progress towards many of the goals and targets associated with the 2030 Agenda and the Paris Agreement was regionally unequal and globally insufficient. The Sustainable Development Goals Summit (2019)[64] and the Climate Action Summit held during the 74th United Nations General Assembly[65] both called for urgent action. Since then, the COVID-19 pandemic and the worsening climate crisis have caused further setbacks. A transformation towards sustainable transport, guided by ensuring inclusion, safety, efficiency, resilience, affordability, and a reduced environmental footprint would spur progress along multiple dimensions of sustainability. At the same time, such a transformation would need to consider emerging trends and challenges continuing well beyond 2030.

OVERALL SDG PROGRESS

Even prior to COVID-19, assessments showed that only a few SDG targets—including childhood mortality and increasing primary school enrolment—were on track to being achieved by 2030.[66] For several others—such as eradicating extreme poverty or reducing maternal mortality—progress was in the right direction, but not rapid enough. Inequalities were on the rise in many countries. At the global level, trends were not even in the right direction for crucial measures such as reducing obesity, curbing GHG emissions, and halting biodiversity loss.

The situation has worsened with the COVID-19 pandemic.[67] In 2020, an additional 119–124 million people are estimated to have been pushed into extreme poverty and a further 83–132 million into chronic hunger. Moreover, an extra 101 million children fell below minimum reading-proficiency levels, which indicates how sweeping learning losses have been. Women and girls have faced disproportionately high impacts due to the increased burden of care work, loss of work in the informal sector, a rise in domestic partner violence, and an expected increase in the frequency of under-age marriage. The unequal pace of vaccination across countries threatens vastly unequal outcomes for billions of people in developing countries, further impeding SDG progress.[68,69]

Sustainable transport can help accelerate progress and reverse several of these negative trends. However, such impacts are possible only through an integrated approach that seeks to consciously realize synergies, manage trade-offs, and emphasize coherent and coordinated actions across stakeholders at all levels.

PROGRESS ON SUSTAINABLE TRANSPORT-RELATED SDG TARGETS

Some SDGs are directly connected to sustainable transport through targets and indicators, such as SDG 3.6 on road safety, SDG 9.1 on infrastructure, and SDG 11.2 on providing access to safe, affordable, accessible, and sustainable transport systems for all and expanding public transport. The global indicator framework, as determined by the Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs), created by the United Nations Statistical Commission, is used for monitoring progress.

Table 1 presents a summary description of these targets. The overall picture is one of slow progress, but there are also gaps in data availability and coverage.

SDG TARGET 3.6 (ROAD SAFETY)

The road safety target sought to "by 2020, halve the number of global deaths and injuries from road traffic accidents", with the associated indicator 3.6.1 measuring the "death rate due to road traffic injuries".

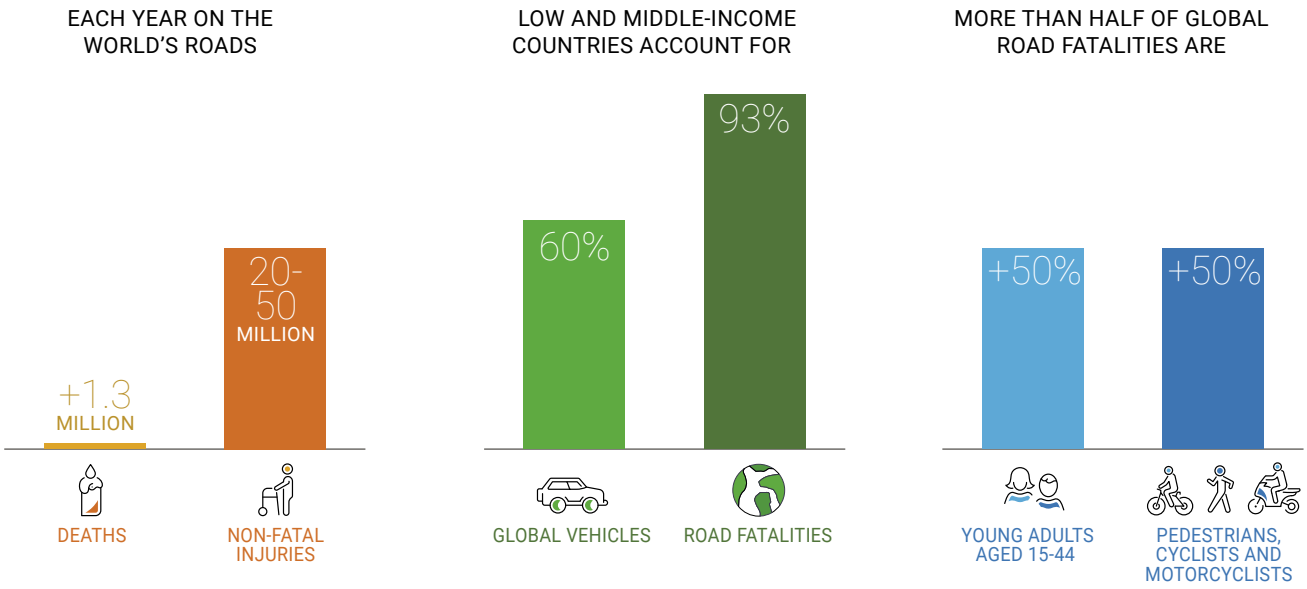
This target was not met, although some progress was made with the global mortality rate, as road traffic injuries declined from 18.1 per 100,000 population in 2010 to 16.7 in 2019. However, road traffic crashes killed about 1.3 million people worldwide in 2019, with 75% of these occurring among boys and men. Road traffic injuries remained the leading cause of death among young people aged 15–29 worldwide.[72] More than half the global road traffic deaths

TABLE 1

Sustainable transport-related SDG targets and indicators

SDG TARGETS		SDG INDICATORS (TIER;[70] CUSTODIAN AGENCY)	DATA AVAILABILITY
3.6	**By 2020**, halve the number of global deaths and injuries from road traffic accidents	**3.6.1:** Death rate due to road traffic injuries (I; WHO)	**Almost 70 countries** currently provide WHO with regular high-quality data on mortality by age, sex, and cause of death, and another 58 countries submit data of lower quality. However, comprehensive cause-of-death estimates are calculated by WHO systematically for all of its Member States (with a certain population threshold) every three years.
9.1	Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	**9.1.1:** Proportion of the rural population who live within 2 km of an all-season road (II, World Bank, ADB, UNECE, UNEP)	**Rural Access Index** (RAI) is currently available for 25 countries in Africa, Asia, South America, Central Asia, and the Middle East.
		9.1.2: Passenger and freight volumes, by mode of transport (I, ICAO, ITF-OECD; IPU, UNCTAD, UNECE, UNEP)	**Aviation Data:** Already provided for all 191 Member States that have air transport activities. **Road/Rail/Waterborne:** For UNECE (56 MS) and ITF (63 MS) Member States data are typically available, although some data gaps appear for some modes due to collection being intermittent.
11.2	**By 2030**, provide access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities, and older persons	**11.2.1:** Proportion of population that has convenient access to public transport, by sex, age, and persons with disabilities (II, UN-HABITAT; UNECE, UNEP)	**130 countries** (1,511 cities)

Source: United Nations Statistical Commission.[71]



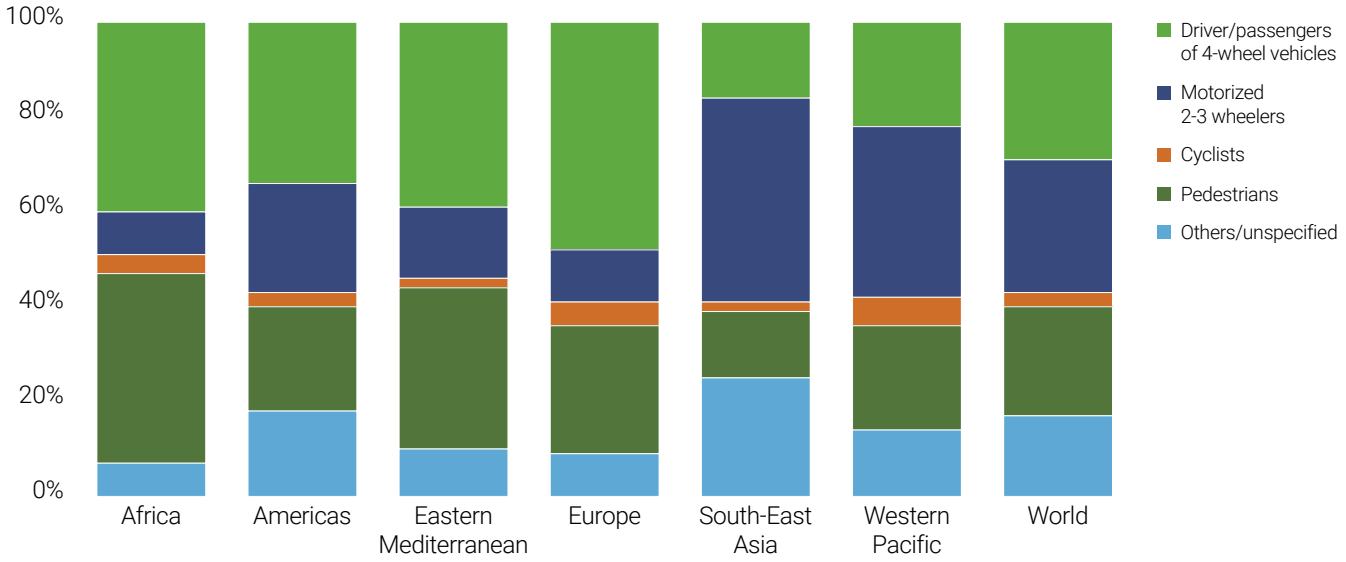
are among pedestrians, cyclists, and motorcyclists. In addition, between 20 and 50 million non-fatal injuries yearly are caused by road traffic crashes.[73]

There are considerable differences across regions and countries. The death rate was over 3.5 times higher in low-income countries than in high-income countries, despite lower rates of vehicle ownership in the former.[74] The proportion of deaths across regions also varies by road user type (Figure 6) and gender (Figure 7).

While advances have been made in terms of legislation, vehicle standards, and access to post-crash care, these are evidently not occurring fast enough, especially given the rapid motorization of transport and rising population in many parts of the world, and the persistent gaps in safe infrastructure for pedestrians and cyclists. In addition, enforcement can sometimes pose a challenge.[75] This was also recognized at the third Global High-Level Conference on Road Safety, held on 19–20 February 2020 in Sweden,

FIGURE 6

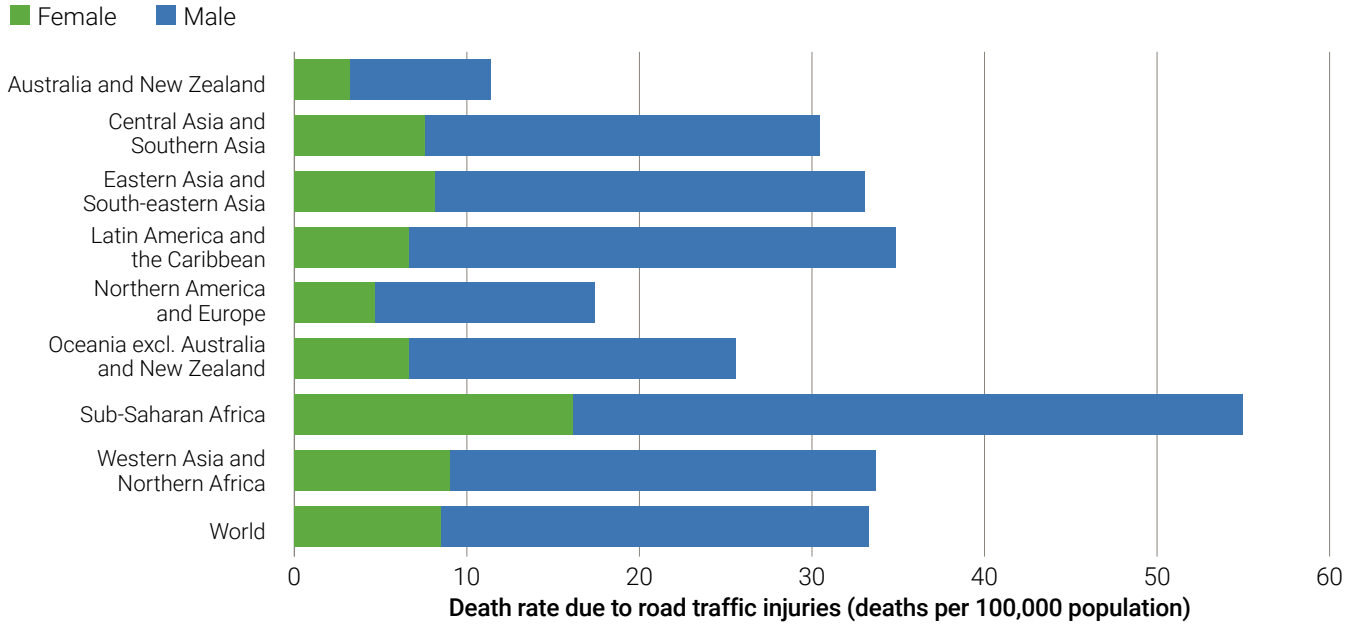
Distribution of deaths by road user type and region (2018)[76]



Source: WHO (2018)[77]

FIGURE 7

Road traffic mortality by region (2019)



Source: WHO (2019)[78]

which marked the end of the UN Decade of Action for Road Safety 2011–2020, and resulted in the Stockholm Declaration.[79]

The appointment of the UN Secretary-General's Special Envoy for Road Safety in 2015 and the establishment of the United Nations Road Safety Trust Fund in 2018 marked the beginning of a global approach towards fostering road safety.

The UN General Assembly, through its resolution A/RES/74/299,[80] declared the period 2021–2030 as the Second Decade of Action for Road Safety, with a goal of reducing road traffic deaths and injuries by at least 50% from 2021 to 2030. This resolution also called for a high-level meeting of the General Assembly on the subject; subsequently it was decided to hold this in New York, back-to-back with the high-level political forum on sustainable development in July 2022, under the theme of 'The 2030 horizon for road safety: securing a decade of action and delivery'.[81]

SDG TARGET 9.1 (INFRASTRUCTURE)

Sustainable and resilient infrastructure is at the heart of sustainable development and central to the achievement of most SDGs.[82] Accordingly, SDG 9.1 calls for developing "quality, reliable, sustainable and resilient infrastructure,

GLOBALLY

1 BILLION
OF THE RURAL POPULATION
REMAIN UNCONNECTED TO A GOOD QUALITY ROAD NETWORK

AFRICA

450 MILLION PEOPLE,
MORE THAN **70 PERCENT** OF THE TOTAL RURAL POPULATION,
REMAIN UNCONNECTED TO TRANSPORT INFRASTRUCTURE AND SYSTEMS

INFRASTRUCTURE AND ISOLATION

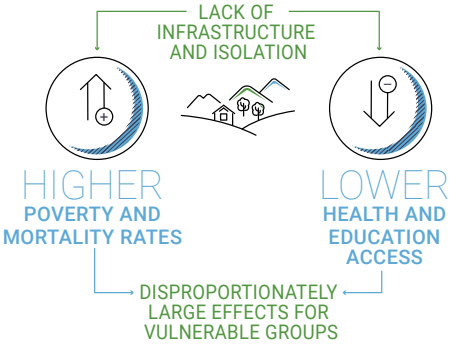
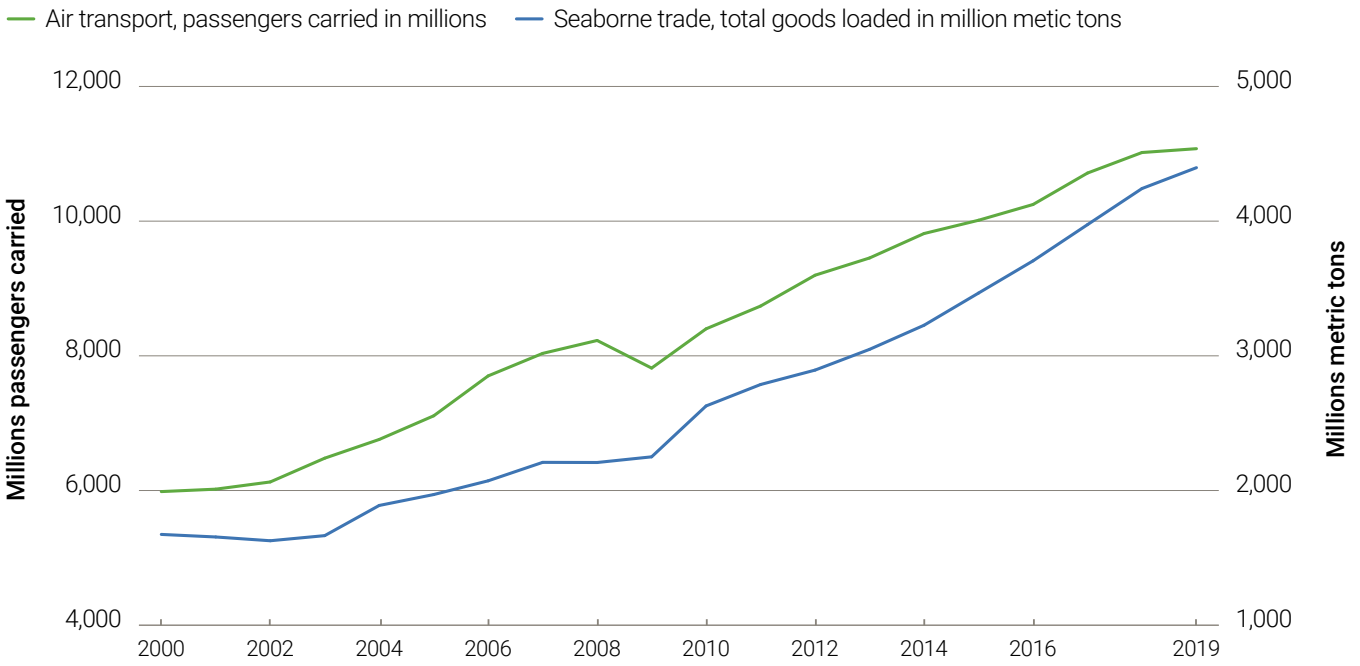


FIGURE 8

Global annual port and air traffic (2000-2019)



Source: UNCTAD 2020 and ICAO (2020)

including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all".

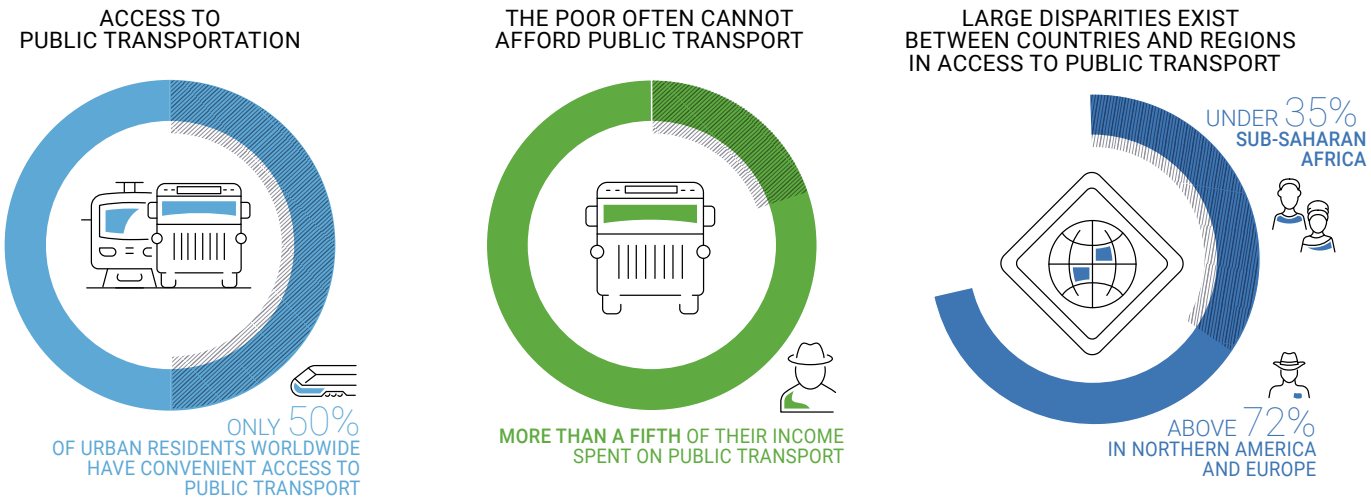
Rural access

The first of the two indicators for SDG target 9.1, namely, indicator 9.1.1, aims to measure the "proportion of the rural population who live within 2 km of an all-season road". Over a billion people still lack access to an all-weather road and adequate transport services, especially in developing countries, including countries in special situations, and this represents a major barrier to social and economic development.[83] As measured in 2021, in the 25 countries using an updated method for the World Bank's Rural Access Index, almost 300 million rural dwellers, from a total rural population of approximately 520 million, still lacked good access to roads. This contributes to deprivation in terms of access to timely health care, education, jobs, and markets for agricultural produce. Rural isolation disproportionately harms the poor, older persons, persons with disabilities, children, and women.

Passenger and freight volumes

The second SDG indicator 9.1.2 aims to measure passenger and freight volumes, disaggregated by mode of transport. The International Civil Aviation Organization (ICAO), as custodian agency, publishes data on aviation: in 2019, Northern America and Europe had the highest passenger numbers and cargo tonnes of freight, followed by Eastern Asia and Southeastern Asia. UNCTAD's data on maritime transport in cargo tonne-miles reflect a global doubling to an estimated 60,000 billion tonne-miles from 2000 to 2019.[84] In terms of weight alone (metric tonnes loaded and discharged), Asia accounted for more than half, followed by Europe and the Americas (about a fifth each) and Oceania and Africa (about a twentieth each).[85] As shown in Figure 8, global port traffic and passenger air transport have steadily increased since 2010.

In addition, inland transport data for this indicator is collected by the supporting custodian agency, UNECE, including through its joint work with International Transport Forum (ITF) and Eurostat.[86]



SDG 11.2 (ACCESS FOR ALL; EXPANSION OF PUBLIC TRANSPORT)

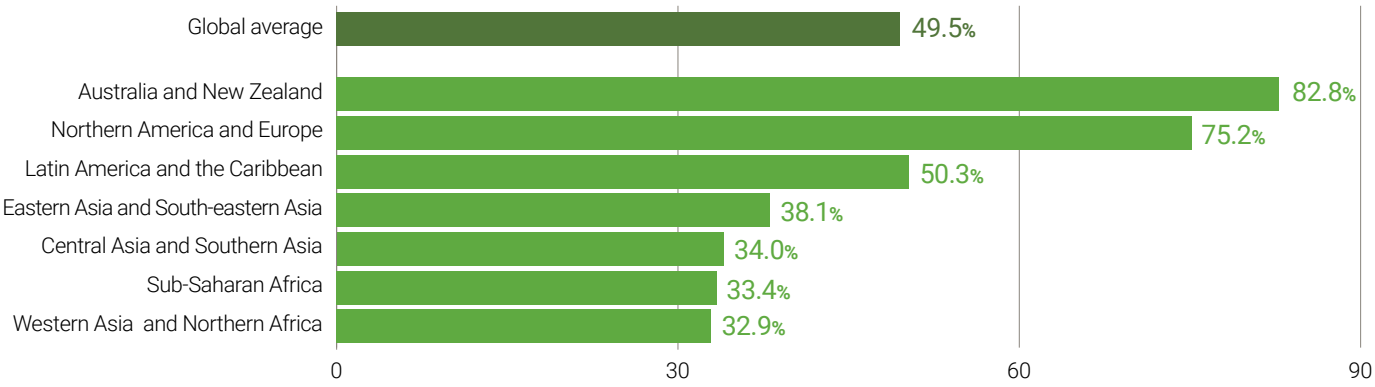
SDG 11.2 seeks to "by 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons".

The indicator associated with SDG target 11.2 seeks to assess the "proportion of population that has convenient access to public transport, by sex, age and persons with disabilities", with a focus on urban populations.

Adequate public transport infrastructure and affordable transport services are still widely lacking in many countries of the world, especially for the most vulnerable groups. This is in contrast to a global increase in public transport demand of almost one-fifth between 2001 and 2014, which suggests related negative impacts, such as worsening congestion and crowding—a challenge that is likely to increase with rapid urban population growth.[87] Today, only 49.5% of urban residents worldwide have convenient access to public transport, based on data from over 1,500 cities collected by custodian agency UN-Habitat.[88] Broken down by region, Western Asia, Northern Africa, and sub-Saharan Africa lag behind, with only about 33% of inhabitants having convenient access to public transport (see Figure 9). Informal transport modes, such as motorcycle taxis, auto-rickshaws, and pedicabs,[89] are widely available in some regions with low public transport access. They often provide reliable transport but may contribute to negative externalities such as congestion and pollution.[90]

FIGURE 9

Proportion of urban population with convenient access to public transport (2021)



Source: UN-Habitat (2021)[91]

Taken together, these targets span only some of the elements of sustainable transport, and notably exclude the environmental dimension. However, the data show that even for this small subset, progress is insufficient.

SUSTAINABLE TRANSPORT AND CLIMATE CHANGE

Climate trends

In 2015, with the Paris Agreement on Climate Change,[92] the international community resolved to keep global average temperature rise well below 2°C above pre-industrial levels, and to pursue efforts to further limit temperature increases to 1.5°C. Meeting this commitment requires peak global GHG emissions to be reached as soon as possible and moving towards carbon neutrality in the second half of the 21st century.

The current situation is dire: the global average temperature in 2020 was 1.2 ± 0.1°C above pre-industrial levels, 2011–2020 was the warmest decade on record, and GHG emissions continue to rise.[93] The most recent assessment of the Inter-Governmental Panel on Climate Change (IPCC) expects, based on current trends, that average warming over the next 20 years will exceed 1.5°C, with several unprecedented consequences, such as rising sea levels, already locked in.[94]

Other studies also indicate that the 1992 objective of the United Nations Framework Convention on Climate Change (UNFCCC) of preventing "dangerous anthropogenic interference with the climate system" is most likely to be missed unless drastic measures are taken. The Emissions Gap Report 2020 of the United Nations Environmental Programme (UNEP), for example, noted that we are heading for a world that is 3.2°C warmer by 2100, even if there is full implementation of unconditional NDCs under the Paris Agreement. A green recovery from the pandemic could, however, cut up to 25% off the emissions we would expect to see in 2030 with implementation of unconditional NDCs— and that would bring the world close to the 2°C pathway. This would include direct support for zero-emissions technologies and infrastructure, reductions in fossil fuel subsidies, and support for nature-based solutions, including large-scale landscape restoration and reforestation, and preservation of intact forest cover.[95]

Sustainable transport and climate action

Mobilizing transport towards climate action is essential. In recent years, different commitments have been made by various stakeholders, including UN Member States, the UN system, civil society, and the private sector, to accelerate progress towards carbon neutrality, with significant impacts for the transport sector (see Annex 3 for overview of selected commitments).

Over time, country pledges have increased —28 countries and the European Union made commitments towards carbon neutrality in 2020 — but many of these are yet to be reflected in updated NDCs.[96] Several private companies, including those in the automobile and aviation sectors, have also been setting goals to achieve carbon neutrality, including through electrification, a shift to low- or zero-carbon fuels, and energy efficiency improvements. In addition, there are several coalitions of private sector companies working towards carbon neutrality, such as the Climate Pledge, Movin'On and the We Mean Business Coalition.

More broadly, sustainable transport commitments should be part of countries' commitments under the Paris Agreement, as reflected in their NDCs. In 2015, of the 166 NDC submissions representing 193 countries, 76% highlighted the transport sector as a mitigation source, but only 8% included transport-specific GHG mitigation targets. About 16% of NDCs included transport adaptation. NDCs also tended to focus more on passenger transport, while less than a quarter referenced freight transport.[97]

New and updated NDCs are due at COP26, which was rescheduled due to the COVID-19 pandemic to 1–12 November 2021. As of 31 December 2020, a total of 48 new/updated NDCs had been received, representing 75 parties—about 40% of them being Parties to the Paris Agreement and accounting for 30% of global GHG emissions. An analysis of these commitments showed road transport to be by far the most frequently identified area for mitigation action. Energy efficiency improvement (e.g., fuel efficiency standards) was the most common mechanism, with parties also indicating measures such as increasing electrification (e.g., building a network of electric charging stations, ending the sale of new fossil fuel–powered cars and vans by 2030), improving transport efficiency

(e.g., developing public transport, building rail networks), or taking cross-cutting action (e.g., decarbonizing ports, establishing vehicle emission standards).[98]

To make a lasting impact, these commitments must now be translated into action.

THE IMPACTS OF THE COVID-19 PANDEMIC ON SUSTAINABLE TRANSPORT

The global pandemic unleashed an unimaginable wave of human suffering, with millions dead and hundreds of millions falling sick. At the same time, the pandemic not only highlighted existing deficits along many dimensions, including entrenched deprivations, inequalities, and poor coping capacity, but also exacerbated them. The pandemic confirmed the central role of transport in facilitating each of the three dimensions of sustainable development. It also emphasized existing challenges and created new ones, although it did offer some potential avenues to reaching sustainability.

Impact and response

In the early days of the pandemic, transport activities, which represented 57% of global oil demand, declined at an unprecedented rate. This happened for a range of reasons: lockdowns and travel restrictions to contain the spread of the virus, shutdowns in manufacturing, supply chain disruptions, and a rapid transition to remote school, work, and service provision. By the end of March 2020, road transport in regions with lockdowns in place had dropped by between 50% and 75%, with global average road transport activity falling to almost 50% of the 2019 level.[99] Air traffic demand, as measured in Revenue Passenger Kilometers, declined by 65.9% in 2020 compared with 2019.[100] According to recent estimates, global merchandise trade fell by around 5.3% during 2020, relative to 2019.[101] For comparison, the largest quarterly decline in trade volumes during the global financial crisis of 2008 was around 5%.[102] This was also reflected in falling freight shipments and international shipping rates in some countries being down by as much as 70%.[103]

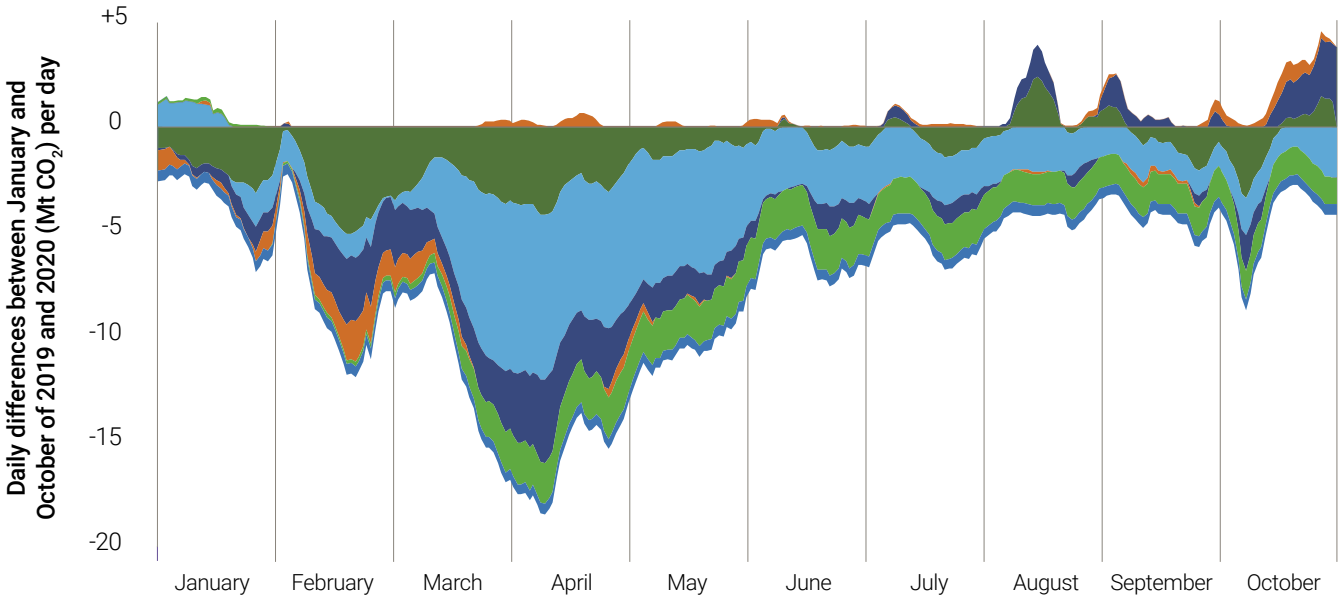
In many cities public transport—essential for sustainable and affordable mobility, including for essential workers—saw massive declines in ridership, with attendant financial stresses. In the United States, ridership in July 2020 was approximately 65% lower than in the same month of the previous year.[104] For Sweden a 40–60% decline in ridership was estimated in spring 2020, compared with the previous year.[105] While these public transport systems frequently adapted quickly to the epidemic by deploying cleaning protocols and other hygiene measures, ridership still plummeted and remains low in many cities. This development has also been driven by increased tele-commuting and continuing risks of exposure in crowded places, all of which threaten the financial stability of these public transport systems.[106] At the same time, a greater reliance on active transport modes, such as walking and cycling, and micro-mobility, such as using 2- and 3-wheelers (e.g., scooters), has been observed in many cities. There was greater investment in micro-mobility companies even before the pandemic.[107]

There was also an immediate impact on associated jobs and livelihoods. The loss to global GDP from the tourism sector, for example, was put at up to $2.4 trillion in 2020, and 100–120 million direct tourism jobs are estimated to be at stake in 2021.[108] There were increasing concerns among those still working, regarding the quality of work, safety, wages, and social protection, illustrated through the plight of seafarers and public transit workers.

Reduced transport activity also led to reductions in GHG emissions, pollution, urban traffic congestion, and traffic accidents. Studies suggest that the majority of global emission reductions were attributable to reduced transport (Figure 10).[109] In early April 2020, daily emissions were estimated to have fallen by 17%, with cities experiencing large reductions in local air pollution.[110] In Europe, estimates suggest that emissions from cars and motorcycles went down by 88% during this time.[111] In terms of road safety, an assessment conducted in the European Union showed a 36% reduction in road fatalities in April 2020, with 910 lives lost compared to 1415 on average during 2010–2019.[112]

FIGURE 10

Reduction in CO_2 emissions in 2020 relative to 2019 levels[113]



Source: UNEP (2020)

Extensive transport-related work has been carried out by the UN system to support national and international responses, for example, support for high-level resolutions[114] and cooperation platforms,[115] as well as the conducting of impact assessment reports[116] and webinars.[117]

Recovery

After the initial steep plunges, recovery started becoming evident over the subsequent months. It is now estimated that merchandise exports will rise 8% over 2021, having fallen 5.3% in 2020.[118] Rapid recoveries and a surge in e-commerce have also led to unanticipated bottlenecks, for example, in the availability of shipping containers, leading to record high freight rates and surcharges, which place upward pressures on consumer prices.[119] Air traffic also swung back up, although total demand for air travel in June 2021 was still down 60.1% compared to June 2019.[120] Forward-looking predictions embody significant levels of uncertainty due to both the continuing prevalence of the pandemic and the longer-term changes in policy and behaviour that are continuing to take place over this period.

Temporary reductions in transport and travel associated with the COVID-19 pandemic did little to slow the climate crisis. As with previous crises, recoveries were associated with a resumption of unsustainable trends: GHG emissions, which had slowed during early 2020 came roaring back. Globally, energy-related emissions fell by about 6% in 2020 relative to 2019,[121] but were already higher in December 2020 than in the same period in 2019.[122]

At the same time, longer-term changes may lower the carbon intensity of transport due to a shift in demand (attributable mostly to the pandemic and renewed attention for non-motorized transport modes) and to technologies (attributable to accelerated timelines for national carbon neutrality targets). A low-carbon recovery could decrease expected emissions in 2030 by 25%, particularly as a result of changes in the shipping, aviation, and lifestyle sectors.[123] Any policies, investments, and behaviours that take effect now could dramatically impact sustainability over the next decade, and a broader rethink may be in the works. For example, in 2020, while car sales overall contracted by 14% year-on-year, electric vehicle

sales rose by approximately 40%, achieving a total market share of 4%. This exceeded most estimates from earlier in the year and was largely attributable to supportive regulatory frameworks and financial incentives along with an expansion of the number of electric vehicle (EV) models and the decreasing costs of batteries.[124]

In addition, the COVID-19 pandemic could have long-term impacts on urban mobility and road safety. Over the course of the pandemic, remote working and learning became increasingly common across the world, and this reduced transport demand. Data from developed regions show that there was a small increase in the adoption of active modes of transport in cities, especially bicycling. Since the pandemic, many cities have built (more) bicycle lanes, and according to estimates, the private micro-mobility and shared micro-mobility industries are set to increase by 9% and 12%, respectively.[125]

The degree to which such changes persist remains to be seen. Although the remaining digital divide will need to be urgently addressed, the post-pandemic period could lead to a significant change in urban travel needs and provision. This will offer an opportunity to transform towards sustainable transport and also necessitate new business and planning models.[126] As a positive trend, several new stimulus packages established in response to the COVID-19 pandemic contain investments in sustainable transport systems that aim to foster climate change mitigation and adaptation. Implications for road safety are less clear, and changes in the relative usage of different urban transit modes will be an important determinant of this.

Assessments of the impacts of the pandemic have allowed for a sharper understanding of the role of sustainable transport in our lives, and for how to address issues of inclusion and sustainability in a systemic manner.[127] Although long-term consequences are hard to predict (and are also connected to other factors such as carbon neutrality commitments), we can already start thinking about the directions that the transitions to sustainable transport may take. The way we use transport systems could change post-crisis and be based, for example, on new kinds of safety needs and changed user behaviour; suitable sustainable transport solutions would need to be found at local, national, regional, and global levels. The post-pandemic recovery period could therefore be a chance for all actors to rethink passenger and freight transport and come up with solutions that can accelerate progress towards the 2030 Agenda and the Paris Agreement. This includes building resilience to future crises and shocks.

2. CHALLENGES TO ACHIEVING SUSTAINABLE TRANSPORT—A FORWARD-LOOKING ANALYSIS

Any forward-looking analysis of the challenges and prospects for sustainable transport must be informed by the global long-run trends shaping the context within which policies and initiatives will play out. Those most relevant for sustainable transport include demographic changes, globalization and trade, urbanization, digitalization, and climate change. Another emerging issue is related to lifecycle and recycling challenges in the sustainability transition.

Demographic change

The global population is projected to reach 8.5 billion by 2030, with the rate of growth varying from region to region. In sub-Saharan Africa, the population is increasing rapidly, while in Europe the population will decline between 2015 and 2030.[128]

In many countries in Europe and Asia, the population is ageing. In 2018, for the first time in history, people aged 65 or over globally outnumbered children under five. It is estimated that there will be more than twice as many people over 65 as children under five by 2050, and the number of over-65s will also overtake the number of adolescents and youth aged 15–24 years.[129]

These demographic trends will place new requirements and strains on sustainable transport services. Larger populations will require transport systems to handle higher demand, and suppliers will need to find ways to meet that demand without exacerbating global threats like climate change and biodiversity loss or imposing local costs such

as air pollution, congestion, and road accidents. Areas with ageing populations will need transport services that are inclusive and accessible. Rising inequalities will increase the need for equitable and affordable transport solutions.

Continuing with business-as-usual transport approaches will not accommodate these demographic changes. By 2030, annual passenger traffic will exceed 80 trillion passenger-kilometres—a 50% increase over 2015 estimates, putting an additional 1.2 billion cars on the roads by 2030.[130] In the absence of transformative change towards sustainable transport, these figures portend, among other consequences, rising GHG emissions, increasing air and noise pollution, and worsening trends in road safety. Road traffic injuries are expected to become the fifth leading cause of death by 2030; they are already the leading cause of death among children and adolescents (5–29 years old).[131]

Globally, growth has also been observed in non-communicable diseases, such as ischemic heart disease, diabetes, and cancer, amplified by air and noise pollution, lack of physical activity, and low access to health care.

Urbanization

Close to 4 billion people live in cities, and this number will almost certainly rise to over 6 billion by 2050. This is the equivalent of eight cities the size of London appearing every year. At these rates, by 2050, about 70% of the world's population will live in cities and 85% of the world's economic output will be generated by cities.[132] The rapid rise in the number of people living in cities—regions with high population density—although imposing challenges, will also offer opportunities for a rapid move towards sustainable transport. This will occur through the use of new technologies (see also chapter 3.2) and the reinforcement of sustainable urban–rural interlinkages helping to connect remote communities, among other developments.

Transport in cities is often associated with air[133] and noise pollution, traffic congestion, and road safety issues. WHO estimates that around seven million people die every year from inhaling polluted air, leading to illnesses such as stroke, heart disease, lung cancer, chronic obstructive pulmonary diseases, and respiratory infections, including pneumonia. Transport contributes significantly to these impacts. Vehicle tailpipe emissions alone are estimated to have led to 385,000 premature deaths from ambient PM2.5 and ozone worldwide in 2015: this equates to 11.4% of the premature deaths in 2015 due to global ambient PM2.5 and ozone. Exhaust emissions from on-road diesel vehicles were responsible for nearly half of the impacts worldwide. Together, PM2.5 and ozone concentrations from transportation emissions resulted in 7.8 million years of life lost and approximately $1 trillion (2015 US$) in health damages globally in 2015.[134]

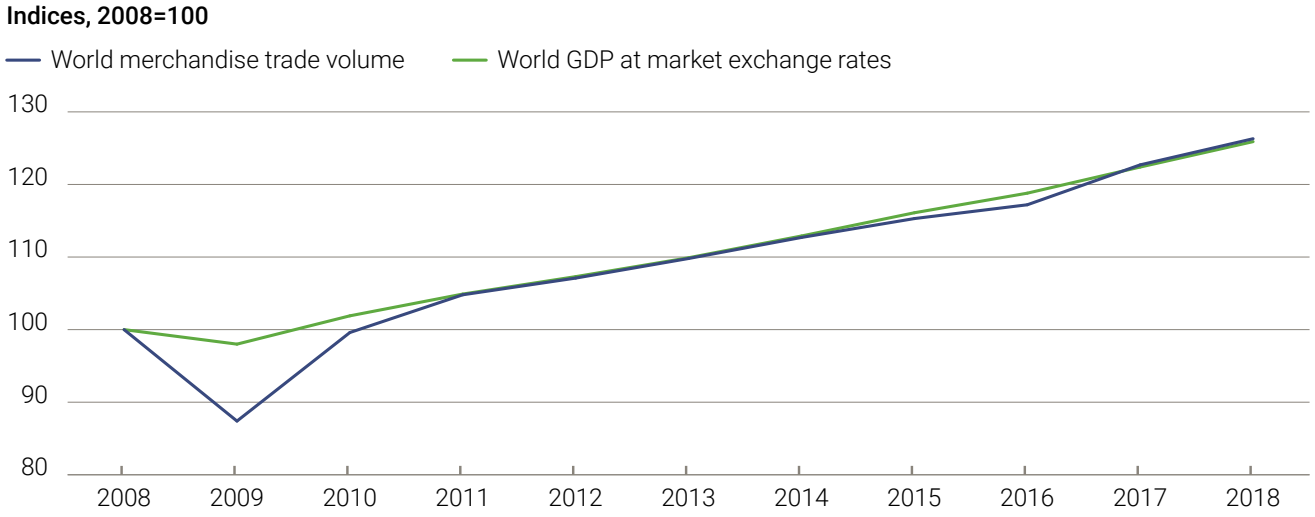
Smog, in the form of ground-level ozone, sulfur dioxide, nitrogen dioxide, and carbon monoxide, remains a serious problem in many cities and continues to harm human health. For example, nitrogen oxides are emitted due to the combustion of fossil fuels in motor vehicles (and from cooking, heating, and lighting, where fossil fuels are used).[135]

Millions of people are also exposed to noise pollution. Noise above 85 decibels, such as from subway trains, damage hearing. The most common related health problem is Noise Induced Hearing Loss (NIHL), as well as high blood pressure, heart disease, sleep disturbances, and stress.[136,137] Also important are time losses and added transport costs from traffic congestion which, for example, amount to an economic cost of 2–5% of GDP in Asia.[138]

In addition, affordability, inclusion, and access remain challenges in many cities. Urban centres provide jobs and livelihoods to many: but the poor also spend a disproportionate part of their income and time on travel to and from work. Vulnerable groups have also been particularly affected by poor urban planning and urban sprawl—for example, being forced to walk or cycle along high-traffic streets and to use slow-moving, overcrowded, and unsafe buses to overcome the spatial segregation generated by these unsustainable urban forms. This makes investment in public transport, active transport modes, and inclusive, safe, and sustainable public spaces for mobility a pressing policy concern.

FIGURE 11

World merchandise trade volume and real GDP at market exchange rates (2008–2018)



Source: WTO (2019)

Globalization

A globalized economy relies on international trade, which creates demand for high-volume freight transport and complex global supply chains. Tourism relies on passenger transport using all modes. Migration is made possible through a range of transport routes and modes—both formal and informal, legal and extralegal.

International trade and passenger travel have been key indicators of a globalized, increasingly inter-connected world. For example, merchandise trade—measured by the average of exports and imports of goods (excluding services)—was valued at about $20 trillion in 2018, having grown by 26% over the previous ten years, keeping pace with the growth in global real GDP over the same period (see Figure 11).[139]

Over the same time period, international tourist arrivals grew by over 50%, reaching 1.4 billion in 2018 and generating an estimated $1.7 trillion in value (passenger transport and receipts) (Figure 12).[140]

FIGURE 12

International tourist arrivals and tourism receipts (2000–2019)

Source: WTO (2020)

Estimates made prior to the pandemic generally saw these trends continuing—for example, before the COVID-19 pandemic, it was estimated that by 2030 annual passenger travel would more than double over the 2015 level, while the volume of freight transport would increase by 70%. Global freight demand was furthermore expected to triple between 2015 and 2050—from 112,000 billion ton-kilometers in 2015 to 329,000 billion ton-kilometers in 2050.[141]

The precipitous declines in travel and transport from early 2020 have bottomed out across modes and have started rising again. However, the continuing sway of the pandemic across the world means that recoveries are slow and subject to considerable uncertainties in the short term. Tourist arrivals, for example, were still down 87% at the beginning of 2021 compared to 2020, with the World Tourism Organization (UNWTO) calling for stronger coordination on travel protocols between countries to ensure the safe restart of tourism and avoidance of another year of massive losses for the sector.[142] According to estimates the global economy could lose over $4 trillion for the years 2020 and 2021 due to the impact of COVID-19 on tourism.[143] In the longer term, there may also be impacts on the levels to which trade and passenger volumes rise, although these are affected by additional factors, including consumer preferences and digitalization.

Restarting global supply chains and transport in an orderly and sustainable way is expected to be one of the challenges during recovery from the COVID-19 crisis. The need to build increased resilience may also lead to changes in how supply chains are set up. Stimulus packages and investment plans, too, may spur a transition towards sustainable transport systems. Experience gained from this global crisis may increase the impetus towards implementing shared solutions for other universal challenges, such as climate change.

Digitalization

Following the onset of globalization (and shaping globalization's continuing evolution), another economic transformation began—'digitalization' which has become a defining characteristic of the 2020s. Digitalization covers the increased use of a variety of digital technologies, such as the Internet of Things and advanced robotics, industrial biotechnology, 3D printing, new materials, and nanotechnology. All these technologies are already in use and are being increasingly adopted everywhere in the world. Many more innovations based on digital technologies are being piloted and deployed at an ever-accelerating pace, driving changes in institutions, business models, and people's daily lives. Most recently, artificial intelligence (AI) has further enabled and accelerated these trends, as it becomes increasingly deployed to automate cognitive processes, and to detect, predict, and respond to people's behaviours and customers' needs: this is opening up new products and services, including in the transport sector. Digitalization will ultimately change global value chains, while also enhancing their management and forecasting, with far-reaching consequences for productivity, employment, skills, income distribution, trade, well-being, and the environment.

Digitalization also means that people can increasingly access many online services, experiences, and even jobs from their own home, which can reduce the demand for travel—both commuting and business trips. It can offer opportunities to make the transport sector more environmentally friendly as long as mobility is not concomitantly increased through increased leisure travel and last-mile freight transport.

The COVID-19 pandemic has accelerated the process of digitalization across a variety of sectors, including those closely associated with transport. This experience has prompted the realization that the overall implications of digitalization for the transformation to sustainable transport are ambiguous. For example, digitalization can lead to greater efficiency in managing transport fleets or enable localized production through 3D printing. However, it can also foster greater geographic dispersion of supply chains and facilitate 'just-in-time' management, increasing overall demand for transport and vulnerability to disruption. Similarly, increasing e-commerce and package delivery are increasing the need for freight transport, linked to increasing emissions and congestion.

Even where digitalization could accelerate the achievement of sustainable transport, this could come with adverse impacts on other elements of sustainable development. For example, remote working arrangements could, on the one hand, reduce overall travel demand across levels and modes, thus also reducing associated negative externalities, such as emissions and traffic congestion. On the other hand, it could also threaten the provision of low-cost mass transit which remains crucial for essential workers and those unable to work remotely. Similarly, the provision of some level of services such as healthcare and education could take place remotely, again reducing transport demand. However, this could also exacerbate inequalities because of a persisting digital divide. In Africa, for example, only around 27% of the population were estimated to be using the Internet in 2020, leaving the continent lagging behind all other regions.[144] Constraints in both rural and urban transport infrastructure and services are often compounded by limitations in the development and resilience of technological infrastructures.

Resilience to climate change and extreme weather events

The transport infrastructure provides the physical network for global trade in goods and also serves to connect people and societies. At the same time, it is affected directly and indirectly by climate change, with potentially far-reaching consequences for international trade and for the sustainable development prospects of the most vulnerable countries and communities.[145] Climate change and extreme weather events, which are among the highest global risks of the next ten years,[146] are adding new challenges to the transport sector and its systems and infrastructure, for example through sea level rise, flooding, and more frequent and severe storms and droughts. The resulting damage, disruption, and delays involve extensive human and economic costs.[147,148]

Enhancing climate resilience and adaptation for critical transport infrastructure will be key to achieving progress on the SDGs and climate action. Accelerated action on climate change adaptation and resilience-building is therefore urgently required. Global initiatives such as the Sendai Framework for Disaster Risk Reduction (2015) note the importance of promoting the resilience of new and existing critical infrastructure, including transport infrastructure, to ensure that it remains safe, effective, and operational during and after disasters to provide life-saving and essential services.[149] Both hard engineering and soft adaptation options can be used to increase the ability of transport infrastructure and systems to withstand climate change and extreme weather–related events.[150]

In view of the long service life of transport infrastructure, effective adaptation (and mitigation) requires established approaches and practices to be rethought early on. Moreover, a good understanding of risks and vulnerabilities, through 'fit-for-purpose' risk-assessment procedures, is needed for the development of well-designed adaptation measures that minimize the adverse effects of climate change. These impacts can vary considerably according to physical setting and other context-specific factors. For instance, extreme events and flooding may affect coastal transport infrastructure in some parts of the world, while melting permafrost could become a major problem in others.[151] There is also a need to bridge potential data and knowledge gaps,[152] and to develop appropriate technical and management solutions that reduce vulnerability and allow for decision-making under uncertainty (e.g., early warning systems, scenario planning, improved forecasts, end-to-end transparency, data analytics). The UN system has been supporting efforts in this regard. UNCTAD, for example, has been carrying out research, technical assistance, and consensus-building, as well as engaging in related collaborative initiatives, particularly for seaports.[153]

Adaptation measures also require sufficient financing, technology transfer, and capacity-building efforts, as well as coordinated policy responses and supportive legal and regulatory approaches.[154] Standards, guidance[155] and methodological tools[156] also have an important role to play.

Significant investments are needed to make infrastructure physically robust and to ensure transport systems maintain functionality and recover quickly and at minimal cost. For example, a recent study covering 53 ports in the Asia–Pacific region estimated that the cost of adapting these ports to future climate realities could range from

$31–49 billion.[157] While the investments needed are high, such measures may limit future operational/rehabilitation costs. World Bank estimates suggest that the overall net benefits of investing in resilient infrastructure in developing countries could amount to $4.2 trillion over the lifetime of new infrastructure—a $4 benefit for every dollar invested in resilience.[158]

The challenges and needs of different population groups must be considered when designing climate-resilient transport systems and infrastructure (see also chapter 2.2). In 2019, the International Federation of Red Cross and Red Crescent Societies (IFRC) found that inaction could cause a 50% increase—every year by 2050— in the number of people, currently 108 million, needing international humanitarian aid because of floods, storms, droughts, and wildfires;[159] this would put additional pressure and demands on transport systems.

Recycling challenges through the sustainability transition—another megatrend?

While net-zero commitments from countries and companies in the transport sector can be realized through the widespread adoption of new technologies, the jettisoning of carbon-intensive transport modes, for example vehicles powered by an internal combustion engine (ICE), can bring its own set of distinctive challenges. By early 2021, 17 countries had announced 100% zero-emission vehicle targets or the phase-out of ICE vehicles by 2050. France, in December 2019, was the first country to put this intention into law, with a 2040 timeframe.[160] It must be noted, however, that in passenger car terms, the 17 governments that have set ICE vehicle phase-out targets accounted only for about 13% of global new passenger car sales in 2019.[161]

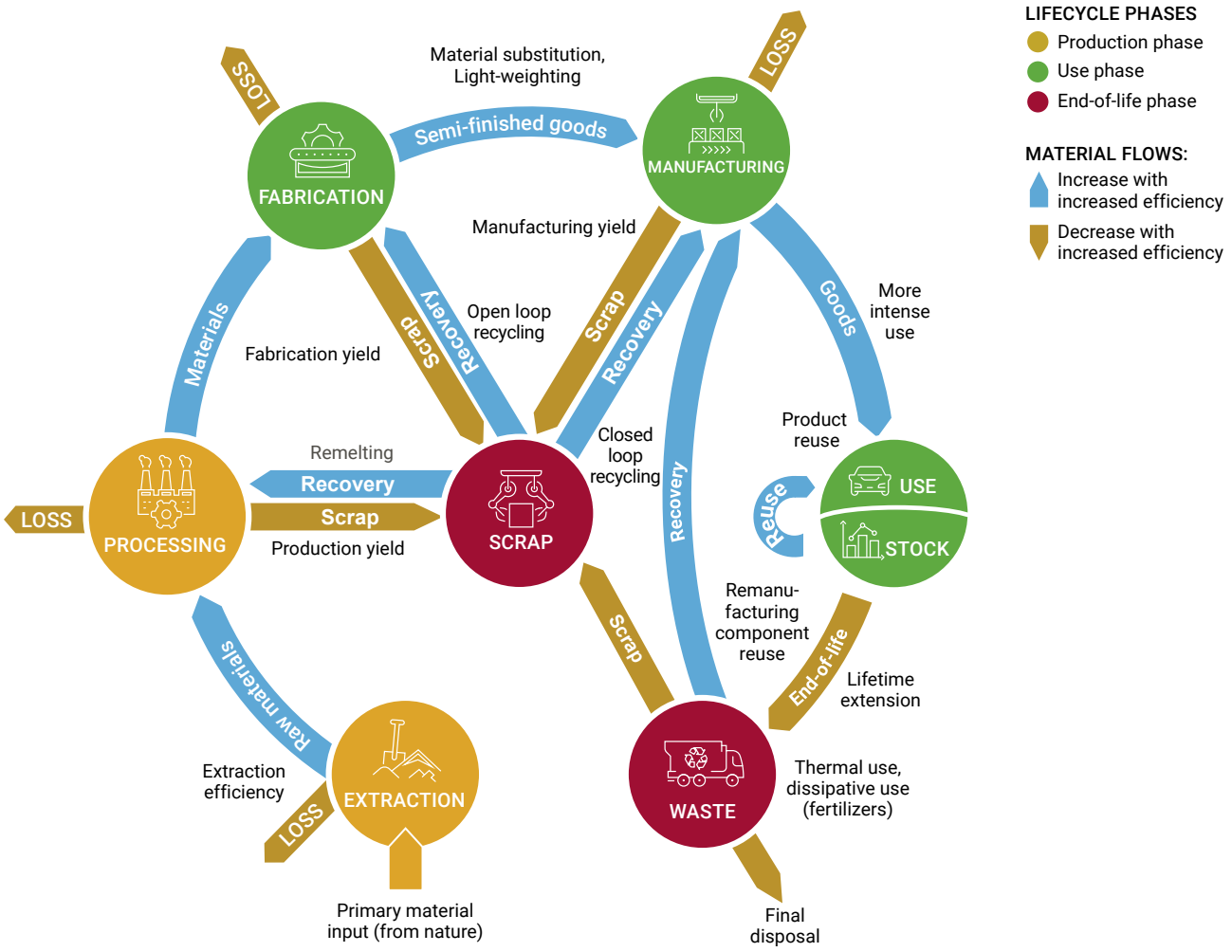
Existing measures to reduce the lifecycle environmental impact of vehicles, include material efficiency strategies, such as lightweight design, product lifetime extension, and recyclability (see Figure 13), which will have a potentially significant impact on lifecycle emissions.[162] Some countries have passed different forms of legislation, including obligations for car manufacturers to increase the rate of recycling of motor vehicle parts and material.[163] Some companies already engage in so-called closed-loop recycling which allows the product to be recycled back into itself.[164] In addition, lifetime extension is possible through strategies such as increased durability and repair, and also remanufacturing.[165]

Due to factors such as environmental protection regulations, however, the responsible disposal of used vehicles can be expensive in originating markets, making the export of used vehicles, including obsolete vehicles, to developing countries more attractive and lucrative.[166] International trade in used vehicles between developed and developing countries is a complex issue in terms of environmental and safety issues.[167] Another challenge is that buyers in developing countries often cannot afford to replace the vehicle they have bought with a newer model. In 2020, the average age of light vehicles on U.S. roads was 11.9 years.[168] In comparison, the average age of Ethiopia's cars was 15–20 years.[169] Poor vehicle maintenance due to lack of resources can also cause higher emissions in developing countries. A recent UNEP report[170] found that 70% of exported light duty vehicles (LDVs) head to developing countries. The European Union, Japan, and the United States, as the three largest exporters of used vehicles, exported 14 million used LDVs worldwide between 2015 and 2018.[171] UNECE has developed the United Nations Global Technical Regulations which set global rules for the recyclability of motorized vehicles to reduce the environmental footprint and lifecycle impact of vehicle production and disposal.[172]

The importance of assessing impacts along the entire product cycle is also evident from other applications. For example, the leakage of environmentally harmful refrigerants from mobile air-conditioning systems in cars, vans, buses, and trucks remains a considerable challenge, particularly in developing countries. Progress has been made in limiting such emissions through implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer. Such systems, by increasing fuel consumption, are estimated to also add from 2.5–7.5% to the GHG emissions of individual vehicles. In addition, the scrapping of older tonnage in major ship breaking countries poses challenges for safety, health, and environmental conditions.[173] While important as a recycling process, environmental concerns such as the release of harmful, toxic materials and substances, and social concerns, such as workers' safety

FIGURE 13

Material efficiency strategies in the product lifecycle



Source: UNEP, (2020)[174]

(e.g., exposure to toxic fumes, fires, falling steel plates) and child labor, remain.[175] Many ships are scrapped outside their countries of registration, where regulations and protections can be weaker.

Another example of lifecycle management is the repurposing of old transport vehicles and infrastructure, which has already been done in some cities across the world (e.g. commuter bike tunnel in San Sebastian, Spain).[176] In New York City, for example, the subway reef programme ran from August 2001 through April 2010, with the Metropolitan Transportation Authority (MTA) deploying more than 2,500 decommissioned subway cars to underwater locations.[177]

Forward-looking transport scenarios

Prior to the COVID-19 pandemic, forward-looking transport scenarios were developed by different stakeholders.

The ITF Transport Outlook 2021, for example, presents scenarios for global transport demand over the next three decades to 2050, covering passenger and freight transport and all transport modes. It predicts that total transport activity will more than double by 2050 compared to 2015 under the trajectory reflecting current efforts. Passenger transport would increase 2.3-fold and freight transport 2.6-fold. Current transport decarbonization policies would be insufficient to pivot passenger and freight transport onto a sustainable path, with CO_2 emissions from transport

increasing by 16% until 2050. Even if today's commitments to decarbonize transport were fully implemented, the expected emission reductions from these policies would be more than offset by increased transport demand. By contrast, more ambitious transport decarbonization policies, involving both passenger and freight transport, could reduce transport CO_2 emissions by almost 70% in 2050 compared to 2015. Such a reduction would bring within reach the goal of the Paris Agreement, to limit global warming to 1.5˚C. It would, however, require more and better-targeted actions to reduce unnecessary travel, a shift in transport activity to more sustainable modes, improvements in energy efficiency, plus rapid scale up of the use of electric vehicles and low-carbon fuels.[178]

Robust projections are challenging, given the ongoing COVID-19 pandemic and the difficulty of predicting transport (passenger and freight) transformations and growth trajectories.

3. COUNTRIES IN SPECIAL SITUATIONS

In total, there are 91 countries in special situations: the least developed countries (LDCs), landlocked developing countries (LLDCs), and small island developing States (SIDS).[179] Due to their geographical location, history, and economy, these countries face myriad challenges as they pursue sustainable development. They are also highly vulnerable and exposed to shocks and disruptions affecting supply chains and related transport systems, as well as climate change and extreme weather events.[180] For such countries, one set of obstacles often causes and compounds others. In many cases, transport is central not only to the challenges of countries in special situations but also the potential solutions to them.

One indicator of this is a composite measure of the transport and insurance costs of international trade across all modes and commodities. Relative to the global average (2016) this indicator was estimated at 0.73 for developed countries, 1.27 for LLDCs, 1.40 for LDCs, and 1.47 for SIDS. While the absolute value of this indicator had gone up over the 2006–2016 time period, the relative values had remained about the same.[181] In the Ashgabat Statement[182] of the first Global Sustainable Transport Conference, participants noted the need to assist developing countries, in particular African countries, LDCs, LLDCs, and SIDS, to leapfrog to sustainable transport through, for example, strengthened policy planning, standard setting, and regulatory frameworks.

Without integrated policy making, adequate investment, and long-term vision, the geographical location of countries in special situations can disproportionately dictate their destiny. They face a double bind—they are often remote from global transport hubs but, because of their small and undiversified economies, they are particularly reliant on transport and trade. In addition, the fact that not all transport modes are viable in every country only emphasizes the fact that there can be no one-size-fits-all solution to global transport challenges. Moreover, these countries, though making only negligible contributions to the emissions that cause climate change, are particularly vulnerable to the impacts of extreme weather events and climate change. The challenges they face are expected to become more severe in the coming years, particularly in view of predicted long-run trends.

At the same time, their small size and low level of development also means that these countries can be proving grounds for well-considered and well-adapted development innovations—relatively small investments can have potentially transformative results. The potential for leapfrogging unsustainable infrastructure development is also high, but for that to happen, either new, more sustainable transport modes must be affordable in those countries or adequate means of implementation must be provided.

LDC CHALLENGES

The United Nations currently identifies 46 countries as least developed countries (LDCs), based on per capita income, human assets, including health and education, and structural economic vulnerability related to size, remoteness from global trade centres, and susceptibility to physical and economic shocks. With their small economies and low GDP per capita, LDCs often lack

adequate infrastructure, including water, electricity, digital connectivity, and transport. They also suffer from low institutional capacity not only on the part of national and sub-national governments but also of the various regulatory and legal entities that create an enabling environment for development, transport, trade, and economic growth. The deficiency of both 'hard' physical infrastructure and 'soft' governance-related or regulatory infrastructure can, in turn, create a vicious circle, where foreign investors hesitate to invest in LDC economies.

Challenges abound in advancing sustainable transport in LDCs and overcoming them is essential if they are to achieve the 2030 Agenda and the Paris Agreement. With two-thirds of the LDC population living in rural areas and more than half of the population projected to continue living in rural areas by 2030,[183] these countries and their partners need to work to ensure that all communities have access through sustainable transport; this includes bridging the 'last mile' by road, rail, or waterway for those who do not live close to an all-weather road or public transport network. In addition, the economies of LDCs are generally powered by agriculture and extractive industries—sectors that rely heavily on high-volume freight transport. Because of the relatively small size of LDC economies, regional cooperation and joint action are particularly important. Here again, advances in transport—both the 'hard' aspects, like transnational road and rail projects, and the 'soft' elements, including streamlining of regulatory frameworks relating to customs and border crossing—play a critical role.

In addition, informal settlements are a common feature of many cities in LDCs and can be home to more than half of a city's population. Because of the unplanned nature of these areas, infrastructure development has been very poor, and roads are often narrow and unpaved. This situation has limited the opportunities for buses/paratransit to cater to the transport demand of most of the urban poor and other vulnerable groups living in these settlements. A particular challenge is the lack of dedicated infrastructure for walking, which accounts for 75% of all journeys, and for cycling.

The Istanbul Programme of Action (IPoA), adopted in 2011, charts the international community's vision and strategy for the sustainable development of LDCs with its strong focus on developing these countries' productive capacities. Among others, it calls upon LDCs to develop and implement comprehensive national policies and plans for infrastructure development and maintenance encompassing all modes of transportation and ports, communications, and energy. It also calls upon development partners to actively support private sector investment—including via public–private partnerships and grant/loan blending—in infrastructure development and maintenance, in communication, and in multimodal transport such as railways, roads, waterways, warehouses, and port facilities.[184]

To address the transport needs of LDCs, and thereby assure a critical building block of their sustainable development, will require coordinated action on the part of a variety of stakeholders and decision makers, including the LDC governments themselves, partner governments, local and global private sector entities, civil society, and the science and academic community (see Box 7 for an example).

BOX 7

The Single African Air Transport Market (SAATM)[185]

Greater air connectivity is needed among African countries. The Single African Air Transport Market (SAATM) was launched as a flagship project of the African Union Agenda 2063 to create a single unified air transport market in Africa that will advance the liberalization of civil aviation and act as an impetus to the continent's economic integration agenda. To date, 34 countries have signed up to the SAATM,[186] representing over 80% of the existing aviation market in Africa. The key objectives of SAATM are to: (1) reduce journey and waiting times for most passengers by more than 20%, (2) make air services more competitive to bring about fare reductions, and (3) contribute to the growth of the tourism industry in Africa and to job creation in both the aviation and tourism sectors.

Measures required to address transport-related challenges faced by LDCs include:

- Governance-related capacity-building and regulatory reforms.
- Commitment to adequate public budgeting for sustainable transport infrastructure.
- Public–private partnerships and other innovative arrangements for investments in sustainable transport infrastructure, including public transport and active transport modes.
- Encouraging investments without unsustainable debt load.
- Prioritizing sustainable, green, and resilient infrastructure and technology in all transport modes.
- Collaboration and integration with other infrastructure investments and reforms, including information and communications technology (ICT) (notably broadband), energy, water services, and others. ICT can help bolster e-commerce, which may allow access to services, such as health services and education, and may change the nature of the need for transport.
- Promotion of regional integration (e.g., removal of non-tariff barriers to trade and focusing on trade facilitation, establishing joint projects on customs and border procedures).

The Fifth United Nations Conference on the Least Developed Countries (LDC5),[187] to be held from 23 to 27 January 2022 in Doha, Qatar, is expected to define a new programme of action for LDCs.

LLDC CHALLENGES

There are 32 landlocked developing countries (LLDCs) in Africa, Asia, Europe, and South America, characterized by their lack of direct territorial access to the sea and remoteness from world markets.[188] As maritime transport accounts for over 80%, by volume, of all global freight, lack of access to the sea can undermine the development of LLDCs.[189] The need to reach marine transport routes means that LLDCs are dependent on neighbouring countries for transit, making the political and economic relations between these countries both complicated and critically important. Customs and border-crossing procedures, as well as long and often circuitous transit routes, mean that, from order to delivery, LLDCs take nearly twice as long to import and export goods as transit countries do and have a higher average cost of export ($3,444 per container for LLDCs versus $1,301 per container for transit countries in 2014).[190]

The geographical realities and structural deficiencies of LLDCs bring with them a host of transport challenges. Generally, LLDCs suffer from inadequate 'hard' infrastructure, such as roads, rail, airports, waterways, and dry ports. It has been estimated that in order to reach the global average densities for paved road and railways, LLDCs would need to construct almost 200,000 km of paved roads and 46,000km of railway, at a cost of about $500 billion, equivalent to 2% of GDP over a period of 20 years.[191] Attracting the investment—whether domestic or foreign, public, or private, or a mix—can be challenging, not least because LLDCs often also lack the enabling environment for investments, including the 'soft' infrastructure of enforceable laws and regulations and also the necessary human capacity. These deficits are self-compounding because, without investment, the infrastructure continues to fall short, which makes future investment even less likely.

A road or rail network with so-called 'missing links' or unserved stretches cannot reliably connect cities or connect an LLDC to all its neighbouring countries. In the case of aviation, a substandard airport and network means that industries with high-value and time-sensitive or perishable goods—everything from pharmaceuticals to fruit to electronics—may not take root in the economy. All LLDCs score less than 50 (out of 100) on the International Air Transport Association (IATA) Airport connectivity indicators which measure the degree of integration within the global air transport network. With a few exceptions, the air freight volumes have not improved in the LLDCs.[192]

The Vienna Programme of Action for Landlocked Developing Countries for the Decade 2014–2024 aims to address the challenges faced by LLDCs and to contribute to the eradication of poverty stemming from their being landlocked through the implementation of specific

actions in priority areas, including transport infrastructure development and maintenance and transit policy issues.[193] A Roadmap for Accelerated Implementation of the Vienna Programme of Action (VPoA) for LLDCs was developed by the UN system and adopted by the Group of Landlocked Developing Countries in September 2020. It contains practical solutions practical solutions to support greater implementation of the VPoA in the remaining five years of the Decade.

Discussions of LLDC development challenges often centre around the need for access to the sea and the ability of inland transport networks to effectively connect to gateway ports, but in fact a variety of interventions can strengthen the transport sector and make it more sustainable. These include:

- Multimodal and connected transport and transit corridors, focusing on both the hard and soft infrastructure; committing to improved LLDC–transit country relationships and regional integration will be critical[194,195] (see Box 8, for an example).

- Public–private partnerships within the LLDCs and partnerships with the international community—including South–North, South–South, and triangular—will drive the development of LLDCs. Incentives should be developed to attract the business sector while safeguarding the public trust. Good practices from other countries and regions should be brought to bear.

- Border-crossing and trade-facilitation procedures, documents, and requirements should be simplified and harmonized, in particular through ratification and effective implementation of international Conventions and regional and multilateral agreements on trade, transport, and transit. Where possible, digital solutions should be adopted (such as eTIR[196]).

- Capacity-building measures should take place, involving both LLDCs and neighbouring countries, so that government experts and other stakeholders can develop a pipeline of sustainable, bankable transport infrastructure proposals involving both LLDCs and their neighbours.[197]

BOX 8

The Northern Corridor Transport Network

The Northern Corridor is a key transport route in East and Central Africa. The main Northern Corridor artery is served by a combination of transport modes and infrastructure facilities that include: the Port of Mombasa; a road network; a rail network; inland water routes; inland container depots; and an oil pipeline. Trade along the corridor is governed by the Northern Corridor Transit Agreement, which is administered by the Northern Corridor Transport and Transit Coordination Authority (NCTTCA). That Authority administers a number of programmes to facilitate intra-regional trade and transport, including a Green Freight Transport Program[198] and the Customs and Trade Facilitation Program which is geared towards promoting compliance in the areas of:

1. Simplification, rationalization, harmonization, standardization, and modernization of trade business processes and documentation;
2. Rationalization and minimization of trade transaction costs;
3. Promotion of private-sector participation in policy formulation and implementation of activities relating to trade and transport facilitation;
4. Improving industry service standards and encouraging self-regulation;
5. Harnessing ICTs towards a smart Corridor.[199]

- Modernization and mainstreaming of sustainability and resilience principles across the transport networks of LLDCs and those connecting LLDCs to global markets is needed, such as fleet renewal, infrastructure upgrading, and enhancing the use of ICT in transit, customs, and border management.

SIDS CHALLENGES

The United Nations recognizes 38 countries as small island developing States (SIDS).[200] While the SIDS are a very diverse group of States, they are united by certain characteristics besides their island geography, such as relatively small size, remoteness from major trade hubs and international transport networks, heavy dependence on imports and foreign trade, and vulnerability to external economic, health, and environmental shocks.

Many of these environmental shocks are the result of climate change and extreme weather events, such as increasingly severe tropical storms. Some SIDS face existential threats, especially due to sea-level rise which threatens low-lying atoll islands.[201] The structural vulnerabilities of SIDS make sustainable transport particularly vital for their progress but also add to the challenges inherent in developing sustainable transport systems and networks. SIDS are generally dependent on food and energy imports, which makes maritime freight transport critical. In addition, for some SIDS, particularly in the Pacific, effective air and maritime transport is needed to develop the export fisheries industry. In many cases SIDS also rely heavily on the tourism industry, which is completely dependent on effective transport systems.

International tourism is a significant contributor to the economy of many SIDS where tourism accounts for, on average, almost 30% of GDP. This share is upwards of 50% for some islands.[202,203] In at least seven SIDS, tourism accounts for over one-quarter of GDP and 9% of overall exports ($61 billion). Receipts from tourism in all SIDS have grown according to UNWTO from $26 billion in 2000 and $53 billion in 2013 to $64 billion in 2016.[204]

Connectivity and transport costs are at the heart of the logistical challenges for SIDS,[205] with most of them paying, for example, higher freight costs for the transport of their imports than the world average.[206] Ports and airports are crucial lifelines for SIDS' external trade, food, energy, and tourism. Several, however, are among the countries with the lowest shipping connectivity, as they often face a vicious cycle of low trade volumes that discourage investments in better maritime transport connectivity, and low connectivity that makes merchandise trade costly and uncompetitive.[207] UNCTAD data on shipping connectivity and port-waiting time provide indicators, for instance, on efficiency, access to markets, infrastructure endowment, supply-side capacity, trade facilitation, and other sustainability parameters. The data suggest that geography, trade volumes, and port efficiency matter for a country's shipping connectivity. UNCTAD's Liner Shipping Connectivity Index (LSCI) covers 178 countries and shows maritime connectivity trends from 2006 to 2021.[208] The LSCI for SIDS is far lower and relatively stagnant (in 2006–2020) compared to the world average. This raises important questions for SIDS. The Pacific islands are the most marginalized from global shipping and trading networks and incur some of the highest shipping costs in the world. Transport routes are long, expensive, and vulnerable.

As small countries with small economies, SIDS are often in the position of having to spend a large part of their public budget on transport infrastructure, particularly roads. The Government of Fiji, for example, dedicates a third of its budget to its Road Agency; and the total value of the road network in Belize (as measured in infrastructure stocks) is equivalent to 142% of national GDP. The values are similar for a number of SIDS in all regions, while the values for transport infrastructure stock as a percentage of GDP are much lower in non-SIDS countries.[209,210]

For the smaller SIDS such investments may only be possible though the international community, a situation that brings its own challenges. Building redundancy into SIDS' transport systems is also challenging, making the risks of large-scale disruption or even loss of access to international markets greater, should a disaster strike. This concern is particularly acute, given that more intense tropical storms or sea-level rise are anticipated due to climate change. In addition, the government departments of these small States are often overstretched, and the ability of transport professionals to specialize and build their expertise—for instance, in climate adaptation strategies—can be limited.

Taken together, these considerations indicate that SIDS are characterized by high exposure to natural disasters and climate variability and change, as well as by low adaptive capacity. An UNCTAD assessment of eight seaports and coastal airports of two Caribbean SIDS, namely Jamaica and St. Lucia, found that most of their infrastructure would experience severe flooding in the event of a 1 in 100-year extreme sea-level event as early as the 2030s, if adaptation is not carried out.[211,212,213] This makes resilience-building and effective adaptation action for critical transport infrastructure in SIDS an urgent imperative.

The SAMOA Pathway[214] calls for enhancement of the enabling environment at the national and regional levels in order to attract more public and private investment in building and maintaining appropriate infrastructure: this includes ports, roads, transportation, electricity and power generation, and ICT infrastructure. The Samoa Pathway also calls for: gaining access to environmentally sound, safe, affordable, and well-maintained transportation; progress in making land, sea, and air transportation safer; development of viable national, regional, and international transportation arrangements, including improved air, land, and sea transport policies that take a lifecycle approach to the development and management of transport infrastructure; and increased energy efficiency in the transport sector.

To address the challenges faced by SIDS—including those related to climate change—SIDS governments and their partners in the public and private sectors will need to take proactive action in a range of areas (see Box 9, for an example). Action is required in:

- Improving domestic, inter-island, and international connectivity and access to international markets and trade through sustainable transport systems.
- Making infrastructure and investment decisions based on long-term, climate-sensitive, and human-centred sustainability considerations. This may mean investing in sustainable, green infrastructure now or prioritizing infrastructure designs that can be retrofitted and upgraded with relative ease as technology develops, as more information on climate change impacts is gathered, and as country-specific climate models are developed. This aims to ensure that no one is left behind. [215]
- Conducting thorough health impact, environmental impact, and climate vulnerability assessments before making key infrastructure investments and integrating resilience into the design of new transport systems.
- Addressing the factors driving lower connectivity and higher transport costs in SIDS and establishing transport policies that prioritize sustainability, resilience, and context-appropriate solutions: this would include the incorporation of local and indigenous knowledge into decision-making and also the use of so-called nature-based solutions.
- Building capacity for integrated policy making to promote greater policy synergies across different sectors and ministries, including transport, trade, finance, and tourism.
- Building capacity for effective transport asset management, including strategic, financial, and technical aspects that incorporate the whole lifecycle,[217] while also including local communities in implementation and maintenance efforts.
- Inclusive, multi-ministerial, and multi-stakeholder policy making, which takes into account various aspects, such as land use planning, gender, and community considerations, etc., is key.

BOX 9

Samoa's road network vulnerability assessment and Climate Resilient Road Strategy

Approximately 70% of Samoa's population live within one kilometre of the coast. Its population and infrastructure are highly vulnerable to climate change, extreme weather events, and natural disasters. It is estimated that Cyclone Ofa in 1990 and Cyclone Val in 1991 caused combined damage to assets and production valued at 2.5 to 3 times the annual GDP of Samoa. A vulnerability assessment of the road network on the islands of Upolu and Savai'i (1,150 kilometres) was undertaken to support the development of a Climate Resilient Road Strategy. This included: identification of key hazards, assets, and areas vulnerable to severe weather events; assessment of the impacts of climate change; and analysis of current practices in network development, maintenance, and asset management. The latter would contribute to the development of the strategy and maintenance plans that, if implemented, would decrease the vulnerability of the road network. As part of the Samoa Vulnerability Assessment, aspects of social vulnerability were investigated and linked to the engineering and economic analysis to provide a more holistic approach to assessing the costs of adapting to climate change.[216]

IMPACT OF THE COVID-19 PANDEMIC ON COUNTRIES IN SPECIAL SITUATIONS

The economic consequences of the COVID-19 pandemic for LDCs, SIDS,[218] and LLDCs, and for countries affected by conflict have been severe,[219] with significant impacts on production, food security, and agricultural livelihoods. The pandemic has lowered external demand and commodity prices, disrupted supply chains and transport systems, caused a collapse in tourism, reduced foreign direct investment, reduced public revenues, increased debt, and decreased remittances. The fragility of these countries' economies and their dependence on transport networks have been underscored in different ways: for example, through increased shipping costs for SIDS and transshipment delays that have exacerbated the trade, transit, and transportation challenges faced by LLDCs. Not only have exports been impacted by supply and demand constraints; the enactment of ad hoc border control procedures to control the virus has also imposed significant delays and difficulties in accessing medical supplies, food, fuel, and other essentials.

Assessments made in early 2021 indicated that the risks of disruptions due to the pandemic were highest in Africa and the Middle East, where trade networks and transport routes are critical for delivery of essential goods. Similarly, those LDCs that are most integrated into the global economy and supply chains, such as Bangladesh and Myanmar, suffered significant economic harm during the pandemic.[220] Many of these assessments continue to be valid as the pandemic wears on. Sub-Saharan African countries, which imported over 40 million tons of cereals in 2018 to fill local gaps, are at high risk due to the increased volatility of supply chains and lack of reliable transport infrastructure, such as all-weather roads. These economic and supply chain challenges are, in turn, further stressing healthcare systems in countries in special situations, with potentially dangerous outcomes, especially in terms of maternal and child health.[221]

Countries affected by conflict are also at high risk, with violent conflict often exacerbating the spread of infectious disease.[222] Conflict zones and refugee camps are at particularly high risk, as supply chains to these areas were already tenuous. Retaining open lines of transportation will be key to ensuring access to essential services and medical care in conflict-affected regions.

4. REGIONAL DEVELOPMENT

Sustainable transport is crucial for regional development, linking countries to regional and global markets, promoting trade opportunities, and stimulating economic growth. In many regions, however, developing countries may lack strong institutions, sufficient financial and human resources, and the specialized expertise needed not only to develop and effectively deploy sustainable transport systems but also to implement them in a coherent way along with other elements, such as urban and land planning and intermodal transport connectivity, including air transport and logistics. This can hamper countries' own development as well as that of the region. Addressing these challenges by building local, national, and regional capacity across all levels of government, jurisdictions, organizations, and modes is as important as developing the necessary infrastructure. This notion is also reflected in SDG 17 of the 2030 Agenda, which aims to "strengthen the means of implementation and revitalize the global partnership for sustainable development" and also, for example, in SDG 13 (Climate Action), which includes capacity-building as a target and as an indicator.

In addition, policies, strategies, and other measures that leverage integrated regional transport connectivity for economic growth, while at the same time enabling progress towards a sustainable and low-carbon development path, should be promoted. In this context, regional cooperation and joint action are particularly important, both with regard to the 'hard' aspects, like transnational road and rail projects or efficient air connectivity; and the 'soft' elements, such as streamlined customs and border-crossing regulations. Regional and interregional economic integration and cooperation should be promoted through, for instance, improvements to the planning of transportation infrastructure and mobility, connectivity enhancements, and facilitation of trade and investment.

5. LEAVING NO ONE BEHIND

While countries in special situations face specific challenges related to transport, a lack of transport options and mobility challenges frequently contributes to persistent poverty, inequality, and deprivations among individuals across the world, particularly affecting the poor, rural populations, women, children and youth, older persons, persons with disabilities, indigenous peoples, people living in informal settlements, and transport workers.

THE POOR

Poor communities in rural and urban areas are in danger of being left behind, as they may often entirely lack access to adequate transport services and/or cannot afford the available transport options, especially as they may also be spatially segregated and need to travel large distances every day. These constraints must be addressed even as transitions get under way towards newer, more sustainable, low-emission options. For example, low-/zero-carbon public transport must continue to expand and be affordable and accessible to the poor and other vulnerable groups. In addition, the price of low-/zero-emissions vehicles will have to fall considerably from current levels; and there will have to be reliable access to affordable low-carbon electricity and/or vehicle fuels. At the same time, the policy, planning, and budgeting for safe transport, including non-motorized transport, need to be ensured and upscaled, especially with regard to pedestrians and cyclists from poor communities and informal settlements. Finally, it should be noted that access through sustainable transport, while crucial, must be accompanied by the provision of quality services if it is to be a meaningful factor for poverty reduction. Expanding access to digital service delivery could reduce the need for some journeys.

RURAL POPULATIONS

There is a particular risk of leaving rural populations behind. In Asia, approximately 700 million people are estimated to experience socio-spatial isolation.[223] In Africa, about 450 million people, or more than 70% of its total rural population, are estimated to still be unconnected to transport infrastructure and systems.[224] Their relative isolation is associated with higher mortality rates and lower health, education, and poverty outcomes, with disproportionately large effects for vulnerable groups. Rural isolation is also associated with low agricultural productivity due to low input and technology adoption.[225] While poverty and lack of connectivity are correlated, access to transport infrastructure alone—for example, access to an all-weather road—does not guarantee a solution. Affordable and accessible transport services must be available for all; and these services should connect to quality health and education facilities as well as to markets and employment opportunities.

WOMEN

Women face particular challenges, both as providers and users of sustainable transport. Work in the transport and related sectors is traditionally male-dominated (see Box 10). An UNCTAD analysis, for example, shows that women's participation in the port workforce remains low, although digitalization and the automation of activities could lead to higher participation of women in this segment.[226] The share of women working in the transport sector in the European Union, for example, is only 22% (compared to the 46% share of women overall who are in work). In addition, multiple pressures and challenges exist in the area of empowerment of women, including lack of involvement in planning and decision-making, lack of training opportunities, harassment of a sexual and non-sexual nature, gender bias, and working environments that do not take into consideration gender specifics and needs of women. Human resources policies, in particular, are not set up to be family-friendly.[227]

As far as transport users are concerned, gender differences are also pervasive with, for example, the travel purposes and travel patterns of women and men differing; women may also lack access to suitable transport options. In both developing and developed countries, women tend to make more journeys than men, using a greater variety of routes, but within a

BOX 10

Women in Maritime programme

Today, women represent only 2% of the world's 1.2 million seafarers, and 94% of female seafarers work in the cruise industry. Within this historically male-dominated industry, the IMO has taken a strategic approach to enhancing the contribution of women as key maritime stakeholders, among other things, through its Women in Maritime programme and its 2019 SDG Strategy.[228] The primary objective of the IMO Women in Maritime programme is to encourage IMO Member States to open the doors of their maritime institutes to enable women to train alongside men and acquire the high level of competence that the maritime industry demands. The IMO SDG Strategy of the makes SDG5 one of the four priority SDGs[229] and one of its tasks will be to tackle the role of women in maritime transport.

more restricted geographical area. Furthermore, women generally use less expensive modes of transport than men, and in general use public transport.[230] Women also often carry heavier loads than men, or travel with children, to which some (public) transport systems are not adapted.[231]

Women's safety remains a major concern worldwide. For example, 6 in 10 women in major Latin American cities report having been physically harassed while using transport systems.[232] Safety may also vary according to mode of transport and may indeed determine a woman's choice of transport.[233] In one UN-Habitat survey of women's experiences in Cairo, insecurity while travelling was perceived as being highest for bus travel, and then microbus, walking, and metro/underground in that order.[234] The lack of safe transport options for women may, in turn, restrict both their mobility and their access to services and paid work. Emerging data show that since the outbreak of the COVID-19 pandemic, violence against women and girls in transport has intensified.[235]

Several countries are aiming to make their transport systems safer for women and more responsive to their needs. Some have developed 'pink transport', women-only subways, buses, and train cars. Such initiatives are currently ongoing in at least 15 developing and developed countries.[236] In China, the inclusion of women in a working group for an urban transport project in Liaoning Province helped to address safety concerns, increased the frequency of bus services, and led to transport route reconceptualization (e.g., to include streetlights, pedestrian paths, etc.), as well as changes in the procurement process of road construction programmes. In Kathmandu, Nepal, transport operators collaborated with local authorities to provide a more gender-responsive transport service by integrating women into policy-making positions. In Cairo, UN-Habitat and UN Women are supporting the Government of Egypt in the introduction of a modern Bus Rapid Transit (BRT) system, which is more responsive to the needs of women.[237]

CHILDREN AND YOUTH

Children and youth are among some of the most vulnerable road users, given that their most frequently used modes of transport are walking, bicycling, and travelling by two-wheeler. Over 500 children lose their lives on the world's roads every day.[238] Road traffic injury has become the leading cause of death of children and young adults aged 5–29. Several measures can be implemented to protect children and youth, including controlling vehicle speed, reducing drinking and driving, mandating the use of helmets for bicyclists and motorcyclists, using seat belts and similar restraints in vehicles for children, improving children's ability to see and be seen, enhancing road safety infrastructure, adapting vehicle design, reducing risks for young drivers, and supervising children around and close to roads.[239] UN-Habitat, for instance, carried out walkability assessments with and for children in Kibera, the largest urban slum in East Africa, in Nairobi, Kenya. A lack of lighting and safe walking infrastructure stood out as the major impediments to children's walkability in the informal settlements, as did social and weather aspects.

PERSONS WITH DISABILITIES

There are currently more than one billion persons with disabilities in the world—80% living in low-income countries—who require safe and accessible transport

systems. This figure currently represents 15% of the global population, and is projected to rise with population ageing, especially as an estimated 46% of people aged 60 and over have disabilities.[240] While disaggregated data are difficult to come by, crowdsourced reviews, reflecting the direct experience of persons with disabilities (mostly in developed countries) indicate that 32% of public transportation facilities are not wheelchair-accessible, with subway stations being the most difficult to access (61% of them are not accessible). In developing countries, data from selected countries in sub-Saharan Africa, Latin America, and Asia, show that 36% of persons with disabilities consider transportation not to be accessible to them. Countries have, however, been making efforts. A review in 2018 among 126 countries indicated that 54% of them had intervened to improve transport accessibility to persons with disabilities.[241]

OLDER PERSONS

In 2018, persons aged 65 and over globally outnumbered children under the age of five. In 2019, Europe and Northern America had the most aged population, and both regions are continuing to age further.[242] Populations in other regions are also expected to age significantly over the next several decades. Older persons may face particular challenges with regard to disability status, lower incomes, or the need to travel for specific purposes and outside of peak travel times. These challenges, combined with the rising numbers of older persons indicate an increasing need to provide senior citizens with sustainable (public) transport options which are accessible, affordable, and suitable for their needs.

TRANSPORT WORKERS

The COVID-19 pandemic also highlighted working conditions among transport workers, such as public transit workers, customs and other border personnel, freight forwarders and logistics providers, and seafarers, many of whom are facing entrenched wage inequalities[243] and safety risks. For example, public transit workers in many cities are facing increased risks of disease and death due to greater exposure to the COVID-19 virus. At the peak of the crisis, more than 400,000 seafarers were trapped on board their ships, while as of March 2021, about 200,000 seafarers were estimated to have remained on board commercial vessels beyond the expiry of their contract.[244,245] According to the International Chamber of Shipping (ICS) that number had increased to around 250,000 as of July 2021.[246]

The well-being of seafarers and other transport workers remains a major priority for sustainable development. Their health, safety, education, fair pay, and legal protection are all vital issues which can be addressed through, for example, UN inter-agency cooperation and close partnership with governments and the private sector.

The move towards sustainable transport will have important implications for the labour market and, in particular, for transport-related employment. Understanding changing skills demands and job possibilities, as well as the emerging transport technologies and new mobility options and mixes, will all be crucial to easing the adjustments that transport workers will need to make. There seems to be a reasonable likelihood of job redundancies in certain segments of the transport sector, but precise numbers are not known. For example, electric vehicles have fewer parts and components than internal combustion engines, indicating changing requirements for automotive service workers; meanwhile, the introduction of autonomous vehicles could reduce the demand for drivers. The World Maritime University noted in a recent report that the introduction of highly automated ships would lead to a decrease in the global demand for seafarers by 2040 vis-à-vis the baseline projection based on current technology. Furthermore, estimates for countries participating in a survey of the Organization for Economic Cooperation and Development (OECD) showed that 5.7% to 50% of low-skilled workers, such as dockers and baggage handlers, are exposed to high risks of automation.[247] In considering only 15 major developed and emerging economies, the World Economic Forum predicts that frontier technological trends will lead to a net loss of more than 5 million jobs by 2020.[248] An analysis by the McKinsey Global Institute indicates that, technically, about 50% of jobs globally

can be automated. In Asia–Pacific economies, the jobs of 785 million workers or 51.5% of the total number of those employed in the region could be automated.[249] On a more positive note, a recent study by UNECE and the International Labor Organization (ILO) found that 10 million additional jobs could be created worldwide if 50% of all vehicles manufactured were electric. In addition, almost 5 million new jobs could be created worldwide, if UNECE countries doubled their investment in public transport.[250]

To the extent that downsizing of the labor force is expected, forward planning will be critical so that as many workers as possible can be smoothly redeployed to areas that are expanding and that they not only have the related skill requirements but also earn comparable wages. This is particularly important for women and persons with disabilities. Upgrading of all workers' skills on a continuing basis, retraining, and redeployment of some employees are necessary for dealing with the social ramifications of workers being displaced or having their job eliminated. This transformation is all about societal change, and adaptability and flexibility will be the hallmarks of the new era.[251]

CHAPTER III

Realizing sustainable transport solutions for all

1. IDENTIFYING TRANSFORMATIVE PATHWAYS

The challenges to achieving sustainable transport reflect broader sustainable development challenges for the coming Decade of Action and beyond. In its role as an enabler, sustainable transport can accelerate progress towards the SDGs, towards the objectives and targets of other relevant agreements, such as the New Urban Agenda (NUA), and towards climate action by consciously leveraging interlinkages to manage trade-offs and derive benefits from synergies. Transformative actions departing decisively from business as usual are needed across the board and must also be taken in coordination with transformations of other systems (food, energy, water, etc.). The sub-sections that follow will present recent developments in methodological and thematic areas that can contribute to accelerating such transitions.

THE GLOBAL SUSTAINABLE DEVELOPMENT REPORT (2019)

Transformation calls for integrated approaches that bring together multiple stakeholders around shared objectives, in a departure from business as usual. The Global Sustainable Development Report of 2019 identified[252] four 'levers' that need to be deployed together in a strategic and integrated fashion—governance, economy and finance, science and technology, and individual and collective action. While not a definitive characterization, these levers are all critical in the context of transport, as seen earlier, and they provide a useful framework for identifying necessary actions. Apart from their individual impacts, each lever must be deployed together with the others to support or maximize each other's impacts. For example, reducing pollutants from transport may be achieved most efficiently when emission standards (governance) motivate technological improvements (STI); while tax reductions (finance) stimulate purchases, and changes in preferences towards walking and bicycling (individual and collective action) lower vehicular use. Likewise, road safety can be advanced through a combination of goal setting (governance) that motivates research to identify speed limits (STI), investments in adding safety features to existing infrastructure (finance) and voluntary adoption by the population at large of safer road behaviour, motivated by publicity and campaigns (individual and collective action).

This approach can be a useful way of systematically identifying and developing integrated solutions that can span territorial jurisdictions, incentive structures, and comparative advantages. Gaps that need to be addressed to achieve overall objectives can also be identified. While applying this approach, additional consideration may be needed to highlight cross-cutting areas for improvement, that are necessary for the capacity building or integrated planning, essential to improving the impacts of the levers.

AVOID–SHIFT–IMPROVE

The three elements of the Avoid–Shift–Improve approach[253] are applied to identifying solutions to unsustainability. To illustrate, *Avoid* reduces transport demand, for example, through changes in behavior, technologies (e.g., telecommuting, e-services, 3D-printing), redesign of cities through the use of compact, mixed-use planning with inclusive public spaces, or by shortening and simplifying supply chains. *Shift*—closely tied to avoid—changes the nature of transport demand and supply by transitioning away from fossil fuel–heavy modes in favor of active, non-motorized mobility (walking or cycling), public transport, car-pooling or other sharing mechanisms, and improving multimodal transport (e.g., public transit connecting seamlessly to shared bicycles for individual use). *Improve* refers to changes in how transport systems and services are provided or managed, through for example: sustainably charged electric vehicles; safer vehicles with improved technology; safe road design with lower speed limits; improving accessibility for under-served populations and geographic areas; and low-carbon transport technologies.

Solutions identified by applying this approach would vary across countries, depending on the local context and priorities. For example, in areas where access remains a challenge and infrastructure is insufficient to meet demand, the emphasis may be on expanding and upgrading transport networks, both within and between countries, with roads still figuring prominently, complemented by rail for high-volume routes. Once a suitable solution has been identified, the 'levers' framework identified earlier can be deployed for implementation.

MULTIMODAL AND INTER-MODAL TRANSPORT

Integrated transport and transit systems[254] that optimize the relative advantages of each mode of transport are crucial to achieving sustainable transport of passengers and freight within and between countries. Such systems can provide an array of options for passenger and freight transport and successfully connect individuals and countries while supporting economic growth, social development, and global trade. They can reduce transportation costs, shorten transportation time, improve transportation quality, reduce road congestion, and lower environmental impact, for example, by reducing carbon emissions and noise pollution while improving energy efficiency.[255] Planning such transport systems, including long-distance, cross-border transport corridors, requires well-coordinated integration across modes. Emphasis should be placed on low carbon–based and energy-efficient modes of transport and an increased reliance on interconnected transport networks for seamless and 'door-to-door' mobility and connectivity of people and goods. All modes of transport and their efficient integration are important, including road, rail, waterborne and air transport, as well as non-motorized transport, such as walking and cycling—emphasis should, however, be placed on modes of transport based on low-carbon energy and an increased reliance on public transport systems.

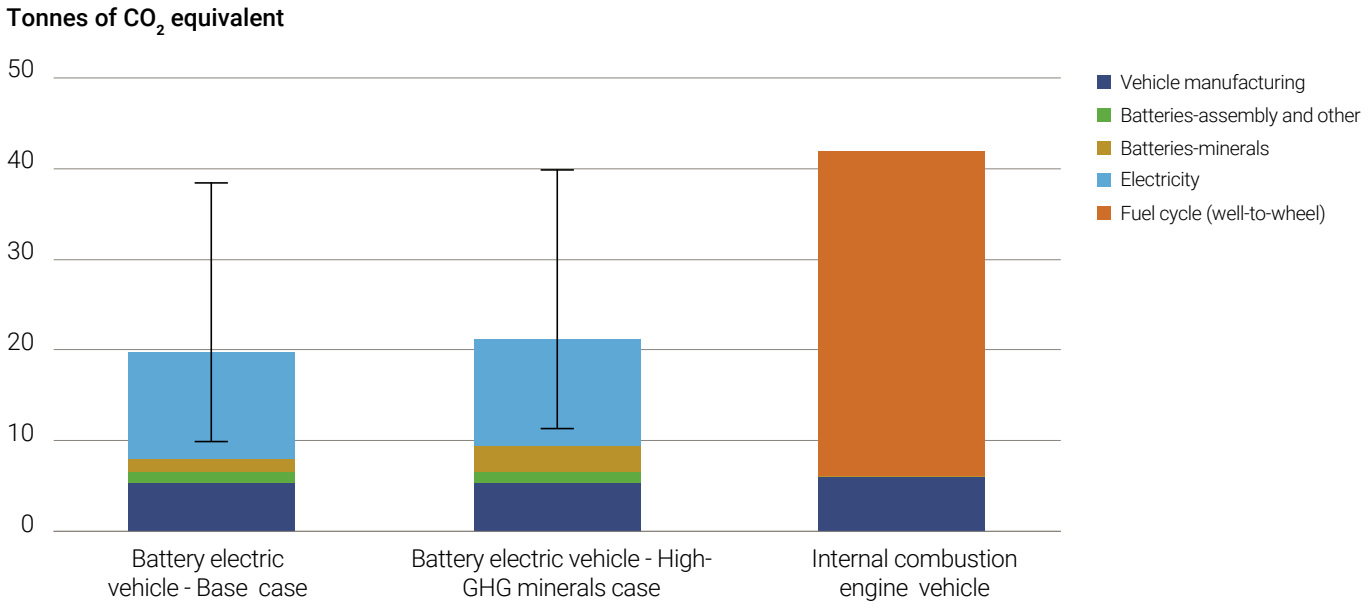
One example is the Rea Vaya system in South Africa which was designed by the city administration to promote multimodality. Transporting goods across national borders and over 'the last mile' to their final destination in a sustainable, safe, efficient, and effective way is an ongoing challenge, where integration modes can be especially beneficial. Solutions will require collaboration between governments and transport providers, with regional initiatives being important for harmonizing legal and policy frameworks.

SUSTAINABLE TRANSPORT AS AN AVENUE FOR CLIMATE ACTION

The SuM4All's *Global Roadmap of ActionToward Sustainable Mobility (GRA)* reports that global GHG emissions from the transport sector need to be reduced from 8 billion tons of CO_2 to 2– 4 billion tons by 2050, with net-zero emissions in the decades thereafter. This implies emissions of less than 0.5 tons on average per capita. Countries with existing high per capita transport-related emissions of 1 to 5 tons must work towards rapid decarbonization.[256] Many countries are

FIGURE 14

Comparative lifecycle GHG emissions over ten-year lifetime of an average mid-size car by powertrain (2018)



Source: IEA (2021)[257]

below the maximum per capita level, yet their emissions are rising rapidly because of increased motorization and economic growth. Finding a path towards carbon neutrality that is consistent with their aspirations for growth and improved living standards, is essential for these countries as well.

The transport sector is therefore a central player in combating climate change. Efforts to improve the energy efficiency of all modes of transport and to increase the use of low-carbon fuels must be deepened and extended without delay over the next decade, as waiting to act would noticeably increase the cost of reaching climate targets. To limit the average global temperature increase to under 1.5°C above pre-industrial levels, the Intergovernmental Panel on Climate Change (IPCC) reported in 2018 that electric vehicles, electric bikes, and electric transit need to displace fossil fuel-powered passenger vehicles by 2035-2050. There have been increases in the fuel-efficiency of vehicles (cars, trains, ships, and aircraft) and policies are being put into place in many countries to reduce transport-related emissions, but these are widely seen not to be adding up to the scale needed for the desired levels of impact. In addition, rising motorization rates are outpacing efficiency gains, and rapid economic growth in some regions is generating new demand for passenger and freight transport. If well-performing public transport systems as well as urban and territorial planning continue to be inadequate, then these trends are likely to continue, as the dependence on two- and four-wheel passenger vehicles increases. Decarbonization of the new vehicle stock takes on added urgency in all countries; but it is important to take into account and mitigate potential trade-offs.

Technological advances, such as electric vehicles, are expected to play a major role in reducing overall road transport–related emissions (see Figure 14), provided they themselves are powered by electricity generated from sources other than fossil fuels. The global EV fleet emitted 51 million tonnes of carbon dioxide equivalent in 2019; this is approximately half the amount that would have been emitted from a fleet of the same sized

powered by internal combustion engine (ICE) vehicles, and totals 53 Mt CO_2-eq of avoided emissions.[258] At the same time, the use of electric vehicles increases demand for electricity generation. It is thus crucial to further accelerate the reduction of GHG emissions from electricity generation. An electric vehicle charged each night with electricity generated from fossil fuels may not be any more efficient emissions-wise than a gasoline-powered vehicle. There is a clear contrast with countries whose electricity supply is dominated by hydro and nuclear.[259] Policies to incentivize the use of electric vehicles should thus be coupled with the simultaneous decarbonization of electricity generation.

Biofuels may be seen as an alternative to fossil fuel use for powering vehicles, but there are notable well-recognized trade-offs with other SDG objectives.[260] For example, the production of biofuels can generate indirect emissions from land use change which could, in some cases, lead to greater total emissions than from using petroleum products. Biofuel use can also negatively impact food security, forest cover, and biodiversity preservation, as they compete for land with these objectives. According to the IEA, biofuel production for transport expanded 6% year-on-year in 2019, and a 3% annual growth in production was expected over the following five years.[261] Due to the COVID-19 crisis, however, transport biofuel production declined 8% from 2019 to 2020. Global biofuel production is expected to recover to the 2019 level in 2021, but this recovery will be uneven.[262] Due to the additional negative impacts of biofuels on progress towards the SDGs, their potential to contribute to reducing fossil fuel use may be limited and subject to reassessment.

On the other hand, other promising options for powering vehicles–including aircrafts and ships–are under development (see section chapter 3.2 on technology).

Apart from improved technologies, the transition to low-emission mobility and resilient mobility will require integrated sectoral interventions and combined efforts across all transport modes along with innovations and changes in urban and land-use planning. Changes in trade patterns, service provision, and individual and collective behavior will also be crucial (e.g., continuing expansion and use of public transport, non-motorized transport, and vehicle-sharing options in highly motorized societies). Measures at global, regional, national, and sub-national levels are needed to manage travel demand and shift preferences towards the most sustainable, efficient, and resilient modes of transport.

All of this is achievable. Boxes 11–14 illustrate some positive steps in the right direction, including initiatives undertaken by different stakeholders and sectors.

BOX 11

Transport in international climate change discussions

At the 22nd session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP22), held in Morocco in November 2016, transport was integrated as a thematic area under the Global Climate Action Agenda and in the Marrakech Partnership for Global Climate Action to 2020. Freight transport was addressed under Transport Day break-out sessions as well as dedicated side-events, such as those organized by UNCTAD, including events organized in collaboration with SLOCAT. Sustainable transport was also featured during Transport Day and side-events at COP25 held in Madrid in 2019. Today, NDCs under the Paris Agreement increasingly make reference to emission reductions from freight and passenger transportation, but the level of ambition is still insufficient.[263]

BOX 12

Shipping and climate action

In April 2018, the International Maritime Organization (IMO) adopted its Initial Strategy on the reduction of GHG emissions from ships— the first global climate framework for shipping.[264] The Initial Strategy calls for a reduction in CO_2 emissions intensity by 2030 by an average of at least 40% across the international shipping sector, and also for efforts to work towards a 70% reduction in intensity by 2050 compared with 2008. It also calls for a reduction in total GHG emissions of at least 50% from shipping by 2050 compared with 2008. The Initial Strategy aims to phase out GHG emissions from international shipping as soon as possible this century. The IMO recently adopted combined technical and operational measures, referred to as 'short-term carbon intensity measures', which are in line with this ambition. It also approved a work plan to accelerate the development of mid- and long-term measures, possibly including market-based measures and/or other measures such as fuel standards. The Initial Strategy points out that technological innovation and the global introduction of alternative fuels and/or energy sources for international shipping will be integral to achieving the overall objectives of carbon reduction in the shipping sector. A revised strategy is expected in 2023.

The cooperation and partnership building between ports and ship owners is especially crucial in relation to SDG 13, as ships use around 15% of their total fuel while in port or in a harbour. The IMO recently invited Member States to encourage voluntary cooperation between the port and shipping sectors to contribute to reducing GHG emissions from ships. This cooperation could include regulatory, technical, operational, and economic actions, such as the provision of the following: Onshore Power Supply (preferably from renewable sources); safe and efficient bunkering of alternative low-carbon and zero-carbon fuels; incentives promoting sustainable low-carbon and zero-carbon shipping; and support for the optimization of port calls including facilitation of just-in-time arrival of ships. The IMO–Norway GreenVoyage2050 Project[265] includes a specific component on supporting cooperation between the shipping and port sectors with a view to reducing GHG emissions from ships.

Research into developing zero-carbon marine fuels, like 'green hydrogen', or 'green ammonia' is under way. The IMO is also stepping up its efforts to act as the global forum and promoter of R&D in zero-carbon marine fuels, bringing together Member States, the shipping industry, financial institutions, ports, shipyards, universities, and other interested stakeholders from all over the world.[266]

BOX 13

Aviation and climate action

In 2018, aviation accounted for roughly 12% of transport-related CO_2 emissions. Before the COVID-19 pandemic, passenger air travel continued to grow rapidly as incomes were on the rise. According to the International Air Transport Association (IATA), emissions are expected to triple over the next 20 years, as air travel takes off in Asia, and mature markets continue to expand. Low- and no-emissions aircraft designed to carry hundreds of passengers over long distances are yet to be developed. Experimentation continues with alternative jet fuels (including biofuel blends), and electricity is being used for short-haul flights by at least one airline. Meanwhile, in 2016, ICAO, the industry's standard-setting body, adopted the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). This would rely on offsets to halt net carbon emissions growth at 2020 levels. It entered its pilot phase in 2021 and will become binding starting in 2027.[267] To date 106 Sates have notified ICAO of their decision to voluntarily participate in the CORSIA from 1 January 2022.

BOX 14

Towards low-sulfur fuels

Since 2013, the Global Strategy to Introduce Low Sulfur Fuels and Cleaner Diesel Vehicles[268] has sought to reduce small particulate and black carbon emissions from cars, buses and trucks by over 90% by 2030. The goal of the Global Strategy is for all countries to phase in low sulfur diesel (50 ppm) by 2025 and for ultra-low sulfur (10 ppm) fuels to represent the majority of the global on-road fuel supply by 2030. The environmental and health benefits of cleaner fuels and vehicles are substantial, eliminating an expected 14 million metric tons of PM2.5 cumulatively through 2050, and up to 500,000 fewer premature deaths a year in 2050. Since the launch of the Strategy, significant reductions in sulfur content have been achieved in several large economies, including Brazil, China, India and Russia.[269]

Scaling up and adapting measures to different contexts does, however, require additional research and development efforts and also financial support in many areas: this includes support for the uptake and development of alternative fuels and new technologies, especially in developing countries. Countries may also need to introduce policy, regulatory, and institutional reforms to remove obstacles to the more rapid deployment of low-carbon, sustainable, and accessible transport solutions. For many developing countries, including countries in special situations, additional financial and technical support is imperative.

2. APPLYING SCIENCE, TECHNOLOGY, AND INNOVATION

Sustainable transport cannot be achieved at the scale and speed required without the deployment of new technologies. Environmentally friendly fuels and engines, autonomous vehicles, and intelligent transport systems (ITS) have become central features of the transport innovation landscape. However, large innovation gaps remain between countries, and between urban and rural areas—gaps that are expected to widen unless deliberate efforts are made to close them. This section provides a selective overview of relevant science-, technology-, and innovation-related issues.

ROAD TRANSPORT

Private car transport accounts for three-quarters of all passenger mobility, making it the predominant means of transport. Over the past two decades, four different technology solutions to the decarbonization of these light-duty motor vehicles have been in competition: ultra-high efficiency internal combustion engines, biofuels, hydrogen, and electric. While electricity and hydrogen can, for example, offer important opportunities to decarbonize the transport energy system, the realization of full-cycle carbon reduction depends on the way in which they are produced. Greater use of electricity or hydrogen for private motor vehicles will be sustainable only if their systems are increasingly based on low- or zero-carbon sources of energy/fuel. In addition, the lifecycle environmental and health impacts of battery production and disposal for a billion electric vehicles remain a matter of concern.

Thus, when battery and resource issues are taken into account, hydrogen produced from non-fossil fuel sources may have a better environmental record than battery-driven vehicles. However, safety concerns and a lack of infrastructure have held back the adoption of hydrogen as a transport fuel, and total sales amounted globally to only 6,000 vehicles between 2013 and 2017.[270] Ultimately, a global technology mix may emerge, although clearly EVs have a far greater role at present.

Global sales of EVs grew from 1.3 million in 2015 to 5.1 million in 2018, achieving a 2–3% share of all new car sales.[271] Sales of electric cars surpassed 2.1 million globally in 2019, boosting the electric car stock to 7.2 million.[272] Yet, the rapid development of EVs, and the phase-out of fossil fuel–based vehicles, already announced by several countries, including France, Norway and the United Kingdom, will depend on setting up adequate infrastructure and could be accompanied by unintended harmful effects if it is not implemented sustainably.[273,274]

For example, the vehicles themselves would need to become more affordable for wider adoption, and the growing quantities of lithium needed for batteries would need to be produced in a sustainable way. With supplies of lithium currently limited to certain geographic regions, and overall demand for the metal expected to triple by 2025,[275] manufacturing costs may remain high, unless additional innovations in recycling, alternative materials, or battery design take place.

Fully battery-operated electric vehicles (BEV) could become increasingly prevalent, driven by government policies, cheaper and more reliable batteries, subsidized charging infrastructure, and trends towards shared mobility. A projection from 2019 indicated that battery-driven and plug-in hybrid vehicles could, together, make up the majority of new vehicle sales by 2040.[276] Other projections foresee a mix of battery-driven, fuel cell-driven, and internal combustion vehicles with ever cleaner fuels, the vast majority of which would be zero-carbon by 2040. Recent commitments towards phasing out fossil fuel-based automobiles could accelerate this transition.

To date, the vast majority of sales of BEVs have been in China, followed by Europe and the United States.[277] Almost all manufacturers have EVs in their portfolio. Some manufacturers (e.g., Volvo, GMC) have announced that they will completely switch to EVs in the foreseeable future. Some countries have committed to phasing out fossil-fuel vehicles (e.g., United Kingdom). Much of the new demand for automobiles in coming decades will originate in developing countries, where factors such as prices, infrastructure, and policies will be crucial to wider diffusion.[278] Several initiatives have been launched to promote the use of electric mobility (see Boxes 15 and 16, for examples).

Another category is heavy-duty road transport—trucks and buses—which currently contributes just 3% of global GHG emissions. Emissions for this category are, however, growing by over 2% annually in line with rising transport volumes, with trucks accounting for more than four-fifths of this growth.

BOX 15

The SOLUTIONSPLus project: Integrating urban electric mobility solutions[279]

Launched in January 2020, and supported by the European Commission, the SOLUTIONSplus project aims at "Integrating Urban Electric Mobility Solutions in the context of the Paris Agreement, the SDGs and the New Urban Agenda". It brings together highly committed cities, industry, research, implementing organizations, UN agencies (UN-Habitat and UNEP) and finance partners to establish a global platform for shared, public, and commercial e-mobility solutions to kick start the transition towards low-carbon urban mobility. The project encompasses city-level demonstrations to test different types of innovative and integrated e-mobility solutions, complemented by a comprehensive toolbox, capacity development, and replication activities. Demonstrations will be launched in Hanoi (Vietnam), Pasig (Philippines), Lalitpur/Kathmandu (Nepal), Kigali (Rwanda), Dar es Salaam (Tanzania), Quito (Ecuador), Montevideo (Uruguay), Madrid (Spain), and Hamburg (Germany).

BOX 16

UN Environment's Electric Mobility Programme[280]

UNEP is leading a global Electric Mobility Programme that assists developing and transitional countries to shift from fossil-fuel to electric vehicles. It supports the introduction by over 50 countries and cities of electric buses, cars, and two- and three-wheelers. For example, backing is being given to eight countries to develop national roadmaps for the introduction of electric two- and three-wheelers in Africa and Southeast Asia and to conduct pilot schemes. Support is also being given to 50 countries to develop fiscal and regulatory policies and programmes to promote efficient vehicles, including electric cars. A clean bus fleet programme has been developed as well, providing support to 20 cities in Asia, Latin America, and Africa to prepare roadmaps for low-emission public transport, including electric buses.

Solutions for heavy-duty vehicles and road freight transport will be different from solutions for light-duty vehicles because of the challenges of developing battery and charger technology for long distances and heavy payloads. These technologies are at various stages of development, but the cost is still significantly higher than the diesel vehicle alternative.[281] Hydrogen fuel cells are a competitive option for long-haul freight transport, as they are a more lightweight form of energy storage and have faster refuelling capability.[282] A modal shift to rail and waterways also holds long-term potential to reduce GHG emissions. This could be spurred by national regulations and international Conventions, such as the European Agreement on Main International Railway Lines (AGC), the European Agreement on Main Inland Waterways of International Importance (AGN), and the European Agreement on Important International Combined Transport Lines and Related Installations (AGTC), which may assist in making available an adequate infrastructure for these transport modes.

As electric mobility continues to expand, the electricity infrastructure—ranging from low- or zero-carbon generation, transmission, grid connections, and fast charging capacities—must also be developed. On the other hand, the network of vehicle batteries could be used for load balancing to deal with the intermittent generation from renewables such as wind and solar. This, in turn, requires investment in the necessary digital infrastructures and markets. Technological innovations in the energy sector are essential—powering EVs using zero-carbon electricity, along with deployment of smart-grid technologies that can distribute load more efficiently.

The infrastructure requirements of the transition are particularly challenging for developing countries that have lower levels of available public finance, administrative capacity, and electricity infrastructure to start with.[283] Here, the initial focus could be on electrification of fleet vehicles—buses, taxis, and two- or three-wheelers. In the short term, low-sulfur fuels, stricter vehicle emission standards, and increased fuel efficiency remain important mitigation measures.

WATERBORNE TRANSPORT (MARITIME AND INLAND WATERWAYS)

Maritime transport

Most freight transport demand is met today via maritime channels (over 80% and around 70% in terms of tonnes and tonne-kilometres, respectively).[284] The GHG emissions of shipping as a whole (international, domestic, and fishing) stood at close to 3% of the total global figure in 2018.[285] Efficiency improvements, driven by digital technologies, can contribute significantly to lowering the fuel usage, and thus the GHG footprint, from this sector (see also Box 17 on maritime autonomous surface ships). Some of these gains may already have been realized; for example, it is estimated that overall carbon intensity, as an average across international shipping, was approximately 20–30% lower in 2018 than in 2008.[286] Further efficiency improvements can be made, for example, by using mapping software with satellite-generated data to determine the most efficient routes, including weather routing which accounts for currents, weather forecasts, and real-time sea conditions.[287] The short-term carbon intensity-reduction measure adopted by IMO in June 2021 and expected to enter into effect in 2023, could incentivize the adoption of these technologies.

BOX 17

Maritime autonomous surface ships[288]

The digital revolution is fundamentally changing shipping. Artificial intelligence, data-supported remote management, and autonomous operation are all becoming realities. The IMO aims to ensure that shipping's regulatory framework allows for their full benefits to be realized without compromises on safety or environmental performance. Existing IMO instruments, such as treaties on safety, facilitation, and liability and compensation, are currently being assessed via a regulatory scoping exercise on Maritime Autonomous Surface Ships (MASS) to see how they might apply to ships with varying degrees of automation. The scoping exercise was completed in 2020. Autonomous and remote-controlled ships are also being trialled in some sea areas. Most predictions are that autonomous or semi-autonomous operation would be limited to short voyages, for example, from one specific port to another, across a short distance.

The IMO also promotes the use of just-in-time (JIT) shipping,[289] an inventory control strategy with digital cooperation between ports and ships, which can slow ship speeds without imposing mandatory speed limits and can reduce the fuel usage of ships by over 20%. An important component of JIT shipping is port call optimization, which has been developed by the International PortCDM Council (IPCDMC) and the International Task Force on Port Call Optimization (ITPCO).[290]

More broadly, technologies to facilitate a low-emission transition in this sector remain at various stages of development. These include electric propulsion for short haul and ammonia or hydrogen for long haul. As part of its Initial GHG Strategy, the IMO agreed in 2018 on a target to reduce shipping emissions by at least 50% below 2008 levels by 2050. Given the international nature of shipping, coordination across States will be crucial to making advances in technology development and deployment, using, for example, demonstration, testing, regulation, and standard setting, and also establishing refuelling infrastructure. The existing target provides an incentive to test low- and zero-emissions shipping technologies and fuels but will need to be supported by further measures to accelerate their adoption.[291]

Inland waterways

Inland water transport can be a viable alternative or addition to road and rail transport. Though often more environmentally friendly and frequently the most economical mode of inland transport, it remains under-exploited.[292] Digitalization can enhance the efficiency and sustainability of inland water transport. Related River Information Services (RIS) can take different forms, such as Fairway information Services (FIS); Traffic information (TI); Traffic management information (TM); Transport logistics Information (ITL), including Voyage planning (VP), Transport management (TPM), Port and terminal management (PTM), Cargo and fleet management (CFM); Information on Law Compliancy (ILC); Statistics information (ST) and Information for waterway charges and harbour dues (CHD).[293] Different initiatives are ongoing in this regard. In 2017, the European Commission, for example, launched an initiative on the Digital Inland Waterway Area (DINA) regarding the future digitalization of inland waterway transport.[294]

AIR TRANSPORT

Prior to the pandemic, aviation accounted for 2% of global GHG emissions, and these were growing by around 4% per year. Emissions plunged as the pandemic took hold in early 2020, but they have since bottomed out and resumed trending upwards.

Low-emissions technologies and fuels have not yet entered the marketplace on a significant scale. Electrification may be the preferred option for short-haul flights. Long-haul aviation, which accounts for around 80% of the sector's emissions[295], requires high-energy-density fuels, and currently there is no commercially viable substitute for kerosene jet fuel, though some airlines have begun mixing it with biofuels. Some companies have been developing synthetic fuels, produced from a combination of CO_2 (captured directly from the air or from flue gases) and hydrogen and ammonia (potentially from renewable powered electrolysis). In principle, such sustainable aviation fuels can be blended with jet fuel up to 100% in existing jet engines, but so far only blends up to 50% have been certified for use. The ICAO Global Framework for Aviation and Alternative Fuels (GFAAF) is the online database for sharing information related to sustainable aviation fuels.[296]

Besides low or zero-carbon fuel options, other ways of reducing the carbon footprint of aviation include demand reduction—including through modal shifts to less carbon-intensive forms of transport, such as high-speed rail—and increasing logistical and operational efficiency. However, modal shifts need to also consider any additional social and environmental impacts in the local context.

Like shipping, aviation is a highly cost-competitive industry, which can constrain the more rapid adoption of sustainable aviation fuel or other low-carbon options in the absence of regulation, standard setting, or falling prices. Currently, 'certified sustainable' aviation fuel costs 50–100% more than conventional jet fuel, even with

the benefit of existing U.S. and European Union incentives, and three to six times more without. Thus, at current prices, full use of such fuels could add roughly 10–20% to the price of a long-distance economy flight ticket.[297]

The ICAO is the industry's global standard-setting body. The ICAO Assembly at its 40th Session in 2019 reiterated two global aspirational goals for the international aviation sector: 2% annual fuel efficiency improvement through 2050 and carbon neutral growth from 2020 onwards, as established in 2010. ICAO is also exploring the feasibility of a long-term global aspirational goal for international aviation.

In order to achieve these goals, and to promote sustainable growth of international aviation, ICAO is pursuing a basket of measures, including aircraft technology improvements[298], operational improvements[299], sustainable aviation fuels[300], and market-based measures, such as an emission offset scheme named CORSIA. The scheme itself is too new for its impacts to be judged, although the International Air Transport Association (IATA) did announce, in early 2020, plans to develop the Aviation Carbon Exchange (ACE), as a streamlined marketplace for airlines to buy and sell emissions credits under CORSIA.[301] Major airlines have also recently announced the setting of targets to become climate-neutral.[302] However, as with CORSIA, many of these commitments appear to hinge on carbon offsets, which can be of uneven quality and pose challenges in terms of certification and credibility.[303]

In the longer-term, a switch to alternative fuels and electric airplanes would appear to be essential.

RAIL TRANSPORT

Rail transport, especially when powered by non-fossil fuel-based electricity, already has a low carbon footprint. In the last decades, increasing use of digital technology has transformed the way railways are working today. Digital tools aim to address individual needs and requirements by creating door-to-door solutions and added value for the customer experience before, during, and after travel. New technology-based approaches, such as automatic train operations (ATOs), are also increasingly being explored to enhance network capacity, increase punctuality, save energy, lead to financial savings, and improve safety.[304] For passengers, apps showing real-time traffic information, schedules of arrivals/departures, platform information, station maps, and allowing for journey alerts all improve convenience. On-board internet and entertainment services are increasingly being offered to improve the journey experience.

AUTOMATED AND AUTONOMOUS VEHICLES (ALL MODES)

Growing experimentation is also under way on autonomous vehicles and connected vehicles, the latter principally with regard to freight transport. Automated vehicles incorporate varying degrees of automation and consequently require different levels of human involvement for operation. In principle, fully autonomous vehicles require no human intervention, and their operation is fully automated through a combination of on-board sensors, computer programs, maps, satellite positioning systems and related technologies.[305]

Connected vehicles use wireless communications technology to link to transport infrastructure and other components of the transport network, including other vehicles. Such technologies enable real-time communications between components of the transport network and can therefore be used to improve traffic safety and emergency response services. They can also be used to analyze real-time traffic data across highways and consequently help smooth traffic flow.

In line with this evolving technology, pilot runs are being carried out to deploy truck platooning (see Box 18), which wirelessly links multiple trucks in a convoy. When connected, the trucks maintain a predefined distance from each other, responding automatically to changes in the movement of the lead truck. Platooning reduces CO_2 emissions, as the trucks following the lead truck experience less air resistance and can also improve safety. It may be possible to deploy fully automated vehicles as part of such convoys.

The overall implications of automated—and eventually fully autonomous—vehicles for sustainable transport are not yet entirely clear. Issues yet to be fully resolved

include those relating to the safety risks connected with the parallel circulation of autonomous vehicles, traditional vehicles, and new forms of mobility and also to cyber security and insurance and liability considerations.

BOX 18

Truck platooning system in Singapore

With the vehicle population in Singapore approaching one million, the government is seeking to address the increasing travel demand and land constraints: 12% of the country's total land is used for road and land transport infrastructure. Singapore is also faced with a shortage of drivers. This situation has led the authorities to consider new vehicle concepts that will increase productivity, improve road safety, optimize road capacity, and enable new mobility concepts. Singapore has tested autonomous cars, taxis, utility vehicles, and buses. Truck platooning trials took place in two phases over a three-year period, from January 2017 to December 2019. The Ministry of Transport and the Port of Singapore Authority have partnered with two automotive companies to design, develop, and test an autonomous truck platooning system for use in transporting containers from one port terminal to another. Truck platooning can help alleviate labour-force shortages. and allow more freight movements to be carried out at night to ease traffic congestion. Truck platoons have also shown the potential to achieve major fuel savings and contribute to increased road safety.[306]

Several of these issues are under discussion at the United Nations.[307] For example, amendments to the 1968 Vienna Convention on Road Traffic, which entered into force in 2016, allow automated driving technologies to transfer driving tasks to the vehicle in traffic, provided that these technologies are in conformity with the United Nations vehicle regulations, or the technologies can be overridden or switched off by the driver.[308] In June 2020, three new UN regulations were adopted by the World Forum for Harmonization of Vehicle Regulations (WP.29) of UNECE, focusing on cyber security, software updates, and automated lane-keeping systems. These entered into force in January 2021.[309] Two major vehicle manufacturers (one from Japan, one from Germany) are already applying these regulations. In parallel to this initiative, a process initiated by China, the European Union, Japan, and the United States, is harmonizing a set of regulations for autonomous vehicles, that will create a stable regulatory environment to support innovation.[310]

At the same time, most transport modelling studies indicate that a future transport system relying heavily on autonomous vehicles will most likely increase the number of overall vehicle-kilometres travelled, even if the vehicles are shared. This will be a sustainability concern if the vehicles have significant direct or indirect emissions, and their overall environmental footprint is unsustainable. Incentives to reuse and repurpose materials and components of new transport equipment will be needed to avoid new sustainability challenges. There is also the issue of interoperability and standardization. Some of the new technologies could generate greater consolidation and concentration, as they lead to more interconnected business processes and horizontal integration. Such a consolidation of market power can foster inefficiencies, raise prices, and stifle innovation. Yet another concern is the prospect of sudden, large-scale redundancies in the labour market for drivers and those with skills that cannot be easily transferred to vehicles incorporating new technologies. Thus, policy and regulation should keep pace with technological development, address coordination problems, and incentivize experimentation, adoption, and widespread diffusion; the related social adjustment costs and challenges must also be addressed.[311]

While technological progress continues towards fully automated or "autonomous" driving systems, a number of innovations derived from these developments will help to address safety. These innovations introduce some form of automation in risky situations and help in preventing collisions. Examples include advanced emergency braking, risk mitigation functions that kick in if, for instance, the driver faints, emergency steering function, low-speed manoeuvre assistance, and remote-control parking. The UNECE provides assessment criteria for these features and supports their market entry.

SMART CITIES AND INTELLIGENT TRANSPORT SYSTEMS (ITS)

Cities are home to over half the world's population and are projected to grow in the future (See chapter 2.2). They are a key entry point for sustainable development.[312] Their potential as drivers of the transformation towards sustainable transport is determined to a great extent by the design, operation, safety, and efficiency of their transport, energy, and communication networks. The accelerated introduction of active transport modes, such as walking and cycling, and of low-emission, sustainable transport innovations is fundamental to the future sustainability of urban areas, as is the gathering of disaggregated and human-centred mobility data, as these provide evidence for policy, planning, and investment.

The New Urban Agenda[313] calls for just, safe, healthy, accessible, affordable, resilient, and sustainable cities and human settlements to foster prosperity and quality of life for all. One approach to attaining these objectives is through a smart city—one "that uses ICTs and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects".[314]

Smart cities encompass modern, efficient delivery of many services that leverage a range of technologies. These include services related to transport and mediated by *intelligent transport systems* (ITS).[315] Based on a survey of 50 megacities worldwide, ITS applications fall into the following categories:[316]

- *Sharing technologies:* Many cities have widely deployed applications of private and pooled e-hailing, bike sharing, and car sharing, and have also piloted autonomous vehicles. Only a few, however, have experimented with demand-based micro-transit, which is a transit service offering demand-driven flexible routing and/or flexible scheduling of minibus vehicles.
- *Traffic management and data technologies:* Most cities have widely deployed technologies for real-time road navigation, real-time public transit information, integrated multimodal information, digital payments in public transit, intelligent traffic signals and vehicle pre-emption. A majority have also experimented with smart parking technologies, but only a few have explored congestion pricing or predictive maintenance of transit infrastructure.
- *Urban cargo:* Although smart parcel lockers are in the pilot or early deployment stage in most cities, practices and technologies supporting parcel load pooling and urban consolidation are rare.

Some of these technologies are expanding rapidly in cities in developing and developed cities alike. For example, while North America and Europe continue to account for two-thirds of the global ITS market, Asia—with a current share of about 23%— is quickly catching up. ITS markets in China and India are increasing at around 19% per year. This rapid growth in ITS development in Asia and the Pacific would benefit from strategies for region-wide, interconnected, and multimodal services.[317]

ITS can rationalize transport systems, making them more efficient and sustainable through, for example, the provision of live information on traffic, routes, occupancy rates in trains, and mode options for both passenger and freight transport,[318] leading to potentially significantly reduced travel time and more sustainable travel choices. Attention to, and inclusion of, the needs, rights, and access of vulnerable groups is particularly important in this regard, as they could be faced with reduced access to these technologies. Cyber security can also be a challenge, as ITS involve different parties and, by their very nature, are open systems, to enable data access for various purposes.[319]

At the same time, services such as taxi e-hailing apps and more timely parcel deliveries could increase congestion and pollution and also prove detrimental to public transport, which is more accessible to the poor. These services should seek to electrify vehicles, increase pooled trips, and complement mass transit to truly support the transition to sustainable transport.[320]

The post-pandemic period which is seeing possible long-term changes in transport demand, due to telecommuting and online purchasing, could trigger systemic changes in urban transport.[321]

RURAL TRANSPORT: CONNECTING RURAL COMMUNITIES

Rural communities are particularly vulnerable to digital exclusion and cannot always benefit from digital technologies. That said, if good quality, reliable transport infrastructure and services are in place, information and communications technologies can open up new opportunities for rural communities. For example, Alibaba, an online marketplace company, connects rural residents in China with global markets—both as sellers and buyers—thus allowing them to transport their products to global markets and have goods, like fertilizers and seeds, brought to their doorstep.[322]

Rural transport is all about connecting local people to other communities, transportation nodes, and markets. The most important nodes in this respect are rural freight centres –which play an important role in e-commerce–, and roadside markets; other important larger-scale nodes or hubs are airports, seaports, dry ports, border crossings, and bus and railway stations. Technologies that support these nodes can also support rural access links. To design effective rural transport policies, however, governments need a large volume of data together with the technical capacity to analyze that data. Most governments have road asset management systems, but not all rural roads are included.

New technologies can help fill the data gap and monitor transport connectivity[323], including regarding SDG indicator 9.1.1, namely, the *"proportion of the rural population who live within 2 km of an all-season road"*. Examples include GIS-data collected from mobile phone movements, unmanned aerial vehicles, and other technologies.[324] In the Arab region, for example, with the support of the Islamic Development Bank and in cooperation with UNECE, the United Nations Economic and Social Commission for Western Asia (UNESCWA) is developing a Geographic Information System (GIS) for transport networks and facilities. The GIS system includes a capacity-building component for the national focal points on how to use the GIS tool to analyze transport performance in pursuit of inclusive and sustainable development.

CROSS-BORDER CONNECTIVITY

The digitalization of transport logistics and documents, which impacts the management of freight and passenger flows, offers the potential to improve sustainability.[325] The development of international standards in logistics and mobility can ensure interoperability, data and contracting transparency in the supply chain, and the elimination of modal silos in line with the protection of personal and trade data. Accordingly, different stakeholders, such as container carriers, port authorities, customs and other border agencies, and logistics and freight service providers, are using smart technologies to optimize operations, automate administrative procedures, facilitate electronic payments, and make border crossings faster, less costly, and more efficient.[326] The establishment of such systems as 'Electronic Single Windows' in Ghana and Rwanda has improved their logistics performance and overall enabling environment for business. The Ghana National Single Window programme has reduced the time and cost of import procedures per consignment by 400 hours and $50, respectively. In Rwanda, introduction of the system reduced the time needed to clear goods from 11 days in 2010 to 34 hours in 2014.[327]

The UN plays a vital role through global Conventions like the Customs Convention on the International Transport of Goods under Cover of TIR Carnets (TIR Convention) and Harmonization Conventions. These enable paperless solutions to be developed for border crossing and trade (an effort that was accelerated during the COVID-19 pandemic). The newly created eTIR system facilitates cross-border movements by reducing the risks to goods shipments and reducing administrative burdens at borders. It also maximizes the benefits of integrated supply chain management, providing advance cargo information and the exchange of information in real-time.[328]

Various global positioning, navigation, and tracking systems, as well as predictive logistics approaches, enable transport stakeholders to optimize schedules and minimize transport costs. Electronic cargo tracking systems, for example, are increasingly being used in transit transport facilitation. In Africa, for example, the Regional Electronic Cargo Tracking System (eCTs), launched in 2017, integrates tracking platforms in the Democratic Republic of Congo, Kenya, Rwanda and Uganda, to help reduce transit time, enhance cargo safety, and help traders to better predict the arrival of goods. It allows the countries to jointly and electronically track in real time the movement of goods along the Northern Corridor from the port of entry to the final destination. The system has reduced transit time between Mombasa and Kampala from an average of 21 days in 2017 to an average of five days in 2020.[329]

While these innovations facilitate the operation of global supply chains and 'just-in-time' management, enabling production to take place in widely dispersed locations across the world, further measures are required to avoid adverse impacts on the resilience of manufacturing and distribution processes, as has been the case during the pandemic.

3. STRENGTHENING GOVERNANCE

The development of a sustainable transport system, including large-scale adoption of sustainable transport technologies, will only happen with supportive institutional and policy innovations at global, regional, national, and local levels, as well as the involvement of various stakeholders in the decision-making process.

Some of the necessary elements are presented in the Global Roadmap of Action toward sustainable mobility (GRA) prepared by the Sustainable Mobility For All initiative.[330] While the national/local context determines the exact combination of policy instruments used, learning from successful initiatives can also provide some broader guidance.

At an institutional level, sustainability and climate change considerations must be mainstreamed into transportation planning at all levels; they must also emphasize inclusive transport options, emissions reduction, and climate change adaptation and resilience. Integrating the SDGs and climate action is needed both in short-term ad hoc transport decision-making, and in long-term planning. Given the need for coherent action that cross-cuts sectoral, stakeholder, and in some cases, territorial boundaries, institutions must actively facilitate collaboration among ministries, various levels of government, and with all relevant stakeholders, including the private sector and civil society.

In many countries, institutions with sufficient financial and human resources to deploy sustainable transport strategies are limited. Stable institutions and robust regulatory frameworks are, however, vital to the effective operation of the private sector. A national low-carbon green development strategy—developed in consultation with stakeholders, empowered by an inclusive and multi-sectoral institutional architecture, and supported at the highest level of government could provide a clear signal and long-term certainty to the private sector. Such stability creates an enabling environment for the growth of sustainable enterprises and green business. Policy and regulatory uncertainties, on the other hand, slow the transition. Closer international cooperation will thus be needed to reduce such uncertainties.[331]

REGULATIONS AND STANDARDS FOR SUSTAINABLE TRANSPORT

Government policies, including those related to social issues, such as poverty, inclusion, inequality, decent work, and gender equality will be crucial to achieving the transition to sustainable transport. Alongside these, it is also essential to include aspects related to the economy and environment and to science, technology, and innovation.

International agreements and regulations

If the transition to sustainable transport is to take place at the global scale, appropriate international regulatory and policy coordination are crucial. International agreements and regulations underpinning sustainable

transport play an important role in implementing public policy objectives and in facilitating cross-border transactions through the harmonization and unification of laws at the international level. UN agencies, such as ICAO, IMO, the Inland Transport Committee of UNECE,[332] and UNCTAD[333] have actively supported the development of international agreements and regulations geared towards sustainable transport. Annex 2 gives an overview of existing international transport-related Conventions, regulations, and agreements. There are also numerous non-mandatory instruments that address sustainable transport topics.[334] The geographical scope of transport Conventions needs to be expanded and their implementation supported. Regulatory support and capacity-building for countries that wish to become contracting Parties to these agreements—or are contracting Parties but face challenges in their implementation—will further these goals.

Local and national efforts

Legislation and regulations at the national level (and also at sub-national levels) can be especially important if market incentives alone do not foster a sustainable transport path, or where short-term decision-making, rather than long-term planning, dominates events. Likewise, the development of new technologies and the application of science linked to achievement of sustainable transport may require an incentive structure to ensure that adequate resources, human and financial, are available.[335]

Regulations for sustainable transport at the domestic level can relate to different areas, such as transport services, vehicles and vehicle use, and engineering and technology (e.g., technical standards). Vehicle regulations, for example, can improve the energy efficiency of vehicles and reduce emissions from road transport. Examples include: road safety measures; emission and pollution standards; fuel economy/quality standards; regulation of the import of new and used vehicles, including fossil fuel motor vehicles above a maximum age; and end-of-life vehicles along with user and producer responsibility for them (including recycling and reuse).

Other incentive measures, such as voluntary standards and non-government certification schemes regarding, for example, sustainable sourcing or decent labour practices can send valuable signals to consumers. As decisions about investments and maintenance of a sustainable transport infrastructure and development of technologies for sustainable transport are often weighed against other competing considerations and pressures, non-market incentives can help tip the scale towards sustainable transport and long-term thinking. Such incentives could, for example, include the following: strategies that moderate transport demand during peak times, like congestion pricing and access restrictions; quota systems, credits, taxes, or other incentives to encourage the purchase or sharing of cleaner vehicles or that reward individuals who cycle or walk; removal of subsidies on fossil fuels; introduction of subsidies for clean fuel technologies; taxes on polluting forms of transport; the government deciding to invest in and encourage use of public and non-motorized transportation (e.g., through subsidies for the poor) rather than building infrastructure for private vehicles; policy prioritization, for example to invest in and encourage the use of mass transit and public transportation, and also non-motorized transportation; and procurement of e-vehicles for use by government officials.

Harmonization

Varying standards and regulations between sub-national entities or across borders pose a challenge to cross-cutting transport planning and implementation. When harmonization is feasible, it can speed the scaling up of sustainable transport solutions and related technological innovation and generate greater collaboration among stakeholders. Overarching structures to help with harmonization already exist. They include the United Nations technical regulations on vehicle emissions, electric cars, and autonomous vehicles,[336] developed under the auspices of the World Forum for Harmonization of Vehicle Regulations. These key tools support the development of innovations in the road sector and help achieve the potential benefits of new technologies. Harmonization of this kind is regulated in the shipping and aviation sectors through the relevant international bodies

IMO and ICAO and for railways, intermodal transport, and inland waterways through UNECE. Non-governmental technical bodies, such as the Society of Automotive Engineers International (SAE International), the Institute for Electrical and Electronics Engineers (IEEE), and the International Organization for Standardization (ISO) also publish and establish standards which, while advancing sustainability, can facilitate inter-operability and cross-border technology adoption.

INTEGRATED PLANNING

Sustainable transport objectives are anchored in transport planning. If they are to live up to their potential for delivering on the SDGs and climate action, however, coordinated efforts across different ministries are needed for their implementation. Such coordination may also be required across geographic jurisdictions, for example between urban and provincial/national authorities, or between national governments in a particular multi-country region.

In many countries, transport ministries themselves are divided across modal lines. Institutional capacity must therefore be built to support integrated transport planning that covers all the dimensions—social, economic, and environmental—of sustainable transport, as well as incorporates issues relating to all modes of transport.

Most transport infrastructure is long-lived. Decisions taken in the short run have long-term implications, and are typically hard to reverse. Even across different transport modes, decisions can be closely interconnected—for example, inter-city train use becomes more attractive if there are suitable regional and local mobility options at either end. Strategic decisions need to be made about the build-out of transport networks over time to accommodate long-run trends (see chapter 2.2), such as growing populations and increased urbanization, in ways that are economically justified, socially inclusive, and environmentally sustainable. These decisions will include the choice of modal mix, the siting of infrastructure with its various components (including future EV charging stations), and the design features of infrastructure which is able to cope with intensifying climate change and can be integrated into compact and inclusive public spaces that are accessible to all.

Short- and long-term transport targets should be clearly defined and aligned with the SDGs and climate action goals. Planning should take into account a full lifecycle analysis. Land-use planning should also be integrated and aligned with the objectives of the transport planning process.

Transport planners and policymakers must also decide on appropriate means of raising the revenues needed to maintain and expand transport infrastructure and services, as well as the appropriate instruments required to foster the intermodal shifts desired at the pace needed. The science–policy interface, as well as data availability and collection, should be strengthened: this will enable well-informed decisions to be made. Institutional mechanisms are needed which ensure that mobility plans at the sub-national level can be consistent and coordinated with the integrated national sustainable transport plans.

The socio-environmental impacts of different transport decisions should be considered in light of poverty eradication, quality-of-life improvements, inequality reduction, and the mitigation of negative environmental impacts. Such considerations are fundamental to policy and investment decisions. Examples of relevant approaches include the amended European Union Directive on Environmental Impact Assessment,[337] which requires climate change impacts to be taken into account as part of environmental impact assessments for large infrastructure projects; the Climate Change Policy Framework for Jamaica,[338] which provides for cross-sectoral mainstreaming of climate change considerations; and ISO Standard 14090,[339] which provides a consistent, structured, and pragmatic framework that enables organizations to prioritize and develop effective and efficient adaptation measures tailored to the specific climate change challenges they face. Of particular relevance is the most recent ISO standard ISO 14091 from 2021 which provides

guidelines for assessing the risks related to the potential impacts of climate change.[340] Regarding health, the World Health Organization's Health Economic Assessment Tool (HEAT) is a harmonized method for quantifying the health benefits of cycling and walking, which can help inform urban planning decisions and support for different modes of travel.[341]

Potential risks related to transport infrastructure and services need to be evaluated and the capacity established to monitor and address these challenges. For example, tools for risk-based compliance monitoring and enforcement (CME) can address safety issues and thereby support decision-making. One example is the development of the GloBallast e-learning portal of the IMO[342] and Risk Assessment Tools related to marine biosafety. In areas where there are no insurance and risk reduction systems, investment in these institutions is imperative. Incentivizing risk reduction is also important: this, among other things, requires resilience to climate impacts and other natural and economic shocks and chronic stressors to be placed at the centre of transport infrastructure planning and the development of transport networks.

Adopting a results-oriented, people-centred approach can lead to better integration, as seen in several different approaches to urban development that incorporate varied transport options. New concepts, such as the '15-minute city' where residents have access to everything they need within a short radius, can help boost quality of life while reducing transport demand, as long as they are designed for inclusivity. Another concept is Transit Oriented Development (TOD)[343] which can help to create dynamic, multi-purpose communities, served by public transit, that accommodate a mix of commercial, residential, entertainment, and public spaces within walking distance of transit stations. TODs bring compact, mixed-use development within walking or cycling distance of high-capacity public transport, thus lowering reliance on individual vehicles, minimizing travel costs, and improving the quality of life in many cities. Box 19 presents an example of integrated planning at the local level, leading to a Sustainable Urban Mobility Plan (SUMP).

BOX 19

Integrated planning at the local level: UN-Habitat-supported Sustainable Urban Mobility Plan (SUMP) for Ruiru, Kenya[344]

Rapid and often unplanned and uncoordinated growth of towns and cities has seriously compromised existing transport systems and increased the challenges of creating future sustainable transport systems, especially in developing countries. The mobility demands of such areas need to be addressed in a sustainable way. A Sustainable Urban Mobility Plan (SUMP) is a strategic plan designed to satisfy the mobility needs of people and businesses in cities and their surroundings for a better quality of life. It builds on existing planning practices and takes due consideration of integration, participation, and evaluation principles. A SUMP is characterized by an integrative approach to the following: provision of competitive modes of transport; minimizing emissions, air and noise pollution; support for and creation of an enabling environment for non-motorized, active modes of transport, such as walking and cycling; promotion of the economic development of a city; and affordability for users and taxpayers.[345] SUMP is a transport planning approach that prioritizes people over any particular mode of transport and has the potential to make better use of existing transport infrastructure.

UN-Habitat, in collaboration with the University of Nairobi, developed a SUMP to support the town of Ruiru, near Nairobi, one of Kenya's fastest growing towns. An implementable plan was created and backed by the consensus of all stakeholders, including government, local businesses, and residents. The SUMP targeted improvements in walking and cycling facilities with the overall objective of making the town accessible for all. Among other things, it included the provision of dedicated lanes for non-motorized transport, the improvement of street infrastructure, and the definition and securing of crossing levels.

MULTI-STAKEHOLDER ENGAGEMENT

Involving various stakeholders in the decision-making process around the SDGs and climate action is a critical enabling step for the transition to sustainable transport systems and also for ensuring the political and social viability of those systems. To achieve multi-stakeholder support, a dialogue is needed between governments and other stakeholders including the private sector, academia, civil society, and, importantly, the representatives of women and vulnerable groups. Open dialogue and inclusive decision-making can focus on local and national transport concerns and related social, economic, and environmental issues. They can also cover regional and global transport challenges. This promotes better alignment between transport systems at different scales. Buy-in and broad public support of new sustainable transport policies and strategies are crucial, and relevant stakeholders should be involved in their formulation from the outset. The Aarhus Convention (UNECE) and the Escazu Protocol (UNECLAC) are two UN instruments calling for the inclusive engagement of all stakeholders in sustainable transport/climate action processes and discussions.

For a rapid transition to sustainable transport to be politically viable, it must incorporate the views and concerns of stakeholders who benefit from existing systems and may lose out in some way from the transition. For example, policies relating to transport that significantly affect the costs of mobility, whether through increases in gasoline prices or public transit fares, can be highly unpopular and widen inequalities. These can be linked to such factors as the share of income spent on mobility by different population segments, the degree of inequality, and the pace and size of price/fare changes. Stakeholders may feel threatened by the changes needed; if they are not properly consulted and their concerns adequately addressed early on, they may successfully form blocking coalitions against aspects of the transition.

Local communities, especially the most vulnerable, should be involved in infrastructure design, planning, implementation, and maintenance, wherever possible. Workers in transport jobs that will be adversely affected by the transition should be given the opportunity and training to transition to new jobs. Tripartite social dialogue—between workers, employers, and governments—can contribute to the development of sustainable enterprises and inclusive growth; it can also help in negotiating and achieving the sustainable practices that lead to sustainable transport. Other activities to enhance the early involvement of stakeholders should be fostered.

Efforts to increase stakeholder participation in the decision-making process have resulted in the development of a number of participatory mechanisms related to sustainable development in many countries and at different geographical levels. For example, many governments have put in place processes for consulting stakeholders at different stages of new policy development. More inclusive approaches are on the rise that could help break down the silos in transportation decision-making processes-for example, 'whole-of-society' approaches which comprise wide-ranging national participatory multi-stakeholder processes involving both State and non-state stakeholders.[346] While these approaches may not be specifically related to transportation planning, they are useful spaces for engagement with sustainable transport concepts, or they can be used as models for creating specific sustainable transport-related approaches.

Especially since Rio+20, the increased engagement of a broad range of transport-related stakeholders in international discussions has enhanced the legitimacy of collective decision-making. Such engagement has allowed the consideration of diverse interests, promotion of interdisciplinary collaboration and integrated decision-making, and a balance between social, economic, and environmental considerations and objectives. It allows different stakeholders—governments, the private sector, civil society, and academia—to work together in a coordinated manner and to pool financial resources, knowledge, technology, and expertise (see Box 20 for an example).

BOX 20

Environmentally Sustainable Transport (EST) Forum: An emerging platform for advancing transport policy towards achieving the SDGs in Asia[347]

Since 2005, the annual Regional Environmentally Sustainable Transport (EST) Forums in Asia have been a venue for high-level governmental decision-makers from 22 Asian countries to meet and discuss how to address transport challenges in an environmentally sustainable way. The EST Forum is attended by representatives of national and local governments, the UN and other international organizations, NGOs, scientific and research organizations, and the private sector. It brings together line ministries and agencies from different areas, such as transport, environment, health, urban development, and energy, to discuss multi-sectoral policy issues concerning the transport sector. In 2010, the Forum adopted the Bangkok 2020 Declaration (2010–2020)[348] with its 20 goals and a recommended set of benchmarks among Asian countries for their overall decisions in transport policy, planning, and development. This represents an unprecedented voluntary commitment on the part of the countries involved.[349] A new Declaration will be launched in 2021 for the next decade. With the coordination support of UNCRD-DSDG/UNDESA, the Forum fosters a common understanding across Asia of the essential elements of EST, alongside the need for an integrated approach—Avoid, Shift and Improve—not only to addressing unsustainable transport practices but also to building safer, liveable, resilient, and sustainable cities and communities in the region. The policy discussions at the Forum are aligned with the 2030 Agenda, the Paris Agreement, the New Urban Agenda, and other relevant global agreements that have set out objectives and/or targets for improving rural and urban access, national connectivity, and economic, social, and environmental sustainability to guide the development of the transport sector in Asia and the Pacific.

4. IMPROVING FINANCING

Financing for sustainable transport comes from multilateral, public, and private sources. It can be directed towards a range of initiatives, for example, expansion of infrastructure in under-served areas and retrofitting or installation of complementary infrastructure and equipment (e.g., green electric charging networks) to accelerate net-zero transitions and build resilience. Accordingly, the specific financing instruments or sources can also vary. Transport funding comes from different sources, with private sources dominant in developed countries and public funding slightly greater in developing countries. As countries are at different stages of development and technology use, aggregated estimates for financing needs are not available. However, some piecemeal estimates are available.

The OECD, for example, estimates that USD 6.9 trillion a year of infrastructure investments— of which transport is one component—are required up to 2030 to meet climate and development objectives.[350] In another set of estimates, the IMF assessed the additional spending needed to achieve the SDGs in low-income developing countries and indicated that annualized infrastructure investments (including roads, electricity, water, and sanitation) would be of the order of $244 billion (2016 US$) in the runup to 2030.[351] While the additional spending for roads is not broken down, it is likely to amount to about 2% of GDP in those countries. Note that this would not include investments in other components of sustainable transport, for example, in mass transit, railways, and ports.

Beyond the necessary infrastructure investments needed for ensuring universal access and safety, much of the additional transport investment will need to be directed to sustainable, low-carbon, climate-resilient transport infrastructure, vehicles, and other capital stock.

These flows are currently captured by data on global climate finance, as global investments in low-carbon power, transport, and other technologies fall under this rubric. The Climate Policy Initiative[352] estimates

global climate finance flows annually, putting the figure for 2017/18 at $579 billion, including both public ($253 billion) and private flows ($326 billion).[353] Low-carbon transport accounts for $141 billion, second only to renewable energy generation at $337 billion. As these are estimates of actual (current) investments, additional spending to deal with, for instance, stranded assets, R&D on sustainability options for the maritime and civil aviation sectors, infrastructure for encouraging active modes, or for a complete decarbonization of the sector would lie outside the scope of these numbers.

BOX 21

Green bonds

Global climate funds, like the Green Climate Fund, the Clean Technology Fund, and the Global Environment Facility, play an important role in supporting climate action, including a switch to sustainable low/zero emissions transport.

Institutional investors are looking for more long-term sustainable investments, and green bonds offer an increasingly popular option. Transport investments are among the most common uses of such bonds. In 2019, global green bond issuance exceeded $200 billion, a new record. Almost a quarter of that amount went to transport sector investments (see Figure 15), after energy and buildings.

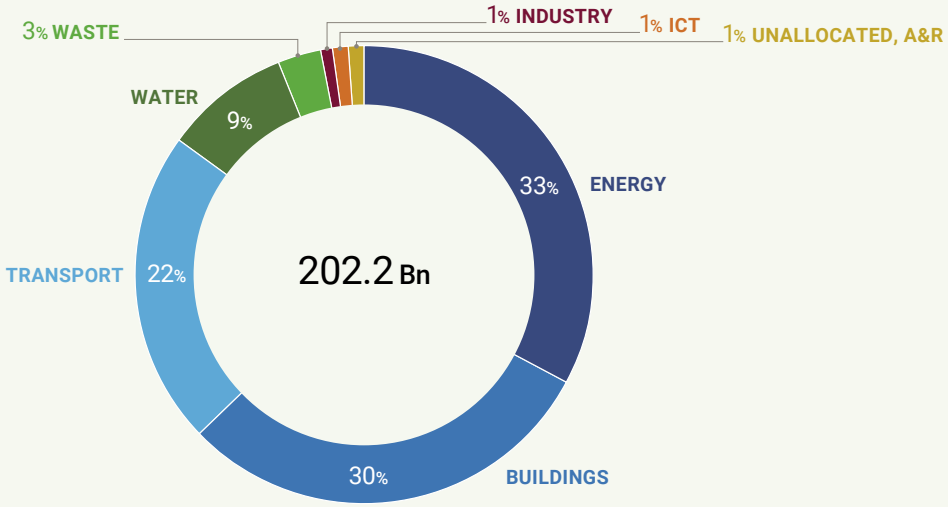
To date, very few developing countries—only two out of the top fifteen—have been among the largest green bond issuers.[354] While most of that debt was privately issued, nine countries issued sovereign green bonds in 2019 at $2 (approx. 13% of total issuance). Some countries[355] are now repeat sovereign issuers.

An example of transport-related green bond issuance is that of the Japanese shipping firm NYK Line, which issued a ¥10 billion green bond in May 2018. The funds are to be used to improve ship–port interfaces to help reduce CO_2 emissions, for example through the use of new technologies to reduce ship idle time.[356] In May 2020, IFC, in partnership with private institutional investors, raised $475 million for the Real Economic Green Investment Opportunity (REGIO) fund, a global green bond fund targeting emerging markets.[357]

In some markets bond interest rates are based on the issuer's environmental, social, and governance (ESG) scores. Governments may also provide tax exemption to encourage green bond issuance.

FIGURE 15

Allocation of proceeds from climate bonds (2019)



Climate Bonds Initiative[358]

According to the most recent (2017–2018) figures, transport is the largest recipient of public sector climate investment ($94 billion), with domestic, bilateral, and multilateral development finance institutions (DFIs) accounting for the biggest share. The overwhelming share of private finance flowed to renewable energy generation, with only 15% destined for low-carbon transport. As private motor vehicle manufacturers increasingly ramp up production of electric vehicles, that picture is also likely to change markedly.[359]

These flows do not include those related to climate change adaptation. For the most vulnerable developing countries, such flows are expected to dominate, and resilience-building costs are likely to contribute significantly in many cases to overall transport infrastructure project costs. For these costs, multilateral banks and funds, like the Green Climate Fund and the Adaptation Fund under the UNFCCC, can be important sources of support (see Box 21). The countries most in need of such support, however, report finding it administratively complicated and time-consuming to access the funds. These concerns will need to be addressed as a matter of priority.

Domestic public financing

Domestic public investment for transport is estimated to be 50 times larger than multilateral and bilateral ODA combined, with most of such spending still focusing on roads.[360] To ensure a shift towards (multimodal) sustainable transport, the inclusion of sustainable transport projects within relevant national development plans, and consequently national budgets, is crucial as an integral part of national efforts to implement the 2030 Agenda. Governments need to devise long-term sustainable transport plans, factoring in the long lives of much transport infrastructure, lock-in effects, and the need to transition towards more sustainable transport options in the medium term. Such plans could apply the avoid–shift–improve approach, as well as ensure that complementary levers such as policies and behavioural change are also in place to ensure efficient investment.[361] The planning of sustainable transport systems should include risk and impact assessments, including those on environmental, social, and health impacts. Box 22 gives an overview of public financing during the COVID-19 pandemic.

All *fiscal policies* related to sustainable transport, such as subsidies, taxation, pricing, and market-based charges, should be integrated within a coherent national fiscal framework, with the aim of steering supply and demand towards a sustainable transport system while ensuring equitable and affordable access by the public. Market-based instruments can provide economic incentives for preferred behavior and decreased usage of emission-generating transport options. These include: direct road use charges (e.g., road tolls; congestion charging); vehicle registration and ownership charges; parking regulations and fees; high occupancy tolling (HOT lanes) on high-traffic roads; land value capture[362,363] and other 'indirect beneficiary-pays' measures. Their impact is also dependent, however, on the availability of low-cost public transport options to encourage mode switching as often as possible.

Government spending on inefficient subsidies that cause market distortions, such as fossil fuel subsidies, should be reduced and phased out. The elimination of such subsidies should, however, take fully into account the specific need to minimize the negative impacts on the poor and other population groups.[364]

PUBLIC PROCUREMENT

Public procurement wields enormous power in directing production: it accounts for an average of 12% of GDP in OECD countries and up to 30% of GDP in many developing countries. Leveraging this purchasing power by promoting public procurement that prioritizes sustainability, in accordance with national policies and priorities, can play a key role in achieving the SDGs. Sustainability-based procurement will impact, and can drive, investments in public transport. Ultimately, sustainable procurement can improve product quality, lower prices, and stimulate further investment. Sustainability standards need to be instituted for public procurement related to transport projects.

BOX 22

Public financing during COVID-19 pandemic

COVID-19 relief efforts have taken many forms, including government recovery and stimulus packages, grant funding, and a variety of private sector solutions. The integration of sustainable transport and climate targets can create the necessary incentives to shift the status quo. Broader policies to incentivize shifts in the private sector and to remove the high upfront costs of some transport systems will further accelerate action. Ultimately, the private sector is essential to mobilizing the resources needed to fully transition to sustainable low-carbon transport.

Recovery packages and post-pandemic policies have the potential to transform the emissions trajectory. As of July 2021, total global stimulus amounted to approximately $17.2 trillion, of which $4.8 trillion was supporting sectors that are strongly associated with carbon emissions and nature, namely, agriculture, industry, waste, energy and transport, with about $1.8 trillion estimated as 'green' (IFC 2021).[365]

There were several examples of 'green stimulus' initiatives – including in transport-related areas by G20 countries.[366] Some notable country action includes China's plans to expand its electric vehicle charging network by 50 percent, India's initiative to transform the country's rail system to net-zero by 2030 and the United States' Climate Plan that promotes zero emission vehicles and increasing fuel economy standards.[367,368,369] At the same time, in many countries, resources that went towards providing immediate support to struggling transport sectors such as aviation (estimated as aggregating about $173 billion in 2020) reportedly did not include provisions for pollution reduction or climate targets.[370]

G20 Countries

Since the start of the pandemic, G20 countries have committed over $382 billion to the mobility industry. Analysts reported that almost half of this funding was committed to 'unconditional fossil fuels', including supporting existing fossil fuel–based sectors with no pollution reduction requirements or climate targets. However, the category also includes some socially beneficial outcomes such as road repairs, the purchase of ambulances, and various types of subsidies for households. While these help support the SDGs, attaching climate imperatives or conditions wherever possible could have further improved their impacts on sustainability.

The remaining investments ($216 billion) were allocated to mobility policies with varying levels of sustainability conditions. Most of this ($159 billion) supported 'conditional clean' energy policies, including electric vehicles and related infrastructure. Approximately 10% of funding commitments ($40 billion) supported 'conditional' fossil-fuel policies, for example, initiatives aimed at lowering the emissions of conventional aircrafts and cars. Other energy commitments accounted for $12 billion and included funding for hydrogen, biodiesel, and ethanol. Lastly, $4 billion was allocated unconditionally to support clean energy, including initiatives to expand bike lanes, improve sustainable city planning, make public transportation green, and build green ports.

PRIVATE SECTOR INVESTMENTS AND PPPS FOR SUSTAINABLE TRANSPORT

Globally, private sector investment accounts for 61% of the total investment in transport infrastructure in high income countries and 44% in low-middle income countries.[371] As a key stakeholder, the private sector can play a major role in achieving sustainable development far beyond just being a source of financing. Its role as a driver of sustainable economic growth not only brings the private sector opportunities for value creation, but important responsibilities as well. For example, the private sector plays a key role in the shipping sector, where the choice of the shipping routes is determined by the private carrier's port-calling strategy and feeder

network, based on the geopolitical location of the port, the capacity of the port, and its traffic volume. In this sense, the maritime networks are formed by services provided by private carriers, which are inevitably sensitive to cost and revenue. They are also the key decision-makers, when it comes to adopting more sustainable shipping practices to reduce the impacts of their operations on the marine ecosystem.[372]

With regard to road infrastructure, the public–private partnership (PPP) model has been more or less the exclusive vehicle for private investment. With regard to air transport infrastructure, governments have traditionally been the main provider, but airports are increasingly being transferred to the private sector. Regarding ports, private investments occur primarily in two ways: the concession for an existing terminal infrastructure is awarded to a PPP and the private party executes cargo handling operations; or a Build–Operate–Transfer (BOT) type project is commissioned. Regarding railway infrastructure, evidence of privatizations is very limited, as they are relatively infrequent.[373]

Private investment flows into transport systems in developing countries have increased significantly since 2000, often through PPPs. According to the World Bank's PPP database, private investment in transport PPPs in developing countries increased by 400% from 2000 to 2012.[374] The World Bank's most recent PPP report[375] shows that transport projects continue to outpace energy projects, and are the largest recipient of PPP project investment (at $25.8 billion in 78 projects).[376] The increasingly important role of private sector investments in sustainable transport infrastructure plays an important role in the current context of declining ODA, constrained government revenues, and the limited borrowing capacity of many developing countries.

While PPPs for public transport infrastructure can leverage and scale up finance, expertise, technology development, and innovation, many developing countries face a number of challenges in engaging the private sector. Common barriers include opaque legal frameworks in cases of dispute; laws that prohibit foreign involvement in, or private operation of, government-owned assets; inadequate PPP contracts and misaligned incentives and risks among public, private, and other entities; and a changeable policy environment.[377]

The 2019 Financing for Sustainable Development Report (FSDR)[378] lists some of the initiatives used by development partners to address the hurdles that prevent private investment in infrastructure through PPPs, including the Global Infrastructure Hub,[379] the PPP Knowledge Lab,[380] the Global Infrastructure Facility,[381] SOURCE, an online infrastructure project preparation and information tool;[382] the Global Infrastructure Forum; the Infrastructure Financing and PPP Network of Asia and the Pacific, convened by UNESCAP;[383] and the International PPP Centre of Excellence convened by UNECE.[384]

To create an enabling environment for PPPs on sustainable transport projects, national and sub-national governments should develop solid legal and regulatory frameworks; this means putting in place proper governance structures, promoting transparent fiscal accounting, and also advancing and promoting bankable projects. It is critical for governments and public authorities to set clear standards and parameters, as well as accountability measures, for the involvement of the private sector in transport service provision and the PPP process (e.g., appropriate certification of sustainability).

Experience suggests the important role of governments in preparing and expanding the pool of bankable projects that support sustainable transport (see also Box 23 on credit ratings of cities). This could be done by taking various measures, including: establishing project preparation facilities with streamlined procedures; providing targeted support for national PPP centres; utilizing new private investment facilities and entities, such as the Private Infrastructure Development Group co-owned by a number of bilateral and multilateral developing cooperation agencies and finance institutions,[385] and special purpose vehicles (SPVs) for dedicated sustainable transport interventions and projects (e.g., metro, bus rapid transit, bike-sharing, etc.).[386]

BOX 23

Credit ratings of cities

Although cities may be especially important when it comes to implementing sustainable transport initiatives at scale, they can also face special challenges in attracting investment. For example, only a small percentage of the 500 largest cities in developing countries have low credit ratings— about 4% in international financial markets and 20% in local markets.[387] Moreover, multilateral development banks and private lenders often cannot lend directly to sub-national governments.[388] Attracting private investment into municipal infrastructure requires robust institutional, fiscal, and regulatory systems that are often lacking in developing countries. Establishing such systems requires policy and institutional reforms that may lie beyond the competence and control of city governments.[389] Urgent support for technical and institutional capacity is therefore needed to enable sub-national governments to effectively plan, raise, and access capital, including to implement strategies for sustainable transport. National and sub-national governments in developing countries should closely collaborate with development finance institutions (DFIs) and development partners to improve the credit ratings of cities.

Governments should engage the private sector from the outset in co-designing PPP projects promoting sustainable transport, such as financing urban mass transit and overcoming the upfront incremental costs of zero electric emissions mobility, and also put in place proper incentives and accountability mechanisms for a balanced allocation of risks and returns between public and private sectors.[390] Some countries have adopted government default guarantees[391] to cover potential liabilities and improve the bankability of PPP projects.[392]

From the Smart Freight Procurement Framework and Guidelines[393] to the Poseidon Principles,[394] private-sector commitments and sector-led standard-setting are also playing an increasingly prominent role in guiding the sustainable transport sector transformation.

In general, countries need to establish solid, transparent, and predictable financial frameworks and to develop the capacity to formulate pipelines of bankable sustainable transport projects; doing so would open up access to a wide range of financing sources (with an appropriate mix of debt, grant and equity). At the same time, it would reduce risks, as appropriate guarantees or other risk mitigation instruments would be provided within these frameworks.[395] Banks and financial institutions need to have well defined criteria designed to steer financing towards sustainable transport and the infrastructure needed to support it. Where applicable, plans for dealing with 'stranded assets'—such as GHG-emitting vehicles whose value needs to be written off in the sustainability transition before their anticipated life is over—must also be implemented and incentives put in place for recycling them.

CORRUPTION RISKS OF TRANSPORT PROJECTS

The development of an integrated strategy to promote efforts against corruption and to further respect for human rights has been recommended, both in general and with respect to the SDGs.[396] This suggestion extends to the transport sector and related sustainable transport projects. Measures to combat corruption include improving the performance and integrity of the public sector, strengthening civil society participation, reducing corruption in the private sector, conducting anti-corruption audits, implementing Codes of Conduct and Integrity Pacts, making government information transparent, and protecting whistle blowers.[397]

OFFICIAL DEVELOPMENT ASSISTANCE (ODA)

International development finance accounts for only a small share of transport investment finance in developing countries. It must therefore be used strategically to leverage other sources of finance, including private finance, for sustainable transport. When official development assistance (ODA) is used to leverage private investments, developing country governments

should have a central role in decisions around the use of ODA for blending finance, aligned with sustainable transport priorities. Major efforts are needed to ensure the transparency and accountability of all stakeholders in PPPs. Bilateral and multilateral development finance institutions (DFIs) should be encouraged, if not required, to publish their relevant contracts and establish public complaint mechanisms.

ODA is critical to supporting investment needs and filling financing gaps, especially in countries in special situations. Yet, recent trends show a decrease in gross bilateral ODA disbursements from OECD DAC countries towards the transport sector in African countries, LDCs, LLDCs, and SIDS during 2010–2017. As most ODA in transport and other infrastructure sectors is in the form of loans—a reflection of the expected economic returns to investments—there can also be concerns about debt sustainability, particularly in countries that are already highly leveraged, such as a number of SIDS.[398]

Development partners should avoid siloed and short-term approaches by aligning their ODA to the national sustainable transport strategies of developing countries and consider supporting bundled, harmonized sustainable transport projects across jurisdictions and country borders. Evidence indicates the positive impacts of bundling sustainable transport projects into multi-jurisdictional investment programs in terms of attracting larger investment flows, an example being those supported in Latin America by the Clean Technology Fund, one of the World Bank's climate investment funds.[399]

MULTILATERAL DEVELOPMENT BANKS

Multilateral Development Banks (MDBs) can significantly complement domestic resource mobilization for sustainable transport, for example, through infrastructure investments to expand and upgrade rural access and also through the provision of attractive public transport options in rapidly growing cities. At the Rio+20 Conference in 2012, eight multilateral development banks (MDBs)[400] announced their commitment to provide more than US$175 billion of loans and grants to transport in developing countries over the coming decade, with an increasing focus on sustainable transport. They established a Working Group on Sustainable Transport and are reporting on their sustainable transport-related lending. The most recently published report, for 2016–2018,[401] finds that, collectively, the MDBs provided new funding of more than $20 billion in 2016, $22 billion in 2017, and nearly $19 billion in 2018 for more sustainable transport projects. Figure 16 suggests that these MDBs are on track to achieving their target.

AID FOR TRADE

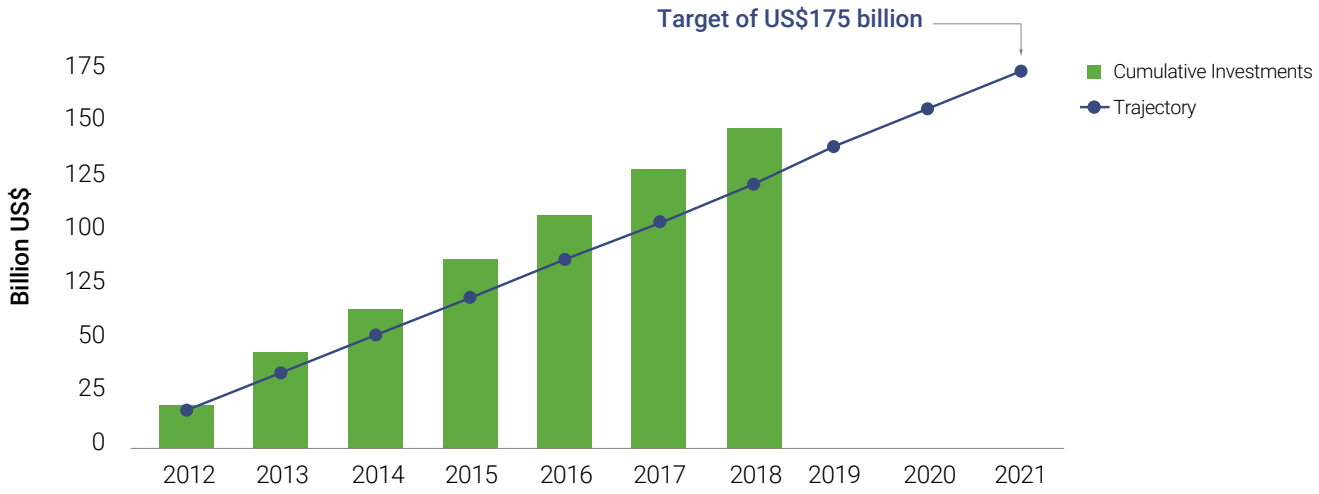
The World Trade Organization (WTO) –led Aid for Trade initiative seeks to mobilize resources to address the trade-related constraints identified by developing and least-developed countries. It is an increasingly popular form of ODA, rising from $23 billion in 2006, the launch year of the initiative, to $43 billion in 2017.[402,403] Over the 2006–2017 period, over $410 billion was disbursed in aid for trade support to over 146 developing countries.[404] As of 2015, 29% of such support was concentrated in the transport and storage sectors.[405] Aid for trade can not only support economic growth but also address emerging challenges affecting developing countries, such as strengthening the resilience of transport infrastructure and developing regional transport infrastructure and solutions.

UN ROAD SAFETY FUND

Established in April 2018, the United Nations Road Safety Fund (UNRSF) aims to help low- and middle-income countries establish effective national road safety systems to a) substantially curb the number of fatalities and injuries from road crashes, and b) reduce the economic losses resulting from them. The Fund currently finances 15 high impact projects, targeting key gaps in countries' national road safety systems.[406]

FIGURE 16

Overall loans and grants dispersed for transport by multilateral development banks (2012-2021)



Source: Asian Development Bank (2019)[407]

5. DIRECTING CAPACITY-BUILDING, TECHNOLOGY COOPERATION AND DATA

CAPACITY-BUILDING

In the area of sustainable transport, the limited availability of human resources or weak institutions pose capacity constraints in many countries. As outlined in previous chapters, transport is likely to change in the future, and education, professionalization, and skills in the labour market will need to keep pace. Developing countries often lack the highly specialized expertise needed to develop sustainable transport systems and implement them effectively. While priority is usually given to the acquisition of 'hard' engineering skills in developing countries, there are also critical shortages in many 'soft' skills in, for example, urban transport planning, holistic road design, public transport development, non-motorized transport opportunities, traffic engineering, and transport safety.[408] Demand for skills in the design and implementation of intelligent transport systems will also increase in the coming years. Investments in building the necessary skills will be crucial to a successful sustainable transport transition. In addition, different ministries involved in transport, as well as different transport stakeholders, often work in silos and lack overall coordination. Adequate capacity-building and training measures help to rectify this situation.

The Global Roadmap of Action toward sustainable mobility (GRA)[409] identifies several measures to alleviate capacity-building challenges, such as building local and national capacity across all levels of government, jurisdictions, organizations, and modes, through, for instance, provision of training and information resources. Capacity-building initiatives should be country-driven, address the specific needs and conditions of countries, and reflect national sustainable development strategies and priorities.[410] They should be based on inter-ministerial and multi-stakeholder consultations and coordination. They can be related to planning and implementation of transport projects as well as to the subsequent monitoring and maintenance of infrastructure. Capacity-building activities should also take into account gender aspects and promote women's empowerment. In the context of the 2030 Agenda, capacity-building efforts to enable and/or strengthen data collection, usage, and dissemination will be crucial.

Effective collection and management of large quantities of data collected in real time from multiple devices is, for example, crucial to the smooth and safe operation of intelligent transport systems.

TECHNOLOGY COOPERATION

Science, technology, and innovation (STI) are key to achieving sustainable transport. Innovative transport technology can, for example, alleviate some of the negative impacts of transport (e.g., by increasing transport safety or by decreasing GHG and other emissions). Developing countries, however, often face cost constraints (e.g., high upfront costs) as well as technical capacity challenges in introducing the latest technologies.[411] The 'digital divide', while narrowing, remains wide.

For developing countries to absorb, develop, and scale up key STIs related to sustainable transport, the international community should significantly enhance technological cooperation with low-income developing countries, notably with countries in special situations. Sustainable transport is considered to be one of most promising areas for successful technology cooperation using South-South and triangular channels.[412] Paragraph 70 of the 2030 Agenda for Sustainable Development announced the launch of a 'Technology Facilitation Mechanism' (TFM) to support the implementation of the SDGs. This would facilitate multi-stakeholder collaboration and partnerships through the sharing of information, experiences, best practices, and policy advice among different stakeholders, including in relation to sustainable transport.[413]

Coherent, enabling legal, policy, financial and institutional frameworks at the national, regional, and international levels should be established to facilitate technology transfer and diffusion. At the national level, STI policies and systems need to be integrated into national strategies and action plans for sustainable development. A strengthened science–policy–society interface can ensure that scientific research, technology development, and policy address the needs of society in a timely manner while simultaneously responding to current and future sustainability challenges.[414]

DATA

Gathering and analyzing sound and reliable data and statistics, and making these available for transport planning, risk assessments, and long-term monitoring, is very important. Real-time data can be very informative in terms of indicating mobility patterns and demand and also transport mode preferences. Such data can also be used to inform the viability of some technologies and to fine-tune planning. Data generation can be encouraged by establishing standardized data reporting requirements for all transport service providers, including transportation network companies (TNC), public transport operators, and bike- or car-share companies. In addition, centralized data repositories and data collection guidelines at the national and metropolitan levels can facilitate data access by different stakeholders and increase the use of data to support decision-making, including with regard to encouraging the use of more sustainable transport. These steps should be combined with personal data protection regulations, including processes that handle personal data with the appropriate safeguards and ensure that personal or other potentially sensitive data are not shared without explicit informed consent. Comprehensive monitoring and evaluation methodologies for sustainable transport should be established by national and local governments, linking tracking frameworks, targets, and indicators, where appropriate, to the SDGs. Regular stock of progress towards the transport-related SDG targets and other transport goals also needs to be taken and policies and practices adjusted accordingly. Support is needed for governments to build monitoring and evaluation capacities at all levels.

When navigating global crises, such as the COVID-19 pandemic, access to near real-time data becomes critical for making sound decisions. There is thus a growing reliance on alternative high-frequency data that can be used as proxies to estimate wide-ranging economic variables. Supported by technological advances, such as automatic identification system (AIS) data, and improved data collection techniques and reporting by industry, transport data are becoming an important source of high frequency statistics and market intelligence.[415,416,417]

6. CHANGING THROUGH INDIVIDUAL AND COLLECTIVE BEHAVIOUR

The ways in which transport systems and services are used and provided results from a combination of individual and collective choices. People's decisions and the preferences over the choices they have for transport, including frequency, what mode of transportation they use, and where they live, work, and go to school and participate in other activities, all shape transportation systems and sustainable transport options. In turn, the decisions individuals make and the choices available to them are influenced by social norms, legal frameworks, income, conditions of vulnerability, and access to services and information. Likewise, individual and collective action can change these conditions and shape them in ways that are more supportive of sustainable transport systems.

Even before the COVID-19 pandemic, various measures were being used to influence the behaviour of transport stakeholders. Government regulations and standards (e.g., for fuel efficiency of vehicles) and also government procurement practices changed consumer behaviours, induced technology development, and influenced the products offered by transport equipment companies at scale. These measures were highly effective at making markets and shaping consumer choices towards more sustainable ones. The development in many cities of dedicated infrastructure for non-motorized transport (e.g., bike lanes with bike-share systems) and increasing awareness of the health and environmental benefits of walking and biking also allowed more and more people to substitute them for motorized transport for relatively short trips. Bike sharing has grown rapidly and is today available in over 70 countries. In 2017, there were about 1,250 bike sharing systems with more than 10 million bicycles already in use around the globe; Asia was the largest market.[418] Choosing where to work also has important implications for transport. Telecommuting, for instance, if adopted at large enough scale, could have significant implications for emission reductions.

The COVID-19 pandemic has reinforced these trends and may be prompting longer-term changes in both demand and supply for transport services, with a higher emphasis on alternative modes of working and learning (e.g., telecommuting and e-learning), increased online shopping and services, increased use of active modes of transport, such as walking and bicycling, and increased safety and sanitary measures (e.g., increased cleaning of public transport vehicles and facilities). Planned reductions in passenger density to reduce the risks of community transmission of disease, for example, could significantly change how many travel services will be on offer.

As consumer preferences change, suppliers are altering their product and service offerings. For example, while in most places EVs remain an expensive niche market, that situation is changing with improvements in battery technology, lower battery cost, and the extension of the charging infrastructure. Further efforts are needed to change individual and collective behaviour towards sustainable transport.

CHAPTER IV

Way forward

Sustainable transport, with its objectives of universal access, enhanced safety, improved resilience, greater efficiency, and reduced environmental impact, is vital for achieving the 2030 Agenda for Sustainable Development and the Paris Climate Change Agreement. Even though the need for action is urgent, progress is insufficient. To accelerate the sustainability transformation for transport, stakeholder efforts would need to be marshalled in broader, cross-cutting areas in addition to those focused on specific sectors or outcomes.

Recovery from the pandemic will be a chance for all actors to rethink passenger and freight transport and for integrated solutions to be implemented to support the achievement of the 2030 Agenda and the Paris Agreement within the emerging context of continuing globalization, urbanization, digitalization, and demographic change. In the immediate term, ensuring the sustainable rebuilding and smooth flow of international supply chains and facilitating cross-border movement of people and goods, including medical supplies, should remain a priority for the benefit of global response to the COVID-19 pandemic and subsequent global economic recovery. Support for the transport sector is also needed to improve its epidemic prevention-and-response capabilities and to ensure the safety and health of transport workers, including seafarers. Recovery plans and stimulus packages should include criteria and targets for sustainable and resilient transport systems in the spirit of 'building back better'.

The access of remote rural communities needs to be urgently expanded through more investment and the development and implementation of sustainable transport systems and infrastructure. This will help these communities connect to basic services, jobs, and markets to achieve prosperity and sustainable development.

In urban areas, priority should be given to inclusive, reliable, safe, accessible, and affordable public transport, non-motorized transport (walking and cycling) and multimodal transport options as essential components of sustainable transport solutions. These solutions can become available through integrated, sustainable urban transport planning, policies, incentives, and investments and by offering adequate public space and infrastructure that also incorporate safe bike lanes and sidewalks.

In both rural and urban areas, road safety needs to be significantly increased, for example, through the use of the following: safety performance standards; mandatory protective gear for two-wheelers; improved enforcement; adoption of relevant technological innovations; safe infrastructure for non-motorized transport; the establishment and improvement of transport emergency-response systems; and awareness-raising through publicity and education campaigns.

The mobilization of the transport sector towards climate action needs to be accelerated. The following are needed: increased international cooperation, policies, regulations,

standards, and incentives; sustainable planning; increased commitments and efforts to decarbonize passenger and freight transport across all transport modes (road, rail, waterborne, and aviation); and special attention to the needs of countries in special situations, women and vulnerable groups. At the same time, there is an urgent need to strengthen the climate-resilience and adaptation of transport infrastructure and systems. This requires, among other things, evidence-based climate-risk assessments as well as the inclusion of climate change and extreme weather event considerations and projections in the operational planning, engineering, and design processes. This is especially the case in areas of high vulnerability.

New and emerging technologies, when appropriately applied, are key to solving many of the challenges to achieving sustainable transport. The deployment of existing solutions, such as low-/zero-carbon vehicles, automated safety, and intelligent transport systems, must be accelerated. These must be accompanied by the creation of new fuel, power, and digital infrastructures, including, for example, (high-speed) battery charging, while mitigating any harmful consequences. Governments and international bodies need to provide the regulations, policies, and incentives to accelerate the development and deployment of new transport technologies, including digital applications, while ensuring that no one is left behind. There is also a need for standards and targets, for example, for an accelerated phasing-in of low-emissions technology accompanied by a winding down and phasing-out of deployment of fossil fuel–powered options.

In parallel, research and development must be fast-tracked to improve existing solutions and identify new ones. This particularly applies to the decarbonization of transportation and the achievement of a circular economy, for example through alternative (low-carbon) fuels lowering consumer prices to facilitate adoption and improving end-of-life disposal. The private sector should be engaged to demonstrate the technical feasibility and economic viability of new transport technologies.

Measures to achieve sustainable transport must take into account its interlinkages with the goals and targets across the 2030 Agenda and the Paris Agreement, and help mitigate trade-offs while benefiting from synergies. This calls for the following: an improved understanding of interlinkages; an integrated, interdisciplinary, and cross-sectoral approach that is firmly grounded in science and evidence; and enhanced cooperation, coordination, and policy coherence at all levels, including among different ministries and levels of government as well as international organizations and institutions. Initiatives, tools, and instruments providing guidance and support for enhancing collaboration across sectors, stakeholders, and territorial levels or boundaries should be promoted.

Such integrated approaches must be based on risk-, health-, and environmental-impact assessments; they must take into account related sectors, such as IT and energy; and they must conduct a mapping of and involve all relevant stakeholders, including national and local authorities, local communities, indigenous peoples, women, vulnerable groups, academic and scientific communities, the private sector and civil society, in order to ensure social and political acceptability, ownership, and successful implementation.

There is a particular need to ensure that no one is left behind. The particular challenges and needs of the poor, women, children and youth, older persons, persons with disabilities, indigenous peoples, people living in informal settlements and other groups need to be taken into account.

The needs of countries in special situations will have to be urgently addressed by expanding sustainable transport systems and infrastructure and improving their resilience and their links with international markets, trade, and tourism, including by ensuring efficient movement of people and goods along transport and transit corridors.

Vulnerable groups and countries, including countries in special situations, should be supported when faced with challenges related to the sustainable transport transition, for instance, when confronted by increased transport and logistics costs or the loss of jobs and income.

Sustainable transport objectives should be integrated into national and local sustainable development plans,

COVID-19 stimulus and recovery packages, and Nationally Determined Contributions (NDCs), in a mutually supportive and synergistic manner

National actions must be supported by the international community through the necessary means of implementation, in line with the 2030 Agenda, the Addis Ababa Action Agenda, the UNFCCC mechanisms, and other relevant agreements, including the SIDS Accelerated Modalities of Action (SAMOA) Pathway and the Vienna Programme of Action (VPoA), to build the capacity of national and local authorities and institutions and enable them to develop and implement sustainable transport initiatives and policies. In particular, additional financing is required for, among other purposes, ensuring universal access and safety, as well as achieving sustainable, low-carbon, efficient, and climate-resilient transport systems and infrastructure.

Regional, inter-regional, and international cooperation, capacity-building, and knowledge exchange among countries should be encouraged in order to advance sustainable and resilient transport solutions together with related technology and innovation and learning from good practices. Regional cooperation and joint action can, for example, be strengthened with regard to 'hard' transport aspects, like regional and transborder infrastructure, and 'soft' transport elements, such as streamlined customs and border-crossing regulatory frameworks, including through the development of regional strategies and plans.

Multi-stakeholder partnerships and initiatives are essential to supporting the sustainable transport transformation, especially that of developing countries, including those in special situations; such partnerships and initiatives should be enhanced. Public-private partnerships can, for example, attract investments and technologies in under-served areas. Such multi-stakeholder partnerships and initiatives should reflect the cross-cutting role of transport and allow for flexibility and responsiveness in the face of change and uncertainty.

Businesses and industries of all sizes and sectors should contribute to the attainment of sustainable and resilient transport by applying the SDG framework, climate targets, and human rights principles to their entire value chain—their own internal practices included—and report on sustainable transport objectives in their corporate sustainability reports.

Motivating consumers towards adopting more sustainable mobility patterns and choices will be crucial going forward. This can be done by raising awareness of the benefits of sustainable transport and making sure it develops into being more accessible, affordable, convenient, and safe. Changing consumer preferences can also further incentivize private- and public-sector actions towards sustainable transport.

Coverage, timeliness, and quality of data should be increased, as well as a harmonized data collection, management and sharing system established related to sustainable transport to allow for better monitoring and reporting on transport-related goals.

Action is also needed to promote the implementation of international transport-related Conventions, regulations, and agreements.

Global awareness and action on sustainable and resilient transport need to be increased in support of the 2030 Agenda and the Paris Agreement, including by: fostering global knowledge sharing and development of practical tools; considering holding another Global Sustainable Transport Conference and using upcoming high-level events, such as the second Global Sustainable Transport Conference,[419] COP26, and the high-level meeting on road safety in 2022 to raise awareness and to share knowledge.

The UN system should improve its internal coordination as well as raise visibility and advocacy of sustainable transport, including by considering the establishment of an interagency mechanism on sustainable transport.

Global cooperation and commitments should be catalyzed to accelerate development and diffusion of sustainable transport solutions. In so doing, it must be ensured that all people, especially vulnerable groups, benefit fully from them. The commitments, made at this Conference or in other forums, should be captured as part of the continuous monitoring of global engagement.

Annexes

1. ANNEX 1: MULTI-STAKEHOLDER INITIATIVES AND OTHER SOURCES OF SUPPORT FOR ACHIEVING SUSTAINABLE TRANSPORT OBJECTIVES

Action towards Climate-friendly Transport (ACT)	Launched at the 2019 Climate Action Summit, ACT is the largest global coalition of over 100 organizations, aiming to catalyze transport as an enabler of sustainable development in line with the 2030 Agenda and the Paris Agreement. It has the following areas of focus: integrated long-term planning and policy-making; deployment of electric vehicles; zero-emission freight vehicles; and global dialogue arenas with the private sector.
BreatheLife	BreatheLife is a campaign launched by the World Health Organization, Climate and Clean Air Coalition, UN Environment Programme, and The World Bank which combines public health and climate change expertise with guidance on implementing solutions to air pollution in support of global development goals. It aims to provide a platform for cities, regions, and countries to share best practices and demonstrate progress in their commitment to meet WHO air quality guidelines. The campaign works with 75 member governments to expand monitoring efforts, keep citizens informed, and build demand for implementing solutions to air pollution including in the transport sector.
BSR Collaborations and Clean Cargo	BSR is a global nonprofit business network and consultancy dedicated to sustainability. BSR Collaborations bring together more than 400 companies, spanning multiple sectors and geographies, to strengthen company performance, improve markets and industries, and contribute to systemic change for a more just and sustainable world. Clean Cargo is a business-to-business leadership initiative that involves major brands, cargo carriers, and freight forwarders dedicated to reducing the environmental impacts of global goods transportation and promoting responsible shipping. Clean Cargo represents around 80% of global container cargo capacity and constitutes the leading buyer–supplier forum for sustainability in the cargo shipping industry.
C40 cities	C40 is a network of the world's megacities committed to addressing climate change. C40 supports cities' efforts to collaborate effectively, share knowledge, and drive meaningful, measurable, and sustainable action on climate change.

Child Health Initiative	The Child Health Initiative operates as a collaborative partnership with a focus on global and national advocacy, research, and programme implementation. Its objectives are: to provide a voice for the particular needs and rights of children within transportation and urban mobility policymaking; to highlight the serious and costly health impacts to young people of unsafe roads and air pollution; and to demonstrate, through applied research, programmatic support and technical assistance, the many effective solutions that are available. It is hosted at, and coordinated by, the FIA Foundation.
City Changer Cargo Bike (CCCB) project	City Changer Cargo Bike (CCCB) harnesses the limitless potential of cargo bikes by promoting their usage among public, private, and commercial users. Supported by the European Union Horizon2020 programme, CCCB brings together 20 partners, including cities, research institutions, NGOs, and industries from all over Europe in the quest for faster, more cost-effective, and larger-scale deployment of this sustainable mobility option. Assessing best practices across Europe, CCCB will raise awareness and support the uptake of cargo bikes and cargo bike initiatives. In so doing, the project will foster exciting developments that will offer more sustainable logistics operations, improve public spaces, engage citizens, and reduce traffic congestion.
CIVITAS	CIVITAS is a network of cities dedicated to making sustainable and smart mobility a reality for all in Europe and beyond. Since it was launched by the European Commission in 2002, the CIVITAS Initiative has tested and implemented over 800 measures and urban transport solutions as part of demonstration projects in more than 80 Living Lab cities Europe-wide.
Climate and Clean Air Coalition (CCAC)	The CCAC was established in 2012 as a voluntary partnership of governments, intergovernmental organizations, businesses, scientific institutions, and civil society organizations committed to improving air quality and protecting the climate through actions aiming to reduce short-lived climate pollutants. The Coalition has grown into a global network with over 130 partners and 320 actors carrying out activities around the world and across economic sectors.
Climate Pledge	Climate Pledge is an agreement between 114 major private sector companies that aim to be carbon-neutral by 2040. Signatories agree to measure and report GHG emissions on a regular basis, and to take steps to offset those emissions in a quantifiable, real, permanent, and socially beneficial way.
Getting to Zero Coalition	The Coalition is an alliance of 90 companies launched at the multi-stakeholder Global Maritime Forum. They aim to attain the IMO's target of reducing GHG emissions from shipping by at least 50% by 2050. As an interim goal, the Getting to Zero Coalition aspires to see commercially viable, zero-emissions deep sea vessels entering the global fleet as early as 2030.
Global Fuel Economy Initiative (GFEI)	Launched in 2009, the GFEI is a partnership of the IEA, ITF, UNEP, FIA Foundation, the ICCT, and the Institute of Transportation Studies at the University of California, Davis (UC Davis) established to improve global automotive fuel efficiency. GFEI provides several tools to help countries understand the importance of improved vehicle fuel economy, to support the assessment of newly registered vehicles, and to develop region specific policies, aiming at reaching the GFEI targets for LDVs, HDVs, transit buses, and 2- & 3-wheeler motorcycles. The GFEI has helped close to 70 developing and transitional countries analyze their vehicle fleet and develop fuel economy policies.
Global Maritime Forum	The Global Maritime Forum is an international not-for-profit organization committed to shaping the future of global seaborne trade in order to increase sustainable long-term economic development and human well-being.

IAPH World Sustainability Programme	On 12 May 2017, the International Association of Ports and Harbors set up a World Ports Sustainability Program. Guided by the 17 UN SDGs, the Programme aims to enhance and coordinate the future sustainability efforts of ports worldwide and foster international cooperation with partners in the supply chain. The World Ports Sustainability Programme builds on the World Ports Climate Initiative begun by IAPH in 2008 and extends to other areas of sustainable development. Strategic partners of the World Ports Sustainability Programme include: The American Association of Port Authorities (AAPA), the European Sea Ports Organization (ESPO), the International Association of Cities and Ports (AIVP), and the World Association for Waterborne Transport Infrastructure (PIANC).
International Coalition for Sustainable Aviation	The International Coalition for Sustainable Aviation (ICSA) was established in 1998 by a group of national and international environmental Non-Governmental Organizations (NGOs) as official observers at the ICAO. While many countries have introduced policies and regulations to address aircraft CO_2 emissions and noise, the overall environmental impact of aviation is significant, and its climate impact will continue to grow rapidly unless immediate action is taken. Some countries have led with measures such as taxation or market instruments. However, aviation is an international sector and benefits from a coordinated response that effectively tackles the sector's international emissions. ICSA works with ICAO to promote such a response. Since its inception, ICSA has contributed to ICAO's Committee on Aviation Environmental Protection (CAEP) work on technical means to reduce emissions and noise, market-based measures to reduce emissions, economic and environmental analysis of the sector, modelling and forecasting, and the development of ICAO's carbon calculator.
International Transport Workers' Federation	The Federation is a global nonprofit federation representing over 18 million transport workers from 147 countries in all transport subsectors: civil aviation, inland waterways, ports, railways, road transport, and shipping. One of its priorities is sustainable transport, as decarbonization of the whole economy must be based on industry and trade union cooperation, transport investment, and government leadership.
Movin'On Ecosystem	Michelin's commitment to sustainable development and mobility is embodied by Movin'On, an ecosystem that includes a laboratory and a global summit. The Movin'On Labs is a 'think and action tank', whose members form multiple communities that work closely on cutting-edge technological developments. The Movin'On Summit (previously the Michelin Challenge Bibendum) has become the world's leading sustainable mobility event that gathers policymakers, industry experts, researchers, startup founders, and politicians from around the world to share ideas, solutions, expertise, and experiences to improve sustainable mobility.
New Urban Mobility Alliance (NUMO)	Hosted by WRI Ross Center, the New Urban Mobility Alliance (NUMO) is an organization that include, but is not limited to, cities, NGOs, companies, mobility service operators, and community advocates from diverse sectors around the globe. It aims to create a shift in transportation by aligning shared priorities and turning the values of the Shared Mobility Principles for Livable Cities into deliberate, impactful action.
Partnership for Clean Fuels and Vehicles (PCFV)	The PCFV is the leading global public–private initiative supporting the reduction of vehicle emissions through the promotion of cleaner fuels and vehicles in developing and transitional countries. The PCFV's support of these countries is mainly coordinated by a Secretariat that is based at UNEP. It is a partnership of 73 diverse agencies from the governments of both developed and developing countries, non-governmental and international organizations, and the fuel and vehicle industries. The PCFV has been instrumental in the global phase-out of leaded gasoline, reduction of sulfur levels in fuel, and adoption of improved vehicle emission standards in Africa, Asia, and Latin America.

Partnership on Sustainable, Low Carbon Transport (SLoCaT)	Established in 2009 under the Bellagio Declaration on Sustainable, Low Carbon Transport, SLoCaT is a multi-stakeholder partnership of over 90 organizations, including UN organizations, multilateral and bilateral development organizations, NGOs and foundations, academia, and the private sector. SLoCaT's mission is to promote the integration of sustainable, low carbon transport into global policies on sustainable development and climate change. SLoCaT also leverages action to support of the implementation of these global policies. The Partnership's thematic scope is land transport in developing countries, including freight and passenger transport, both motorized and non-motorized. The Partnership's geographical scope is developing countries, with an initial focus on Asia, Latin America, and Africa.
Sustainable Mobility for All (SuM4All)	Established at the 2016 Climate Action Summit, SuM4All™ is a global multi-stakeholder partnership of 55 public and private sector organizations that speak with one voice and act collectively to help transform the transport sector across modes. Its ambition is to make mobility: (i) equitable—ensuring that everyone has access to jobs and markets through good quality transport regardless of their economic or social status; (ii) efficient—to allow people and goods to move from place to place quickly and seamlessly; (iii) safe—by halving the number of global deaths and injuries from road traffic accidents and other modes of transportation; and (iv) green—by lowering the environmental footprint of the sector to combat climate change and pollution.
The Transport Decarbonization Alliance (TDA)	Launched in 2018, the TDA was part of the 12 commitments made at the One Planet Summit hosted by President Emmanuel Macron in Paris, France, in December 2017. TDA brings together countries, cities/regions, and companies (3Cs) as the major drivers in sustainable, low carbon mobility. Its main objectives include committing to accelerating action to decarbonize transport to achieve a 'net-zero emissions' sector as soon as possible and providing up-to-date public information about relevant objectives, actions, progress, and experiences.
Transport Health and Environment Pan European Programme (THE PEP)	THE PEP is a unique intergovernmental, cross-sectoral, tripartite pan-European policy platform for policymakers and stakeholders of the countries of the pan-European region aiming to accelerate the transformation towards clean, safe, and healthy mobility, and net-zero emission transport. Established in 2002, it has been entirely driven on a voluntary basis by the political will of the Member States. THE PEP is jointly serviced by UNECE and the World Health Organization (WHO) Regional Office for Europe. By working together under THE PEP Framework, Member States have been advancing the implementation of the 2030 Agenda on several fronts and across numerous goals and targets, including those related to health, energy efficiency, the protection of climate and the environment, the quality of urban life, and equity.
Transformative Urban Mobility Initiative (TUMI)	Established in 2017, TUMI enables leaders in developing countries and emerging economies to create sustainable urban mobility. It offers technical and financial support for innovative ideas, focusing on capacity building, mobilization of investment, and supporting approaches on the ground. TUMI has brought together some of the world's leading institutions working on sustainable mobility with city networks and think tanks to implement projects on site where they are needed most. Partners include ADB, CAF, WRI, ITDP, UN-Habitat, SLoCaT, ITDP, ICLEI, GIZ, KfW, and C40.
Urban Electric Mobility Initiative (UEMI)	The UEMI is a joint initiative of the SOLUTIONS partners and UN-Habitat that builds on international activities in the areas of sustainable urban development, energy, and mobility. The UEMI aims to help phase out conventionally fueled vehicles and increase the share of electric vehicles (2-,3- and 4-wheelers) in the total volume of individual motorized transport in cities to at least 30% by 2030. The UEMI is an active partnership that will track international action in the area of electric mobility and aims to initiate local action. The UEMI delivers tools and guidelines, generates synergies between e-mobility programmes and supports local implementation action.

Urban Health Initiative	Led by the World Health Organization, the Urban Health Initiative aims at creating demand for action in key sectors, such as transport, by making the best use of local evidence, data, competencies, and communication strategies to drive the development of healthy sustainable transport systems and urban environments. The Urban Health Initiative model uses the health sector's influential position to: bring together all relevant sectors and stakeholders to promote strategies linking health, environment and sustainable development; provide tools and guidance for decision-makers to assess potential health benefits and risks of transport policies; and demonstrate to the public the full range of health, economic, and climate benefits that can be achieved from implementing transport and land-use policies, interventions, and strategies.
Walk21	Walk21 aims to promote walking worldwide. It offers an international platform for inclusive discussion, development of best practices, and delivery of new initiatives through the annual International Walking and Liveable Communities Conference Series, the International Charter for Walking, research projects, and consultancy service.
World Road Association (PIARC)	PIARC is an association that aims to foster and facilitate global discussion and collaboration on roads and road transport policy and practices within an integrated sustainable transport context.

2. ANNEX 2: OVERVIEW OF INTERNATIONAL TRANSPORT-RELATED CONVENTIONS, REGULATIONS AND AGREEMENTS

OUTCOME DOCUMENTS OF HIGH-LEVEL MEETINGS RELATED TO SUSTAINABLE TRANSPORT		
Vienna Declaration	2021	Fifth High-level Meeting on Transport, Health and Environment
Inland Transport Committee Ministerial Resolution enhancing resilient inland transport connectivity in emergency situations: an urgent call for concerted action (ECE/TRANS/2021/2, ECE/TRANS/304, Annex I)	2021	Eighty-third session of Inland Transport Committee
Stockholm Declaration	2020	Third Global Ministerial Conference on Road Safety
Inland Transport Committee Declaration on enhancing sustainable inland transport solutions to global climate and environment challenges — a united call to action (ECE/TRANS/2020/2)	2020	Eighty-second session of Inland Transport Committee
New Urban Agenda	2017	United Nations Conference on Housing and Sustainable Urban Development (Habitat III)
Ashgabat Statement on Commitments and Policy Recommendations (A/C.2/71/6)	2016	First Global Sustainable Transport Conference, 2016
Buckingham Palace Declaration	2016	The United for Wildlife (UfW) Transport Taskforce's Buckingham Palace Declaration is a landmark agreement committed to take tangible steps to shut down routes exploited by illegal wildlife traffickers.
Transforming our world: the 2030 Agenda for Sustainable Development (A/RES/70/1)	2015	United Nations summit for the adoption of the post-2015 development agenda
Addis Ababa Action Agenda (A/RES/69/313)	2015	Third International Conference on Financing for Development
Vienna Programme of Action for landlocked developing countries for the decade 2014-2024	2014	Ministerial Conference
Almaty Programme of Action: Addressing the Special Needs of Landlocked Developing Countries within a New Global Framework for Transit Transport Cooperation for Landlocked and Transit Developing Countries	2003	
Programme for the Further Implementation of Agenda 21 (A/RES/S-19/2)	1997	
Declaration on the Construction of Main International Traffic Arteries	1950	Economic Commission for Europe - Inland Transport Committee
GENERAL ASSEMBLY RESOLUTIONS		
A/RES/74/299	2020	Improving global road safety
A/RES/74/233	2019	Follow-up to the 2nd United Nations Conference on Landlocked Developing Countries
A/RES/74/15	2019	Political Declaration of the High-level Midterm Review on the Implementation of the Vienna Programme of Action for Landlocked Developing Countries for the Decade 2014-2024

A/RES/72/271	2018	Improving global road safety
A/RES/72/212	2017	Strengthening the links between all modes of transport to achieve the Sustainable Development Goals
A/RES/70/260	2016	Improving global road safety
A/RES/71/239	2016	Follow-up to the 2nd United Nations Conference on Landlocked Developing Countries
A/RES/70/197	2015	Towards comprehensive cooperation among all modes of transport for promoting sustainable multimodal transit corridors
A/RES/69/213	2014	Role of transport and transit corridors in ensuring international cooperation for sustainable development
A/RES/68/269	2014	Improving global road safety
A/RES/55/181	2001	Transit environment in the landlocked States in Central Asia and their transit developing neighbours
A/RES/58/9	2003	Global road safety crisis
CONVENTIONS, AGREEMENTS AND PROTOCOLS (LEGALLY BINDING)		
Convention on the facilitation of border crossing procedures for passengers, luggage and load-luggage carried in international traffic by rail	2019	Status and Contracting Parties
European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)	1957, 2019 files	Status and Contracting Parties
Convention on International Customs Transit Procedures for the Carriage of Goods by Rail under Cover of SMGS Consignment Notes	2006	Status and Contracting Parties
European Agreement supplementing the 1968 Convention on Road Traffic	1971, 2006 (consolidated version)	Status and Contracting Parties
Convention on Road Traffic	1968, amended 2006	Status and Contracting Parties
European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterway (ADN)	2000	Status and Contracting Parties
International Convention on Arrest of Ships	1999	Status and Contracting Parties
Agreement concerning the Establishing of Global Technical Regulations for Wheeled Vehicles, Equipment and Parts which can be fitted and / or be used on Wheeled Vehicle	1998	Status and Contracting Parties
Protocol on Combined Transport on Inland Waterways to the European Agreement on Important International Combined Transport Lines and Related Installations (AGTC)	1991, 1997	Status and Contracting Parties

Agreement concerning the Adoption of Uniform Conditions for Periodical Technical Inspections of Wheeled Vehicles and the Reciprocal Recognition of Such Inspections	1997	Status and Contracting Parties
European Agreement on Main Inland Waterways of International Importance (AGN)	1996	Status and Contracting Parties
Convention on Customs Treatment of Pool Containers Used in International Transport	1994	Status and Contracting Parties
International Convention on Maritime Liens and Mortgages	1993	Status and Contracting Parties
Protocol amending article 1 (a), article 14 (1) and article 14 (3) (b) of the European Agreement of 30 September 1957 concerning the International Carriage of Dangerous Goods by Road (ADR)	1993	Status and Contracting Parties
Convention on Road Signs and Signals	1968, amended 1993	Status and Contracting Parties
European Agreement on Important International Combined Transport Lines and Related Installations (AGTC)	1991	Status and Contracting Parties
Convention on Civil Liability for Damage caused during Carriage of Dangerous Goods by Road, Rail and Inland Navigation Vessels (CRTD)	1989	Status and Contracting Parties
United Nations Convention on Conditions for Registration of Ships	1986	Global road safety crisis
European Agreement on Main International Railway Lines (AGC)	1985	Status and Contracting Parties
International Convention on the Harmonization of Frontier Controls of Goods	1982	Status and Contracting Parties
United Nations Convention on International Multimodal Transport of Goods	1980	Status and Contracting Parties
United Nations Convention on the Carriage of Goods by Sea (Hamburg Rules)	1978	Status and Contracting Parties
Protocol to the Convention on the Contract for the International Carriage of Goods by Road (CMR)	1978	Status and Contracting Parties
Protocol to the Convention on the Contract for the International Carriage of Passengers and Luggage by Road (CVR)	1978	Status and Contracting Parties
Protocol to the Convention relating to the Limitation of the Liability of Owners of Inland Navigation Vessels (CLN)	1978	Status and Contracting
Protocol to the Convention on the Contract for the International Carriage of Passengers and Luggage by Inland Waterways (CVN)	1978	Status and Contracting

Convention on the Contract for the International Carriage of Passengers and Luggage by Inland Waterway (CVN)	1976	Status and Contracting Parties
Customs Convention on the International Transport of Goods under Cover of TIR Carnets (TIR Convention)	1975	Status and Contracting Parties
Agreement on Minimum Requirements for the Issue and Validity of Driving Permits (APC)	1975	Status and Contracting Parties
European Agreement on Main International Traffic Arteries (AGR)	1975	Status and Contracting
International Convention for the Safety of Life at Sea (SOLAS)	1974	Status and Contracting Parties
United Nations Convention on a Code of Conduct for Liner Conferences	1974	Status and Contracting Parties
International Convention for the Prevention of Pollution from Ships (MARPOL)	1973	Status and Contracting Parties
Convention on the Contract for the International Carriage of Passengers and Luggage by Road (CVR)	1973	Status and Contracting Parties
Convention relating to the Limitation of the Liability of Owners of Inland Navigation Vessels (CLN)	1973	Status and Contracting Parties
Protocol on Road Markings, Additional to the European Agreement supplementing the Convention on Road Signs and Signals	1973	Status and Contracting Parties
Convention on the International Regulations for Preventing Collisions at Sea (COLREG), 1972	1972	Status and Contracting Parties
Customs Convention on Containers	1972	Status and Contracting Parties
European Agreement concerning the Work of Crews of Vehicles engaged in International Road Transport (AETR)	1970 (consolidated text dated 2021)	Status and Contracting Parties
Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be Used for such Carriage (ATP)	1970	Status and Contracting Parties
Convention on Road Traffic	1968	Status and Contracting Parties
European Agreement supplementing the Convention on Road Signs and Signals	(1968, amended 2006)	Status and Contracting Parties
Convention on Road Signs and Signals	1968	Status and Contracting Parties
Convention on the Measurement of Inland Navigation Vessels	1966	Status and Contracting Parties
Convention on the Registration of Inland Navigation Vessels	1965	Status and Contracting Parties
Protocol on Road Signs and Signals	1949 (amended 1964)	Status and Contracting Parties

Convention relating to the Unification of Certain Rules concerning Collisions in Inland Navigation	1960	Status and Contracting Parties
European Convention on Customs Treatment of Pallets Used in International Transport	1960	Status and Contracting Parties
Customs Convention on the International Transport of Goods under Cover of TIR Carnets (TIR Convention)	1959	Status and Contracting Parties
Customs Convention concerning Spare Parts Used for Repairing Europ Wagons	1958	Status and Contracting Parties
Agreement concerning the Adoption of Harmonized Technical United Nations Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these United Nations Regulations	1958	Status and Contracting Parties
European Agreement on Road Markings	1957	Status and Contracting Parties
Convention on the Taxation of Road Vehicles for Private use in International Traffic	1956	Status and Contracting Parties
Convention on the Taxation of Road Vehicles engaged in International Passenger Transport	1956	Status and Contracting Parties
Convention on the Taxation of Road Vehicles engaged in International Goods Transport	1956	Status and Contracting Parties
Customs Convention on the Temporary Importation for Private Use of Aircraft and Pleasure Boats	1956	Status and Contracting Parties
Customs Convention on Containers	1956	Status and Contracting Parties
Convention on the Contract for the International Carriage of Goods by Road (CMR)	1956	Status and Contracting Parties
Customs Convention on the Temporary Importation of Commercial Road Vehicles	1956	Status and Contracting Parties
Convention concerning Customs Facilities for Touring	1954	Status and Contracting Parties
Customs Convention on the Temporary Importation of Private Road Vehicles	1954	Status and Contracting Parties
General Agreement on Economic Regulations for International Road Transport	1954	Status and Contracting Parties
Additional Protocol to the Convention concerning Customs Facilities for Touring, relating to the importation of tourist publicity documents and material	1954	Status and Contracting Parties

International Convention to Facilitate the Crossing of Frontiers for Passengers and Baggage carried by Rail	1952	Status and Contracting Parties
International Convention to Facilitate the Crossing of Frontiers for Goods Carried by Rail	1952	Status and Contracting Parties
European Agreement on the Application of Article 23 of the 1949 Convention on Road Traffic concerning the Dimensions and Weights of Vehicles Permitted to Travel on Certain Roads of the Contracting Parties	1950	
European Agreement on the Application of Article 23 of the 1949 Convention on Road Traffic concerning the Dimensions and Weights of Vehicles Permitted to Travel on Certain Roads of the Contracting Parties	1950	Status and Contracting Parties
Convention on Road Traffic	1949	Status and Contracting Parties
Protocol on Road Signs and Signals	1949	Status and Contracting Parties
STANDARDS, RULES AND GUIDELINES (NON-BINDING)		
UNCTAD/ICC Rules for Multimodal Transport Documents	1992	
UNCTAD Model Clauses on Maritime Hull and Cargo Insurance	1989	
UNCTAD Minimum Standards for Shipping Agents	1988	
Guidelines towards the application of the Convention on a Code of Conduct for Liner Conferences	1988	

3. ANNEX 3: OVERVIEW OF SELECTED TRANSPORT AND CLIMATE CHANGE-RELATED COMMITMENTS

ACTOR	TITLE	DESCRIPTION
SELECTED COUNTRY COMMITMENTS		
Argentina	Net zero-related pledge at Climate Ambition Summit 2020	Under its net-zero pledge, the government has encouraged transport by rail and waterways in place of roads, particularly for agricultural goods.
Australia	Stimulus package	The government issued stimulus packages to promote electric vehicles, including by building more charging stations, deploying smart charging infrastructure.
Canada	Stimulus package	The government issued stimulus packages to promote electric vehicles, including by building more charging stations, deploying smart charging infrastructure.
China	Pledge to Be Carbon Neutral by 2060	China has committed funding to national railway development and to incentivizing use of electric vehicles.[420]
Colombia	Bike lanes	Bogota has begun increasing bike lanes to offer a sustainable alternative to driving.
Fiji	Net zero-related pledge at Climate Ambition Summit 2020	Under its net-zero pledge, Fiji has made commitments to decarbonize the transport sector, including land, maritime, and aviation transport.[421]
Finland	Net zero-related pledge at Climate Ambition Summit 2020	Finland has put in place various policies to incentivize low-carbon modes of transport including biking, walking, and driving electric vehicles.[422]
France	Stimulus package	French government launched what it billed a 15-billion-euro ($17 billion) support plan for its aerospace industry in 2020, accelerating research on a green jetliner - target is to have a carbon-neutral airplane in 2035 instead of 2050.
Germany	Stimulus package	The German Government committed to several strong measures for stimulating a green recovery and fostering a low-carbon economy in Germany, including a boost for e-mobility and significant funding for realizing a more sustainable transport sector.
India	Green railways with net zero carbon emissions by 2030	For example, India has recently committed to transforming its railways to “green railways” with net zero carbon emissions by 2030. This includes plans to electrify rail transport by 2023 using solar and wind energy, as well as to retrofit trains with sustainable bio-toilets.[423]
Italy	Bike lanes	Milan has begun increasing bike lanes to offer a sustainable alternative to driving.
Japan	Net zero-related pledge at Climate Ambition Summit 2020	Japan has invested in subsidies for electric vehicles and development of EV infrastructure.
Peru	Bike lanes	Lima has begun increasing bike lanes to offer a sustainable alternative to driving.
Sweden	Net zero-related pledge at Climate Ambition Summit 2020	Sweden has committed to expanding bicycle infrastructure. The government has also issued funding to help support the public transport industry during lockdowns.

United Kingdom	Pledge at Climate Ambition Summit 2020	Pledge to cut GHG Emissions 68% by 2030. To achieve the goal, 43% of cars on United Kingdom roads should be electric.
United States	Biden Plan	The US President has instructed federal agencies to procure carbon pollution-free electricity and clean, zero-emission vehicles. This plan includes funding for transit and transport infrastructure.
SELECTED REGIONAL COMMITMENTS		
European Union	European Union CO_2 Standards for new Passenger Cars and Vans	The European Green Deal calls for net-zero economy-wide GHG emissions and a 90% reduction in GHG emissions from the transport sector by 2050, relative to 1990
SELECTED PRIVATE SECTOR COMMITMENTS		
American Airlines		Reach net-zero emissions by 2050
Daimler		CO_2 neutral by 2039
Delta		Improve fuel efficiency by 25%, committing $1billion to mitigate all emissions by 2030
DHL		Zero logistics-related emissions from its fleet of delivery vehicles to by 2050
Ford		Committed to become carbon neutral by 2050 and has incorporated circular economy principles into manufacturing
GM		Phasing out gas and diesel engines and transitioning to 100% electric by 2035
Honda		In North America, the Japanese automaker said it would aim for 40% of its sales to be zero-emissions vehicles by 2030 and plans to increase the proportion to 80% by 2035. The company also pledged to be carbon neutral in its own operations by 2050.
International Airlines Group (British Airways, Aer Lingus, Iberia)		Reach net-zero emissions by 2050
Maersk		Net-zero CO_2 emissions from operations by 2050
Qantas		Reach net-zero emissions by 2050
Tata Steel		Shift to electric vehicles for transporting steel
Tesla		Climate neutral throughout supply chain and manufacturing process in the future (no date specified)
United Airlines		Reach net-zero emissions by 2050 (including through carbon capture—not purchasing carbon offsets)
Volkswagen		Balance sheet CO_2-neutral by 2050
Volvo		Climate neutral by 2040

SELECTED MULTI-COMPANY PRIVATE SECTOR COMMITMENTS		
115 major private sector companies, including 21 transport companies (automotive, aviation, logistics and transport)	Climate Pledge	Signatories agree to reach net-zero carbon by 2040. They commit to regular reporting, carbon elimination through "efficiency improvements, renewable energy, materials reductions, and other carbon emission elimination strategies" and "credible offsets."
25 companies, four international organizations, annual summit	Movin'On Ecosystem	Michelin's commitment to sustainable development and mobility is embodied by Movin'On, an ecosystem that includes a laboratory and a global summit. The Movin'On Labs is a "think and action tank", where its members form multiple communities that work closely on cutting edge technological developments. The Movin'On Summit (previously the Michelin Challenge Bibendum) has become the leading sustainable mobility event gathering policymakers, industry experts, researchers, startup founders and politicians from around the world to share ideas, solutions, expertise and experiences to improve sustainable mobility.
We Mean Business Coalition	Coalition of 7 business-focused climate nonprofit organizations aiming to "accelerate the transition to a just and climate resilient net-zero economy"	Transport-related commitments relate, among others, to sustainable fuels and electric mobility.

4. ANNEX 4: ABBREVIATIONS AND ACRONYMS

ACE	Aviation Carbon Exchange
ACT	Action towards Climate-friendly Transport initiative
ADB	Asian Development Bank
AGC	European Agreement on Main International Railway Lines
AGN	European Agreement on Main Inland Waterways of International Importance
GTC	European Agreement on Important International Combined Transport Lines and Related Installations
AI	Artificial intelligence
AIS	Automatic identification system
ATO	Automatic train operations
BEV	Battery-operated electric vehicle
BMU	Federal Ministry of the Environment, Nature Conservation and Nuclear Safety (Germany)
BOT	Build-Opperate-Transfer (type project)
BRT	Bus Rapid Transit system
CBI	Climate Bonds Initiative
CFM	Cargo and fleet management
CHD	Information for waterway charges and harbour dues
CMT	Compliance monitoring and enforcement
CO_2	Carbon dioxide
COP22	22nd United Nations Climate Change Conference
COP25	25th United Nations Climate Change Conference
COP26	26th United Nations Climate Change Conference
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
COVID-19	Coronavirus disease
DFI	Development finance institution
DINA	Digital Inland Waterway Area
DTC	Delhi Transport Corporation
eCT	Regional Electronic Cargo Tracking System
ESG scores	Environmental, social, and governance scores
EST	Environmentally Sustainable Transport
EU	European Union
EV	Electric vehicle
FAO	Food and Agricultural Organization
FIS	Fairway information Services
FSDR	Financing for Sustainable Development Report
GDP	Gross Domestic Product
GHG	Greenhouse gas
GIS	Geographic Information System
GMC	General Motors Co.
GRA	Global Roadmap of Action Toward Sustainable Mobility
GSDR	Global Sustainable Development Report
HEAT	Health Economic Assessment Tool
HLAG-ST	High-Level Advisory Group on Sustainable Transport
HLPF	High-level Political Forum on Sustainable Development
HOT lanes	High occupancy tolling lanes
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICE	Internal combustion engine
ICS	International Chamber of Shipping
ICT	Information and communication technology
IEA	International Energy Agency
IEEE	Institute for Electrical and Electronics Engineers
IFC	International Finance Corporation
IFRC	International Federation of Red Cross and Red Crescent Societies
IKI	International Climate Initiative (Germany)
ILC	Information on Law Compliancy

ILO	International Labour Organization
IMO	International Maritime Organization
IPCC	Inter-Governmental Panel on Climate Change
IPCDMC	International PortCDM Council
IPoA	Istanbul Programme of Action
IPU	Inter-Parliamentary Union
ISO	International Organization for Standardization
ITF	International Transport Forum
ITF-OECD	International Transport Forum at the Organisation for Economic Co-operation and Development
ITL	Transport logistics Information
ITPCO	International Task Force on Port Call Optimization
ITS	intelligent transport systems
IUU	Illegal, unreported, and unregulated
JIT	just-in-time
JPoI	Johannesburg Plan of Implementation
km	killometer
LDC5	Fifth United Nations Conference on the Least Developed Countries
LDC	Least Developed Country
LDV	Light duty vehicle
LLDC	Land-locked Developing Country
LSCI	Liner Shipping Connectivity Index
MASS	Maritime Autonomous Surface Ships
MDB	Multilateral developmet bank
Mt	Megatonne
MTA	Metropolitan Transportation Authority
NCTTCA	Northern Corridor Transport and Transit Coordination Authority
NDC	Nationally Determined Contribution
NIHL	Noise induced hearing loss
NUA	New Urban Agenda
ODA	Official development assistance
OECD	Organization for Economic Cooperation and Development
PM2.5	Fine particulate matter 2.5
ppm	Parts per million
PPP	public-private partnership
PTM	Port and terminal management
R&D	Research and development
RAI	Rural Access Index
REGIO	Real Economic Green Investment Opportunity
Rio +20	2012 United Nations Conference on Sustainable Development
RIS	Related River Information Services
SAATM	Single African Air Transport Market
SAE International	Society of Automotive Engineers International
SAMOA Pathway	Small Island Developing States Accelerated Modalities of Action Patrhway
SDG	Sustainable Development Goals
SIDS	Small Island Developing States
SLOCAT	Partnership on Sustainable, Low Carbon Transport
SPV	Special purpose vehicle
ST	Statistics information
STI	Science, Technology, and Innovation
SuM4All	Sustainable Mobility for All Initiative
SUMP	Sustainable Urban Mobility Plan
TFM	Technology Facilitation Mechanism
THE PEP	Transport, Health and Environment Pan-European Programme
TI	Traffic information
TIR Convention	Customs Convention on the International Transport of Goods under Cover of TIR Carnets
TM	Traffic management information
TNC	Transportation network company

TOD	Transit Oriented Development
TPM	Transport management
UN	United Nations
UNCRD-DSDG	United Nations Centre for Regional Development – Division for Sustainable Development Goals
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNDRR	United Nations Office for Disaster Risk Reduction
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCWA	United Nations Economic and Social Commission for Western Asia
UNFCCC	United Nations Framework Convention on Climate Change
UN-Habitat	United Nations Human Settlements Programme
UN-OHRLLS	UN Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States
UNRSF	United Nations Road Safety Fund
UNWTO	United Nations World Tourism Organization
US$	United States Dollars
USA	United States of America
VNR	Voluntary National Review
VP	Voyage planning
VPoA	Vienne Programme of Action
WHO	World Health Organization
WP.29	World Forum for Harmonization of Vehicle Regulations
WTO	World Trade Organization

ENDNOTES

[1] Second Global Sustainable Transport Conference website: https://www.un.org/en/conferences/transport2021.

[2] United Nations Secretary-General High-level Advisory Group on Sustainable Transport. *Mobilizing Sustainable Transport for Development: Analysis and Policy Recommendations*. 2016. Available at: https://sustainabledevelopment.un.org/content/documents/2375Mobilizing%20Sustainable%20Transport.pdf.

[3] No longer active.

[4] Dercon, S. et al. *The Impact of Agricultural Extension and Roads on Poverty and Consumption Growth in Fifteen Ethiopian Villages.* 2009. Available at: https://academic.oup.com/ajae/article/91/4/1007/48507 https://www.jstor.org/stable/20616257

[5] Essakali, M. *Rural Access and Mobility in Pakistan: A Policy Note.* 2005. Transport Notes Series; No. TRN 28. World Bank, Washington, DC. Available at: https://ideas.repec.org/p/wbk/wboper/11781. https://openknowledge.worldbank.org/handle/10986/11781

[6] Khandker, S. et al. *The Poverty Impact of Rural Roads: Evidence from Bangladesh.* 2009. Available at: https://econpapers.repec.org/article/ucpecdecc/v_3a57_3ay_3a2009_3ai_3a4_3ap_3a685-722.htm

[7] Levy, H. *Rural roads and poverty alleviation in Morocco.* 2004. Available at: https://www.semanticscholar.org/paper/Rural-roads-and-poverty-alleviation-in-Morocco-Levy/1af9ef748bd4ec7d20e792463386afdabfc3ec69

[8] Mu, R. and van de Walle, D. *Rural Roads and Local Market Development in Vietnam.* 2011. Available at: https://www.researchgate.net/publication/227356319_Rural_Roads_and_Local_Market_Development_in_Vietnam.

[9] International Transport Workers' Federation. *People's public transport policy demands.* 2020. Available at: https://www.itfglobal.org/en/sector/urban-transport/people%E2%80%99s-public-transport-policy-

[10] SLoCaT. *Sustainable Transport: A Critical Driver to Achieve the Sustainable Development Goals.* An analysis of 2016 - 2019 Voluntary National Reviews. 2019. Available at: https://slocat.net/publications/vnr-sustainable-transport-sdgs/

[11] The Economic Times article. *Free bus ride scheme for women begins in Delhi.* 2019. Available at: https://economictimes.indiatimes.com/news/politics-and-nation/delhi-free-rides-for-women-in-dtc-cluster-buses-from-today/articleshow/71800064.cms?from=mdr

[12] SLoCaT. *Sustainable Transport: A Critical Driver to Achieve the Sustainable Development Goals. An analysis of 2016 - 2019 Voluntary National Reviews.* 2019. *Op.Cit*

[13] World Health Organization. *Burden of disease from environmental noise quantification of healthy life years lost in Europe.* 2011. Available at: https://www.euro.who.int/__data/assets/pdf_file/0008/136466/e94888.pdf

[14] World Health Organization. 2016, March 15. An estimated 12.6 million deaths each year are attributable to unhealthy environments. www.who.int https://www.who.int/news/item/15-03-2016-an-estimated-12-6-million-deaths-each-year-are-attributable-to-unhealthy-environments

[15] See also: United for Wildlife (UfW) Transport Taskforce. *Buckingham Palace Declaration.* 2016. Available at: https://unitedforwildlife.org/the-buckingham-palace-declaration/

[16] Natarajan, M. *Overview: Transnational crime* (M. Natarajan, Ed.). Cambridge University Press; Cambridge University Press. 2019. Available at: https://www.cambridge.org/core/books/international-and-transnational-crime-and-justice/overview-transnational-crime/CF05FFDBCEA2CA6DA53E1D92ECD3260D

[17] United Nations Secretary-General High-level Advisory Group on Sustainable Transport. *Mobilizing Sustainable Transport for Development: Analysis and Policy Recommendations.* 2016. Available at: https://sustainabledevelopment.un.org/content/documents/2375Mobilizing%20Sustainable%20Transport.pdf

[18] See for example: Vienna Declaration: THE PEP Fifth High Level Meeting: https://unece.org/media/press/356504

[19] HLPF website: https://sustainabledevelopment.un.org/hlpf

[20] First Global Sustainable Conference website: https://sustainabledevelopment.un.org/Global-Sustainable-Transport-Conference-2016

[21] Second Global Sustainable Transport Conference website: https://www.un.org/en/conferences/transport2021

[22] Climate Summit 2019 website: https://www.un.org/en/climatechange/un-climate-summit-2019.shtml

[23] Third Global High-Level Conference on Road Safety website: https://www.roadsafetysweden.com

[24] High Level Dialogue on Energy website: https://www.un.org/en/conferences/energy2021

[25] Independent Group of Scientists appointed by the Secretary-General. *Global Sustainable Development Report 2019: The Future is Now – Science for Achieving Sustainable Development.* 2019. Available at: https://sustainabledevelopment.un.org/gsdr2019

[26] UNOPS. *Infrastructure Underpinning Sustainable Development.* 2018. Available at: https://content.unops.org/publications/Infrastructure_underpining_sustainable_development_EN.pdf?mtime=20181220182223

[27] SLOCAT. *Transport action and voluntary national reviews: Action for achieving the Sustainable Development Goals.* 2021. [Preliminary analysis] Available at: https://slocat.net/vnr/. [Note: Full report available September 2021]

[28] See for example: Mantlana. K. and Maoela, M. *Mapping the interlinkages between sustainable development goal 9 and other sustainable development goals: A preliminary exploration.* 2019. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1002/bsd2.100

[29] *Ibid.*

[30] Bolivia. *Economic and Social Development Plan 2016-2020 within the framework of integrated development for living well.* 2016. Available at: http://www.planificacion.gob.bo/uploads/PDES_INGLES.pdf

[31] NDC Partnership. Transport and Climate Change: How nationally determined contributions can accelerate transport decarbonization. Available at: https://ndcpartnership.org/transport-and-climate-change-how-nationally-determined-contributions-can-accelerate-transport

[32] Intergovernmental Panel on Climate Change (IPCC). *Summary for Policymakers. Climate Change 2021: The Physical Science Basis.* Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. 2021. Available at: https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf

[33] IEA. Data and statistics. Available at: https://www.iea.org/data-and-statistics?country=WORLD&fuel=CO2%20emissions&indicator=CO2%20emissions%20by%20sector

[34] IEA. *Data and statistics.* Available at: https://www.iea.org/data-and-statistics/charts/transport-sector-co2-emissions-by-mode-in-the-sustainable-development-scenario-2000-2030

[35] IEA website: *Transport- improving the sustainability of passenger and freight transport.* 2020. Available at: https://www.iea.org/topics/transport

[36] IEA. Global Energy Review 2020. *The impacts of COVID-19 on global energy demand and CO_2 emissions.* 2020. Available at: https://www.iea.org/reports/global-energy-review-2020/oil#abstract

[37] IEA. *Rail.* 2020. Available at: https://www.iea.org/reports/rail

[38] IEA. *Tracking Transport 2020.* Available at: https://www.iea.org/reports/tracking-transport-2020

[39] IMO. *Fourth Greenhouse Gas Study 2020*. Available at: https://www.imo.org/en/OurWork/Environment/Pages/Fourth-IMO-Greenhouse-Gas-Study-2020.aspx

[40] IEA. *Tracking Transport 2020.* Available at: https://www.iea.org/reports/tracking-transport-2020

[41] SLOCaT. *Transport and Climate Change Global Status Report- 2nd edition*. 2021. Available at: http://slocat.net/tcc-gsr

[42] See for example: OECD/ITF. *International Transport Forum Transport Outlook report 2021.* Available at: https://www.itf-oecd.org/itf-transport-outlook-2021

[43] See for example: Sustainable Mobility for All. *Global Mobility Report 2017.* Available at: http://sum4all.org/publications/global-mobility-report-2017

[44] SLOCaT. *Transport and Climate Change Global Status Report- 2nd editio*n. 2021. Op Cit.

[45] Poaponsakorn, N. and Meethom, P. *Impact of the 2011 Floods, and Flood Management in Thailand*. 2013. ERIA Discussion Paper Series. Available at: https://www.eria.org/ERIA-DP-2013-34.pdf

[46] World Bank. *Thai Flood 2011: Rapid Assessment for Resilient Recovery and Reconstruction Planning*. 2012. Available at: https://openknowledge.worldbank.org/handle/10986/26862

[47] See: Polycarpou, L. (Columbia Climate School). Floods, Companies and Supply Chain Risk. 2014. Available at: https://blogs.ei.columbia.edu/2014/11/17/floods-companies-and-supply-chain-risk/; Haraguchi, M. and Lall, U. *Flood risks and impacts: A case study of Thailand's floods in 2011 and research questions for supply chain decision making*. 2014. Available at: http://water.columbia.edu/files/2014/10/supply_chain_Thailand.pdf

[48] International Association of Ports and Harbors. *World Ports Sustainability Report 2020*. Available at: https://sustainableworldports.org/wp-content/uploads/WORLD-PORTS-SUSTAINABILITY-REPORT-2020-FIN.pdf

[49] UNCTAD. *Review of Maritime Transport 2020.* Available at: https://unctad.org/webflyer/review-maritime-transport-2020

[50] Koks, E. et al. *A global multi-hazard risk analysis of road and railway infrastructure assets.* 2019. Available at: https://www.nature.com/articles/s41467-019-10442-3.

[51] Kirezci, E. et al. *Projections of global-scale extreme sea levels and resulting episodic coastal flooding over the 21st Century.* 2020. Available at: https://doi.org/10.1038/s41598-020-67736-6

[52] SLOCaT. *Sustainable Transport: A Critical Driver to Achieve the Sustainable Development Goals.* 2019. Op Cit.

[53] UNDESA. *Compendium of National Institutional Arrangements for implementing the 2030 Agenda for Sustainable Development.* 2019. Available at: https://sustainabledevelopment.un.org/content/documents/22008UNPAN99132.pdf

[54] See for more information: https://www.imo.org/en/MediaCentre/HotTopics/Pages/Fishing.aspx

[55] Website: https://sum4all.org

[56] SuM4All. *Global Roadmap of Action Toward Sustainable Mobility*. 2019. Available at: https://sum4all.org/global-roadmap-action

[57] SuM4All. *GRA in Action Series.* 2021. Available at: https://www.sum4all.org/publications/gra-action-series

[58] Climate Action Pathways website: https://unfccc.int/climate-action/marrakech-partnership/reporting-and-tracking/climate_action_pathways. Relevant milestones have also been integrated into the cross-sectoral Resilience and Adaptation Pathway Action table

[59] Website: https://thepep.org

[60] Website: https://slocat.net

[61] Website: https://www.transformative-mobility.org/news/do-you-act-iact

[62] Involving ICAO, UNDESA, UN-OHRLLS, the World Bank Group, and the Air Transport Action Group (ATAG).

[63] World Summit on Sustainable Mobility website: https://summit.movinonconnect.com/en/#/

[64] SDG summit 2019 website: https://sustainabledevelopment.un.org/sdgsummit

[65] Climate Action Summit 2019 website: https://www.un.org/en/climatechange/2019-climate-action-summit

[66] See for example: Global Sustainable Development Report. 2019. Op Cit.; Sustainable Development Goals Progress Chart 2021, available at: https://unstats.un.org/sdgs/report/2021/progress-chart-2021.pdf; UN Secretary-General report. *Progress towards the Sustainable Development Goals. Advance unedited version.* 2021. Available at: https://sustainabledevelopment.un.org/content/documents/27610SG_SDG_Progress_report_2021.pdf

[67] UN Secretary-General report. *Progress towards the Sustainable Development Goals. Advance unedited version.* 2021. Available at: https://sustainabledevelopment.un.org/content/documents/27610SG_SDG_Progress_report_2021.pdf

[68] See also World Bank event: COVID-19: *Vaccines for developing countries.* 2021. Available at: https://live.worldbank.org/covid-19-vaccines-developing-countries?intcid=WBW_XPL_LangSched_EN_EXT_sm2021#speakers

[69] UN News. *Without access to vaccines, COVID will continue widening inequality everywhere.* 2021. Available at: https://news.un.org/en/story/2021/04/1089462

[70] Tier Classification Criteria/Definitions: Tier 1: Indicator is conceptually clear, has an internationally established methodology and standards are available, and data are regularly produced by countries for at least 50% of countries and of the population in every region where the indicator is relevant. Tier 2: Indicator is conceptually clear, has an internationally established methodology and standards are available, but data are not regularly produced by countries.

[71] See United Nations Statistical Commission website: https://unstats.un.org/sdgs/iaeg-sdgs/tier-classification

[72] UN Secretary-General report. *Progress towards the Sustainable Development Goals. Advance unedited version.* 2021. Available at: https://sustainabledevelopment.un.org/content/documents/27610SG_SDG_Progress_report_2021.pdf.

[73] See: WHO website: https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries

[74] UN Secretary-General report. *Progress towards the Sustainable Development Goals. Advance unedited version.* 2021. Available at: https://sustainabledevelopment.un.org/content/documents/27610SG_SDG_Progress_report_2021.pdf

[75] WHO, *Global Status Report on Road Safety.* 2018. Available at: https://www.who.int/publications-detail-redirect/9789241565684.

[76] Note: The distribution of deaths among road user categories is based on data reported by countries. In some countries, this data is not available or is incomplete, which contributes to the large percentage of those identified as "others" or "unspecified".

[77] WHO. *Global Status Report on Road Safety* 2018. *Op. Cit.*

[78] WHO. *Estimated number of road traffic deaths*. Available on the Global Health Observatory website: https://www.who.int/data/gho/data/indicators/indicator-details/GHO/estimated-number-of-road-traffic-deaths

[79] Stockholm Declaration. Available at: https://www.roadsafetysweden.com/about-the-conference/stockholm-declaration

[80] General Assembly resolution A/RES/74/299. Available at: https://undocs.org/en/A/RES/74/299

[81] General Assembly resolution A/75/L.109 on the "Scope, modalities, format and organization of the high-level meeting on improving global road safety"

[82] See also: UNOPS. *Infrastructure: Underpinning Sustainable Development.* 2018. Available at: https://content.unops.org/publications/Infrastructure_underpining_sustainable_development_EN.pdf?mtime=20181220182223;UNCTAD, SDG Pulse 2021: Sustainable and resilient transport amidst rising uncertainty, disruptions and climate risks, Available at: https://sdgpulse.unctad.org/sustainable-transport

[83] World Bank website. Transport. Available at: https://www.worldbank.org/en/topic/transport/overview

[84] UNCTAD. Review of Maritime Transport 2019. Available at: https://unctad.org/en/PublicationsLibrary/rmt2019_en.pdf

[85] UNCTAD. Review of Maritime Transport 2019. *Op. Cit.*

[86] See for example: UNECE, ITF, and Eurostat. *Common Questionnaire for Inland Transport Statistics*. Available at: https://ec.europa.eu/eurostat/cache/metadata/en/rail_if_esms.htm

[87] HLPF policy brief. *Accelerating SDG 11 achievement.* 2018. Available at: https://sustainabledevelopment.un.org/content/documents/194452018_HLPF_Thematic_Review_of_SDG_11_UNHabitat_12_June_2018_original.pdf

[88] *UN-Habitat SDG 11.2 Data Set:* https://data.unhabitat.org/datasets/11-2-1-percentage-access-to-public-transport/explore

[89] See for example: UN-Habitat. *Informal transport in a developing world. 2000*. Available at: https://unhabitat.org/sites/default/files/download-manager-files/Informal%20Transport%20in%20the%20Developing%20World.pdf

[90] United Nations. *Report of the Secretary-General on SDG Progress* 2019 Special Edition, *Op. Cit.*

[91] UN-Habitat Urban Indicator Database: https://urban-data-guo-un-habitat.hub.arcgis.com/datasets/11-2-1-percentage-access-to-public-transport/explore

[92] *The Paris Agreement.* Available at: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

[93] World Metereological Organisation. *The State of the Global Climate 2020.* Available at: https://public.wmo.int/en/our-mandate/climate/wmo-statement-state-of-global-climate

[94] Intergovernmental Panel on Climate Change (IPCC). *Summary for Policymakers. Climate Change 2021: The Physical Science Basis. Op.Cit*.

[95] United Nations Environmental Programme. *Emissions Gap Report 2020*. Available at: https://www.unep.org/emissions-gap-report-2020

[96] United Nations Environmental Programme. *Emissions Gap Report 2020. Op.Cit.*

[97] SLOCAT. *Transport in Nationally Determined Contributions.* Available at: https://slocat.net/ndcs

[98] United Nations Framework Convention on Climate Change. *Nationally determined contributions under the Paris agreement: synthesis report, addendum 2*. FCCC/PA/CMA/2021/2/Add.2/ Available at: https://unfccc.int/sites/default/files/resource/cma2021_02a02.pdf

[99] IEA website: T*ransport- improving the sustainability of passenger and freight transport. Op. Cit.*

[100] International Air Transport Association (ATAG). 2020 *Worst Year in History for Air Travel Demand.* Article. 2021. Available at: https://www.iata.org/en/pressroom/pr/2021-02-03-02

[101] World Trade Organization. *World trade primed for strong but uneven recovery after COVID-19 pandemic shock. Press release.* 2021. Available at: https://www.wto.org/english/news_e/pres21_e/pr876_e.htm

[102] McKinsey. *Global Freight Flows after COVID-19: What to expect.* 2020. Available at: https://www.mckinsey.com/industries/travel-logistics-and-transport-infrastructure/our-insights/global-freight-flows-after-covid-19-whats-next#

[103] Bradsher, K. and Niraj Chokshi, N. (The New York Times). *Virus Disrupts China's Shipping, and World Ports Feel the Impact.* 2020. Available at: https://www.nytimes.com/2020/02/27/business/economy/china-coronavirus-shipping-ports.html

[104] USA Facts. *Monthly public transit ridership is 65% lower than before the pandemic.* 2020. Available at: https://usafacts.org/articles/covid-public-transit-decline

[105] Jenelius, E. and Cebecauer, M. *Impacts of COVID-19 on public transport ridership in Sweden: Analysis of ticket validations, sales, and passenger counts.* 2020. Available at: https://www.sciencedirect.com/science/article/pii/S2590198220301536

[106] OECD. *OECD Policy Responses to Coronavirus (COVID-19): Cities policy responses.* 2020. Available at: http://www.oecd.org/coronavirus/policy-responses/cities-policy-responses-fd1053ff/#endnotea0z35; UNECE. *Recommendations for Green and Healthy Sustainable Transport – Building Forward Better.* 2021. Available at: https://unece.org/sites/default/files/2021-05/2101940_E_PDF_WEB.pdf

[107] Founder Shield. *Micromobility Trends.* 2020. Available at: https://foundershield.com/blog/micromobility-trends-2020/

[108] UNCTAD. *Covid-19 and tourism update: Assessing economic consequences.* 2021. Available at: https://unctad.org/system/files/official-document/ditcinf2021d3_en_0.pdf

[109] United Nations Environmental Programme. *Emissions Gap Report 2020*. Available at: https://www.unep.org/emissions-gap-report-2020

[110] International Energy Agency. *Global Energy Review 2020: The Impacts of the Covid-19 crisis on global demand and CO_2 emissions.* Available at: https://www.iea.org/reports/global-energy-review-2020

[111] OECD. *OECD Policy Responses to Coronavirus (COVID-19): Cities policy responses.* Available at: http://www.oecd.org/coronavirus/policy-responses/cities-policy-responses-fd1053ff/#endnotea0z35

[112] European Transport Safety Council. *The Impact of Covid-19 Lockdowns on Road Deaths in April 2020.* Available at: https://etsc.eu/pin-briefing-the-impact-of-covid-19-lockdowns-on-road-deaths-in-april-2020

[113] United Nations Environmental Programme. *Emissions Gap Report 2020*. Available at: https://www.unep.org/emissions-gap-report-2020

[114] See for example: Ministerial resolution on "Enhancing resilient inland transport connectivity in emergency situations: an urgent call for concerted action", endorsed by the Inland Transport Committee of UNECE at its 83rd session (ECE/TRANS/304, Annex I).

[115] See for example: "Observatory on border crossings status due to COVID-19" website: https://wiki.unece.org/display/CTRBSBC/Observatory+on+Border+Crossings+Status+due+to+COVID-19+Home

[116] See for example: UNCTAD. *COVID-19 and Maritime Transport Impact and Responses.* 2021. Available at: https://unctad.org/system/files/official-document/dtltlb2021d1_en.pdf

[117] See for example: UNDESA Webinar on Sustainable Transport and COVID-19: Response and Recovery: https://sustainabledevelopment.un.org/index.php?page=view&type=13&nr=3297&menu=1634; UNCTAD Webinar on COVID-19 and maritime transport: Disruption and resilience in Asia: https://unctad.org/meeting/webinar-covid-19-and-maritime-transport-disruption-and-resilience-asia

[118] World Trade Organization. *World trade primed for strong but uneven recovery after COVID-19 pandemic shock.* Press release. 2021. Available at: https://www.wto.org/english/res_e/statis_e/wts2021_e/wts2021chapter02_e.pdf

[119] UNCTAD. *Shipping during COVID-19: Why container freight rates have surged.* 2021. Available at: https://unctad.org/news/shipping-during-covid-19-why-container-freight-rates-have-surged

[120] UNCTAD examines the complex factors behind the unprecedented shortage of containers hampering trade's recovery, and how to avoid a similar situation in the future

[121] IATA. *June Air Travel Recovery Continues to Disappoint.* Article. 2021. Available at: https://www.iata.org/en/pressroom/pr/2021-07-28-02/

[122] Nature Research Journal. *COVID curbed carbon in emissions by 2020 – but not by much.* 2021. Available at: https://www.nature.com/articles/d41586-021-00090-3

[123] UN. The Sustainable Development Goals Progress Report 2021. https://unstats.un.org/sdgs/report/2021/The-Sustainable-Development-Goals-Report-2021.pdf

[124] United Nations Environmental Programme. *Emissions Gap Report 2020*. Available at: https://www.unep.org/emissions-gap-report-2020

[125] IEA. *Global Electric Vehicle Outlook 2021.* Available at: https://www.iea.org/reports/global-ev-outlook-2021

[126] McKinsey & Company.*The future of micromobility: ridership and revenue after the crisis.* 2020. Available at: https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/the-future-of-micromobility-ridership-and-revenue-after-a-crisis

[127] See for example: Joshi-Ghani, A. (World Economic Forum). *How COVID-19 will impact our cities in the long term. 2020.* Article. Available at: https://www.weforum.org/agenda/2020/11/what-will-our-cities-look-like-after-covid-19/

[128] See for example: UNECE. *Recommendations for Green and Healthy Transport – "Building Forward Better".* 2021. Available at: https://unece.org/transport/publications/recommendations-green-and-healthy-sustainable-transport-building-forward

[129] UNDESA. *2019 Revision of World Population Prospects*. Available at: https://population.un.org/wpp/

[130] Ibid.

[131] SuM4All. *Global Mobility Report 2017. Op. Cit.*

[132] WHO. *Global Status Report on Road Safety 2018. Op. Cit.*

[133] Global Sustainable Development Report 2019. *Op. Cit.*

[134] See also for data: Urban Air Action Platform website: https://www.unep.org/explore-topics/air/what-we-do/monitoring-air-quality/urban-air-action-platform?_ga=2.197664108.2114450800.1627576035-1056747533.1622815450

[135] Anenberg, S. et al. (International Council on Clean Transportation). *A global snapshot of the air pollution-related health impacts of transportation sector emissions in 2010 and 2015. 2019*. Available at: https://theicct.org/sites/default/files/publications/Global_health_impacts_transport_emissions_2010-2015_20190226.pdf

[136] See for example: https://www.cell.com/one-earth/pdf/S2590-3322(20)30665-5.pdf; https://unhabitat.org/sites/default/files/2020/10/wcr_2020_report.pdf

[137] National Geographic website. *Noise Pollution*. Available at: https://www.nationalgeographic.org/encyclopedia/noise-pollution

[138] United Nations Statistics Division. Human Settlement Statistics. 2018. Available at: https://unstats.un.org/unsd/environment/FDES/MS%205.1%20Human%20settlements.pdf.

[139] Asian Development Bank website. Urban transport. Available at: https://www.adb.org/sectors/transport/key-priorities/urban-transport.

[140] WTO. World Trade Statistical Review, 2019. Available at: https://www.wto.org/english/res_e/statis_e/wts2019_e/wts19_toc_e.htm.

[141] UN-WTO, International Tourism Highlights, 2019. Available at: https://www.e-unwto.org/doi/pdf/10.18111/9789284421152.

[142] SuM4All. *Global Mobility Report 2017. Op. Cit.*

[143] See: UNWTO. *Tourist arrivals down 87% in January 2021 as UNWTO calls for stronger coordination to restart tourism.* 2021. Available at: https://www.unwto.org/news/tourist-arrivals-down-87-in-january-2021-as-unwto-calls-for-stronger-coordination-to-restart-tourism

[144] UNCTAD. *Covid-19 and tourism update: Assessing economic consequences.* 2021. Available at: https://unctad.org/system/files/official-document/ditcinf2021d3_en_0.pdf

[145] UNDESA. *E-Government survey.* 2020. Available at: https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2020-Survey/2020%20UN%20E-Government%20Survey%20(Full%20Report).pdf

[146] See for example: UNECE. *Climate Change Impacts and Adaptation for Transport Networks and Nodes.* 2021. Available at: https://unece.org/sites/default/files/2021-01/ECE-TRANS-283e_web.pdf

[147] World Economic Forum. *The Global Risks Report 2021*. Available at: https://www.weforum.org/reports/the-global-risks-report-2021

[148] World Meteorological Organization. *The State of the Global Climate 2020.* Available at: https://public.wmo.int/en/our-mandate/climate/wmo-statement-state-of-global-climate

[149] See for example: WHO website. *Climate change and human health.* Available at: https://www.who.int/globalchange/climate/summary/en/index4.html; UNECE. *Climate Change Impacts and Adaptation for International Transport Networks.* 2020. Available at: https://unece.org/info/Transport/pub/2634

[150] 2015 Sendai Framework for Disaster Risk Reduction 2015-2030. Available at: https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030

[151] See for example: Outcome document. High Level Panel discussion on "Climate resilient transport infrastructure for sustainable trade, tourism and development in SIDS". COP25. 2019. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/32155/COP25_HLO.pdf?sequence=1&isAllowed=y

[152] See for example: UNCTAD. *Climate Change Impacts and Adaptation for Coastal Transport Infrastructure: A Compilation of Policies and Practices.* 2019. Available at: https://unctad.org/system/files/official-document/dtltlb2019d1_en.pdf

[153] UNCTAD. *Port industry survey on climate change impacts and adaptation.* 2017. Available at: https://unctad.org/system/files/official-document/ser-rp-2017d18_en.pdf.

[154] See for example: UNCTAD. *Report of the Multi-year Expert Meeting on Transport, Trade Logistics and Trade Facilitation on its eighth session.* 2020. Available at: https://unctad.org/system/files/official-document/cimem7d24_en.pdf

[155] UNCTAD. *Climate Change Impacts and Adaptation for Coastal Transport Infrastructure: A Compilation of Policies and Practices.* 2019. Available at: https://unctad.org/system/files/official-document/dtltlb2019d1_en.pdf; Report of the UNCTAD Multiyear Expert Meeting on Climate Change Adaptation for Seaports in Support of the 2030 Agenda for Sustainable Development. Available at: https://unctad.org/meeting/multi-year-expert-meeting-transport-trade-logistics-and-trade-facilitation-eighth-session

[156] See e.g., PIANC [World Association for Waterborne Transport Infrastructure]. *Climate change adaptation planning for ports and inland waterways.* 2020. Available at: https://www.pianc.org/publications/envicom/wg178

[157] See e.g., https://sidsport-climateadapt.unctad.org/

[158] McCarron, B. et al. *Climate Costs for Asia-Pacific Ports.* 2018. Available at: https://static1.squarespace.com/static/5991a3f3d2b8570b1d58cc7e/t/5ab289c588251b-d42703af29/1521675706594/APAC+ports+climate+costs.pdf

[159] Hallegatte, S. et al. Lifelines: The Resilient Infrastructure Opportunity. 2019. Available at: https://openknowledge.worldbank.org/handle/10986/31805

[160] International Federation of Red Cross and Red Crescent Societies. *The cost of doing nothing- The humanitarian price of climate change and how it can be avoided.* 2019. Available at: https://media.ifrc.org/ifrc/wp-content/uploads/sites/5/2019/09/2019-IFRC-CODN-EN.pdf

[161] IEA. *Global EV Outlook 2020. Entering the decade of electric drive?* 2020.

[162] See also: https://www.automotiveworld.com/news-releases/growing-momentum-global-overview-of-government-targets-for-phasing-out-sales-of-new-internal-combustion-engine-vehicles/

[163] E.g. carbon dioxide (CO_2); Nitrogen oxides (NOx); Hydrocarbons (HC); Sulfur dioxide (SO_2); Particulate matter (PM10); Ozone (O3)

[164] Report of the Secretary-General: Review of progress achieved in implementation of Agenda 21 and the Johannesburg Plan of Implementation: transport (E/CN.17/2010/4).

[165] https://www.weforum.org/agenda/2016/10/how-car-manufacturers-can-reduce-waste/
UNEP, 2020, Resource Efficiency and climate change – material efficiency strategies for a low-carbon future. Available at:
https://wedocs.unep.org/bitstream/handle/20.500.11822/34351/RECCR.pdf?sequence=1&isAllowed=y; see also Positive assessment of vehicle lifetime extension schemes in Japan:
https://www.tandfonline.com/doi/full/10.1080/09535310801890615

[166] UNEP, 2020, Used Vehicles and the environment report: A global overview of used light duty vehicles: flow, scale and regulation. Available at: https://wedocs.unep.org/handle/20.500.11822/34175.

[167] The energy embodied in a typical passenger car is about as large as the energy content of the fuel used by it over a three-year period. For example, exporting it used after three years to a developing country and using its there for at least another 3 years reduces the overall energy footprint after the total 6 years by 40 percent.

[168] https://www.caranddriver.com/news/a33457915/average-age-vehicles-on-road-12-years

[169] Deloitte. *Deloitte Africa Automotive Insights Navigating the African Automotive Sector: Ethiopia, Kenya and Nigeria.* 2018. Available at: https://www2.deloitte.com/content/dam/Deloitte/za/Documents/manufacturing/za_Africa-Auto-2016-Report-28-May-2018.pdf.

[170] UNEP, 2020, Used Vehicles and the environment report: A global overview of used light duty vehicles: flow, scale and regulation. Available at: https://wedocs.unep.org/handle/20.500.11822/34175.

[171] UNEP, 2020, Used Vehicles and the environment report: A global overview of used light duty vehicles: flow, scale and regulation. Available at: https://wedocs.unep.org/handle/20.500.11822/34175.

[172] UNECE Website: https://unece.org/transport/vehicle-regulations

[173] Report of the Secretary-General: Review of progress achieved in implementation of Agenda 21 and the Johannesburg Plan of Implementation: transport (E/CN.17/2010/4).

[174] UNEP, 2020, Resource Efficiency and climate change – material efficiency strategies for a low-carbon future. Available at:
https://wedocs.unep.org/bitstream/handle/20.500.11822/34351/RECCR.pdf?sequence=1&isAllowed=y.

[175] Rabbi,H. and Rahman, *A. Ship Breaking and Recycling Industry of Bangladesh; Issues and Challenges.* 2017. Available at: https://www.sciencedirect.com/science/article/pii/S1877705817332939#:~:text=Over%20two%20decades%20ship%2Drecycling,end%2Dof%2Dlife%20ships.

[176] See: https://nextcity.org/daily/entry/best-bike-lanes-bike-infrastructure,

[177] See: https://gothamist.com/arts-entertainment/behold-nycs-old-subway-cars-at-the-bottom-of-the-ocean

[178] OECD/ITF. *International Transport Forum Transport Outlook report 2021*. Available at:
https://www.itf-oecd.org/itf-transport-outlook-2021.

[179] Of the 16 African LLDCs, for instance, 13 are also LDCs, while 4 of the 10 Asian LLDCs are also LDCs, and 9 of the 38 SIDS are LDCs.

[180] See for example: UNCTAD. *Technical Assistance Toolbox on Sustainable and Resilient Transport: Supporting Developing Countries, including landlocked developing countries and small island developing states, in promoting and implementing sustainable freight transport system.* 2015. Available at:
https://unctad.org/system/files/official-document/tc2015d1rev1_S02_P06.pdf

[181] Estimated from Figure 1, UNCTAD report on Maritime Trade (2017).

[182] Ashgabat Statement. 2015. *Op. Cit*.

[183] UNCTAD. *Least Developed Countries Report.* 2018. Available at:
https://unctad.org/en/PublicationChapters/ldcr2018_ch1_en.pdf

[184] Istanbul Declaration and Programme of Action. 2011. Available at:
http://unohrlls.org/about-ldcs/istanbul-programme-of-action/

[185] IATA. *The Single African Air Transport Market (SAATM).* Available at: https://www.iata.org/en/policy/business-freedom/saatm/

[186] Benin, Botswana, Burkina Faso, Cabo Verde, Cameroon, Central African Republic, Congo Brazzaville, Cote d'Ivoire, Egypt, Ethiopia, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea (Bissau), Guinée, Kenya, Lesotho, Liberia, Mali, Morocco, Mozambique, Namibia, Niger, Nigeria, Democratic Republic of Congo, Rwanda, Sénégal, Sierra Leone, South Africa, Swaziland, Tchad, Togo, Zimbabwe.

[187] Fifth United Nations Conference on the Least Developed Countries (LDC5) website: https://www.un.org/ldc5/

[188] UN-OHRLLS, LDC country profiles. Available at: http://unohrlls.org/about-lldcs/country-profiles/.

[189] UNCTAD. *Review of Maritime Transport 2019.* Available at: https://unctad.org/system/files/official-document/rmt2019_en.pdf.

[190] UN-OHRLLS. *Factsheet Landlocked Developing Countries (LLDCs)*. Available at: http://unohrlls.org/custom-content/uploads/2017/03/LLDCs-Fact-Sheet_2017_REVISEDS.pdf.

[191] UN Secretary-General report. *Implementation of the Vienna Programme of Action for Landlocked Developing Countries for the Decade 2014–2024.* 2018. Available at: https://undocs.org/pdf?symbol=en/A/73/297; OHRLLS. Global Report on Improving Transport Connectivity for LLDCs and Building of Resilient Transport Infrastructure to Support Accelerated Progress Towards the SDGs (Draft). 2021. Available at: https://www.un.org/ohrlls/sites/www.un.org.ohrlls/files/draft_global_report_ohrlls_1_april_2021.pdf

[192] IATA. *Air Connectivity: Measuring the connections that drive economic growth.* Available at: https://www.iata.org/en/iata-repository/publications/economic-reports/air-connectivity-measuring-the-connections-that-drive-economic-growth/

[193] Vienna Programme of Action. Available at: http://unohrlls.org/about-lldcs/programme-of-action/

[194] See for example: Roadmap for Implementation of VPoA for LLDCs. Available at: https://www.un.org/ohrlls/content/roadmap-implementation-vpoa-lldcs

[195] See also: General Assembly resolution. *The role of transport and transit corridors in ensuring international cooperation for sustainable development* (A/RES/69/213). 2015. Available at: https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/69/213&Lang=E.; General Assembly resolution. Towards comprehensive cooperation among all modes of transport for promoting sustainable multimodal transit corridors. 2016. Available at: https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/197%20&Lang=E

[196] eTIR website: https://etir.org/

[197] See for example UNCTAD's Sustainable Freight Transport and Finance technical assistance package: https://unctad.org/topic/transport-and-trade-logistics/infrastructure-and-services.

[198] Supported by UNCTAD's capacity building and technical assistance under its Sustainable Freight Transport Framework.

[199] Northern Corridor Transit and Transport Coordination Authority website: http://www.ttcanc.org/page.php?id=21

[200] See also: http://unohrlls.org/about-sids

[201] See for example: UNCTAD. *SIDS Development and Globalization: Facts and Figures 2021.* Available at: https://dgff2021.unctad.org/sids-challenges/environmental-concerns/environment-climatecrisis

[202] Grenada, the Maldives, Nevis, Seychelles, and St. Kitts.

[203] UNTCAD. *Impact of COVID-19 on tourism in small island developing States. 2020.* Article. Available at: https://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=2341

[204] UNWTO. *International tourism arrivals reach 1.4 billion two years ahead of forecasts.* Article. 2019. Available at: https://www.unwto.org/global/press-release/2019-01-21/international-tourist-arrivals-reach-14-billion-two-years-ahead-forecasts

[205] See also: UNCTAD. *Closing the Distance: Partnerships for sustainable and resilient transport systems in SIDS.*2014. Available at: https://unctad.org/system/files/official-document/dtltlb2014d2_en.pdf

[206] UNCTAD. *Review of Maritime Transport. Chapter 6: Maritime transport in small island developing States.* 2014. Available at: https://unctad.org/system/files/official-document/rmt2014ch6_en.pdf

[207] UNCTAD. *Review of Maritime Transport 2019.* Available at: http://unctad.org/rmt

[208] UNCTAD Liner shipping connectivity index website. Available at: https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=92

[209] World Bank. *Climate and Disaster Resilient Transport in Small Island Developing States: A Call for Action.* 2017. Available at: https://reliefweb.int/sites/reliefweb.int/files/resources/120998.pdf

[210] E.g., Bangladesh and Nepal: 12%of GDP, Kenya: 15%of GDP, Mozambique: 34%of GDP.

[211] See also: SIDSport-Climate Adapt website: https://SIDSport-ClimateAdapt.unctad.org

[212] IPCC report 2014, *Op. Cit.*; IPCC report 2018, *Op. Cit.*; IPCC report 2019 Op. Cit.

[213] Monioudi, *et al. Climate change impacts on critical international transportation assets of Caribbean Small Island Developing States (SIDS): the case of Jamaica and Saint Lucia. Reg Environ Change 18,* 2211–2225 (2018). https://doi.org/10.1007/s10113-018-1360-4; IPCC Special Report on Impacts of 1.5 ºC global warming (Ch. 3); IPCC 2019 Special Report on Ocean and Cryosphere (Ch. 4 and 5).

[214] SIDS Accelerated modalities of action (S.A.M.O.A.) pathway. 2014. Available at: https://sustainabledevelopment.un.org/sids2014/samoapathway; See also: UN General Assembly Resolution A/RES/69/15. Available at: https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/69/15&Lang=E.

[215] World Bank. *Climate and Disaster Resilient Transport in Small Island Developing States: A Call for Action.* 2017. *Op.Cit.*

[216] World Bank. *Supporting Road Network Vulnerability Assessments in Pacific Island Countries.* 2018. Available at: https://www.gfdrr.org/sites/default/files/publication/ACP-EU%20NDRR%20-%20transport%20knowledge%20note%20-%20supporting%20road%20network%20vulnerability%20assessments%20in%20PICspdf.pdf

[217] Hallegatte *et al. Unbreakable: Building the Resilience of the Poor in the Face of Natural Disasters.* 2017. Available at: https://openknowledge.worldbank.org/handle/10986/25335

[218] See for example: Pardo, M. (UNDESA). *Disasters after disasters- short recovery intervals and large financial gaps in small island developing States.* 2021. Available at: https://sdgs.un.org/news/disasters-after-disasters-short-recovery-intervals-and-large-financial-gaps-small-islands

[219] Committee on Development Policy. *Comprehensive Study on the Impact of COVID-19 on the Least Developed Country Category.* 2021. Available at: https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/CDP_Comprehensive_Study_2021.pdf.

[220] Committee on Development Policy. Comprehensive Study on the Impact of COVID-19 on the Least Developed Country Category. 2021. Op. Cit.

[221] *Ibid.*

[222] Bousquet, F. and Fernandez-Tranco, O. *COVID-19 in Fragile Settings: Ensuring a Conflict-Sensitive Response.* 2020. Available at: https://www.un.org/en/un-coronavirus-communications-team/covid-19-fragile-settings-ensuring-conflict-sensitive-response

[223] UNESCAP. E/ESCAP/MCT(3)/7 – Rural connectivity to wider networks. 2016. Available at: https://www.unescap.org/sites/default/files/pre-ods/MCT3_7E_13%20Oct%2016.pdf

[224] Sustainable Mobility for All. *Global Mobility Report 2017.* 2017. Available at: http://sum4all.org/publications/global-mobility-report-2017

[225] Starkey, P. and Hines, J. *Poverty and sustainable transport: How transport affects poor people with policy implications for poverty reduction. A literature review. 2014.* Available at: https://sustainabledevelopment.un.org/content/documents/1767Poverty%20and%20sustainable%20transport.pdf

[226] UNCTAD. *Review of Maritime Transport 2019.* Available at: https://unctad.org/system/files/official-document/rmt2019_en.pdf

[227] UN-Habitat. Gender Sensitive Mini-Bus Services & Transport Infrastructure for African Cities: A Practical Toolkit. 2019. Available at: https://unhabitat.org/gender-sensitive-mini-bus-services-and-transport-infrastructure-for-african-cities

[228] IMO SDGs Strategy (C 122/3 (a)/1). Available at: https://sustainabledevelopment.un.org/content/unsurvey/organization.html?org=IMO

[229] SDG 5, SDG 9, SDG 13 and SDG 14.

[230] International Transport Forum. *Transport Connectivity: A Gender Perspective.* 2019. Available at: https://www.itf-oecd.org/transport-connectivity-gender-perspective

[231] UN-Habitat. *Gender Sensitive Mini-Bus Services & Transport Infrastructure for African Cities: A Practical Toolkit.* 2019. *Op.Cit.*

[232] Sustainable Mobility for All. *Global Mobility Report 2017.* Available at: http://sum4all.org/publications/global-mobility-report-2017

[233] World Bank. Why does she move? A study of women's mobility in Latin American cities. 2020. Available at: https://documents1.worldbank.org/curated/en/276931583534671806/pdf/Why-Does-She-Move-A-Study-of-Womens-Mobility-in-Latin-American-Cities.pdf

[234] UN-Habitat. *Gender-disaggregated mobility data for Cairo.* 2020.

[235] UN Women. *COVID-19 and ensuring safe transport with and for women and girls.* Policy brief. 2020. Available at: https://www.unwomen.org/-/media/headquarters/attachments/sections/library/publications/2020/brief-covid-19-and-ensuring-safe-transport-with-and-for-women-and-girls-en.pdf?la=en&vs=2419

[236] UNDESA. *World Public Sector Report 2019.* Available at: https://publicadministration.un.org/Portals/1/Images/WorldPublicSector/World%20Public%20Sector%20Report%202019.pdf; See also: SaftiPin website: https://safetipin.com

[237] See: UN-Habitat. *Improving public transport services for women: A story from Cairo.* 2018. Available at: https://unhabitat.org/improving-public-transport-services-for-women-a-story-from-cairo.

[238] UNICEF, FIA Foundation. Safe to learn – Safe journeys to school are a child's right. 2015. Available at: https://www.fiafoundation.org/connect/publications/safe-to-learn.

[239] WHO. Global Status Report on Road Safety 2018. *Op. Cit.*

[240] SG Policy Brief. *A Disability-Inclusive Response to COVID-19.* 2020. Available at: https://www.un.org/development/desa/disabilities/wp-content/uploads/sites/15/2020/05/sg_policy_brief_on_persons_with_disabilities_final.pdf.

[241] UNDESA. *Disability and Development Report: Realizing the Sustainable Development Goals by, for and with persons with disabilities.* 2018. Available at: https://www.un.org/development/desa/disabilities/publication-disability-sdgs.html

[242] UNDESA. 2019 *Revision of World Population Prospects.* Available at: https://population.un.org/wpp/

[243] ºSee for example: Balliester, T. and Elsheikhi, A. *The future of work: A literature review.* 2018. Available at: https://www.semanticscholar.org/paper/The-future-of-work-a-literature-review-Balliester-Elsheikhi/4278bc0d10d35b01697968a0893d1c9933fd7a35?p2df;
IRU article. *IRU and ETF urge EU to address unprecedented driver shortage in road transport industry.* 2020. Available at: https://www.iru.org/resources/newsroom/iru-and-etf-urge-eu-address-unprecedented-driver-shortage-road-transport-industry;

International Chamber of Shipping. *Global Supply and Demand for Seafarers.* 2020. Available at: http://www.ics-shipping.org/shipping-facts/shipping-and-world-trade/global-supply-and-demand-for-seafarers; ICAO website. *ICAO Addresses Shortage of Skilled Aviation Professionals.* Available at: https://www.icao.int/Newsroom/Pages/ICAO-Addresses-Shortage-of-Skilled-Aviation-Professionals.aspx; Newsroom. *Revolving door of drivers amid bus industry crisis. 2019.* Available at: https://www.newsroom.co.nz/2019/06/07/623812/workers-describe-revolving-door-of-drivers-amid-bus-industry-crisis; ILO. Labour Markets, *Institutions and Inequality: Building just societies in the 21st century*. 2015. Available at: https://www.ilo.org/global/publications/books/WCMS_314464/lang--en/index.htm; Johnston, H. *Workplace gains beyond the Wagner Act: The New York Taxi Workers Alliance and participation in administrative rulemaking.* 2017. Available at: https://journals.sagepub.com/doi/10.1177/0160449X17747397

[244] COVID-19 crew change crisis still a challenge - IMO Secretary-General. 19 March 2021. Available at: https://www.imo.org/en/MediaCentre/PressBriefings/pages/Crew-change-COVID-19.aspx

[245] See also: Joint statement of the international maritime virtual summit on crew changes. 2020. Available at: https://www.gov.uk/government/news/joint-statement-of-the-international-maritime-virtual-summit-on-crew-changes

[246] BIMCO and ICS. 2021 *Seafarer Workforce Report.* Available at: https://www.ics-shipping.org/publication/seafarer-workforce-report-2021-edition

[247] World Maritime University. *Transport 2040: Automation, Technology, Employment - The Future of Work*. 2019. Available at: https://commons.wmu.se/lib_reports/58/.

[248] World Economic Forum article. The Fourth Industrial Revolution: what it means, how to respond. Available at: https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/;

[249] McKinsey Global Institute. *China's digital economy: A leading global force.* 2017. Available at: https://www.mckinsey.com/featured-insights/china/chinas-digital-economy-a-leading-global-force#.

[250] UNECE/ILO. *Jobs in Green and Healthy Transport: Making the Green Shift.* 2020. Available at: https://thepep.unece.org/sites/default/files/2020-05/THEPEP%20-%20Green%20jobs%20in%20transport.pdf.

[251] World Maritime University. Transport 2040: Automation, Technology, Employment — The Future of Work. *Op. Cit.*

[252] Global Sustainable Development Report 2019, *Op Cit.*

[253] See for example: United Nations Secretary-General High-level Advisory Group on Sustainable Transport. Mobilizing Sustainable Transport for Development: Analysis and Policy Recommendations. 2015. Op. Cit.

[254] In freight transport, when transport is done with multiple modes but without opening the container then it is called intermodal, if the container is opened and the goods transferred to another transport mode, than it is called multimodal.

[255] Li, H. and Su, L. *Multimodal transport path optimization model and algorithm considering carbon emission multitask.* 2020. Available at: https://link.springer.com/article/10.1007/s11227-019-03103-1.

[256] SuM4All. Global Roadmap of Action toward sustainable mobility. 2019. *Op. Cit.*

[257] IEA. *Global EV Outlook 2020. Op.Cit.*

[258]IEA. Global EV Outlook 2020. *Entering the decade of electric drive?* 2020.

[259] See for example: IEA website. Electric vehicles. Available at: https://www.iea.org/fuels-and-technologies/electric-vehicles; Scientific American article. Electric cars are not necessarily clean. 2016. Available at: https://www.scientificamerican.com/article/electric-cars-are-not-necessarily-clean/; UN policy brief. Accelerating SDG 7 achievement. 2018. Available at: https://sustainabledevelopment.un.org/content/documents/17501PB16.pdf

[260] See for example: 2019 Global Sustainable Development Report, *Op. Cit.*; UNEP. Global Environment Outlook 6. 2019. Available at: https://www.unenvironment.org/resources/global-environment-outlook-6; UNEP fact sheet. Biofuels and agro-biodiversity. 2008. Available at: https://www.un.org/en/ecosoc/docs/pdfs/biofuels.pdf

[261] IEA. *Transport tracking report 2020, Op. Cit.*

[262] IEA. Renewable energy market update 2021 -outlook for 2021 and 2022. Available at: https://www.iea.org/reports/renewable-energy-market-update

[263] SLoCaT. *Analysis of NDCs Sees Potential for Ambitious Action on Climate Change in the Transport Sector.* 2016. Available at: http://www.ppmc-transport.org/overview_indcs

[264] UNCTAD. *Sustainable freight transport in support of the 2030 Agenda for Sustainable Development.* 2018. Note by the UNCTAD Secretariat. Executive summary, Trade and Development Board (TD/B/C.I/MEM.7/17).

[265] IMO-Norway GreenVoyage2050 Project website: https://greenvoyage2050.imo.org/about-the-project/

[266] IMO. *Initial IMO GHG Strategy.* Available at: https://www.imo.org/en/MediaCentre/HotTopics/Pages/Reducing-greenhouse-gas-emissions-from-ships.aspx.

[267] Carbon Brief Clear on Climate article. Corsia: *The UN's plan to offset growth in aviation emissions after 2020.* 2019. Available at: https://www.carbonbrief.org/corsia-un-plan-to-offset-growth-in-aviation-emissions-after-2020

[268] The Global Sulfur Strategy: https://www.ccacoalition.org/en/activity/global-sulfur-strategy

[269] United Nations Environment Programme (UNEP), Climate and Clean Air Coalition (CCAC). *Global Low Sulfur Fuels, Cleaner Vehicles Progress Tracker.* 2018. Available at: https://www.ccacoalition.org/en/resources/global-low-sulfur-fuels-cleaner-vehicles-progress-tracker

[270] Victor, D. et al. *Accelerating the Low Carbon Transition: the case for stronger, more coordinated and targeted international action.* 2019. *Op. Cit.* p. 70.

[271] Victor, D. et al. *Accelerating the Low Carbon Transition: the case for stronger, more coordinated and targeted international action*. 2019. *OP. Cit.* p. 70.

[272] IEA. *Global EV Outlook 2020. Op.Cit.*

[273] Shukman, D. *Electric car future may depend on deep sea mining.* 2019. Available at: https://www.bbc.com/news/science-environment-49759626

[274] Against this background the International Seabed Authority and ILO are working on guidelines on the working conditions of deep sea mining workers.

[275] See: The Economist article. Three South American countries hold over half the world's lithium. 2017. Available at: https://www.wired.co.uk/article/lithium-batteries-environment-impact.

[276] Victor, D. et al. *Accelerating the Low Carbon Transition: the case for stronger, more coordinated and targeted international action.* 2019. Op. Cit. p. 70.

[277] IEA. *Global EV Outlook 2020. Op.Cit.*

[278] Including fixed and operational cost of the vehicle over the time of usage.

[279] SolutionsPlus website: http://www.solutionsplus.eu

[280] UN Environment Programme website. Why does Electric Mobility matter? Available at: https://www.unenvironment.org/explore-topics/transport/what-we-do/electric-mobility/why-does-electric-mobility-matter

[281] SDSN. *Roadmap 2050: A Manual for Nations to Decarbonize by Mid-Century.* 2019. Available at: https://roadmap2050.report/transport

[282] Victor, D. *et al. Accelerating the Low Carbon Transition: the case for stronger, more coordinated and targeted international action.* 2019. OP. Cit. p. 77.

[283] Victor, D. *et al. Accelerating the Low Carbon Transition: the case for stronger, more coordinated and targeted international action.* 2019. OP. Cit. p.71.

[284] SuM4All.*Global Roadmap of Action towards Sustainable Transport.* 2019. *Op. Cit.*

[285] IMO. *Fourth Greenhouse Gas Study 2020.* Available at: https://www.imo.org/en/OurWork/Environment/Pages/Fourth-IMO-Greenhouse-Gas-Study-2020.aspx

[286] IMO. *Fourth Greenhouse Gas Study 2020.* Available at: https://www.imo.org/en/OurWork/Environment/Pages/Fourth-IMO-Greenhouse-Gas-Study-2020.aspx

[287] UNCTAD. *Sustainable freight transport in support of the 2030 Agenda for Sustainable Development*. Note by the UNCTAD Secretariat (TD/B/C.I/MEM.7/17). 2018. Available at: https://unctad.org/meetings/en/SessionalDocuments/cimem7d17_en.pdf

[288] IMO website. Autonomous shipping. Available at: http://www.imo.org/en/MediaCentre/HotTopics/Pages/Autonomous-shipping.aspx

[289] See also: GEF-UNDP-IMO GloMEEP Project and members of the GIA, *Just in time arrival guide: Barriers and potential solutions.* 2020. Available at: https://greenvoyage2050.imo.org/wp-content/uploads/2021/01/GIA-just-in-time-hires.pdf

[290] UNCTAD. Digitalizing the Port Call Process. 2019. Available at: https://unctad.org/system/files/official-document/dtltlb2019d2_en.pdf

[291] *Ibid.,* p. 83.

[292] See for example: UNECE. Inland Water Transport. Available at: https://unece.org/transport/inland-water-transport

[293] UNECE. *Guidelines and recommendations for river information services*.2005. Available at: https://unece.org/fileadmin/DAM/trans/doc/finaldocs/sc3/TRANS-SC3-165e.pdf

[294] UNECE. *White Paper on the Progress, Accomplishments and Future of Sustainable Inland Water Transport.* 2020. Available at: https://unece.org/DAM/trans/main/sc3/publications/IWW_WhitePaper_ECE_TRANS_279.pdf

[295] ATAG. Facts and figures. Available at: https://www.atag.org/facts-figures.html

[296] ICAO Global Framework for Aviation Alternative Fuels website: https://www.icao.int/environmental-protection/GFAAF/Pages/default.aspx.

[297] Victor, D. *et al. Accelerating the Low Carbon Transition: the case for stronger, more coordinated and targeted international action.* 2019. *Op. Cit.* p.90.

[298] ICAO Climate change technology standards: https://www.icao.int/environmental-protection/Pages/ClimateChange_TechnologyStandards.aspx

[299] ICAO Operational measures: https://www.icao.int/environmental-protection/Pages/operational-measures.aspx

[300] ICAO. Sustainable Aviation Fuel (SAF): https://www.icao.int/environmental-protection/Pages/SAF.aspx

[301] IATA. *Aviation Carbon Exchange.* Available at: https://www.iata.org/en/programs/environment/ace/

[302] See for example: Businesswire Article. *JetBlue is the First U.S. Airline to Commit to and Achieve Carbon Neutrality for All Domestic Flying.* 2020. Available at: https://www.businesswire.com/news/home/20200813005548/en/JetBlue-is-the-First-U.S.-Airline-to-Commit-to-and-Achieve-Carbon-Neutrality-for-All-Domestic-Flying

[303] See for example on carbon offsets: UNCTAD. *Climate change, green recovery and trade.* 2021. Available at: https://unctad.org/system/files/official-document/ditcted2021d2_en.pdf

[304] UIC et al. *A Roadmap for Digital Railways*. 2016. Available at: https://uic.org/com/IMG/pdf/a_roadmap_for_digital_railways.pdf

[305] ESCAP. *Review of Sustainable Transport Connectivity in Asia and the Pacific. Addressing the Challenges of Freight Transport.* 2019. page 77. Available at: https://www.unescap.org/publications/review-sustainable-transport-connectivity-asia-and-pacific-addressing-challenges

[306] *Ibid.*

[307] See for example: Ministerial Resolution on Enhancing cooperation, harmonization and integration in the era of transport digitalization and automation (ECE/TRANS/2019/2 and ECE/TRANS/288, Annex I).

[308] UNECE press release. *UNECE paves the way for automated driving by updating UN international convention.* 2016. Available at: https://www.unece.org/info/media/presscurrent-press-h/transport/2016/unece-paves-the-way-for-automated-driving-by-updating-un-international-convention/doc.html.

[309] UNECE press release. *UN Regulations on Cybersecurity and Software Updates to pave the way for mass roll out of connected vehicles.* 2020. Available at: https://unece.org/sustainable-development/press/un-regulations-cybersecurity-and-software-updates-pave-way-mass-roll .

[310] World Economic Forum. *This is how good governance can make sure technology works for everyone.* Article. 2020. Available at: https://www.weforum.org/agenda/2020/12/technology-risks-opportunities-governance/ (Chapter 6 Regulatory collaboration)

[311] ESCAP. *Review of Sustainable Transport Connectivity in Asia and the Pacific.* Addressing the Challenges of Freight Transport. 2019. Op. Cit., page 78.

[312] UNDESA. *The World's Cities in 2018.* Available at: https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf.

[313] The New Urban Agenda. Available at: http://habitat3.org/the-new-urban-agenda/

[314] UNECE website. *UNECE paves the way for automated driving by updating UN international convention.* Available at: https://www.unece.org/housing-and-land-management/areas-of-work/housingurbandevelopment/sustainable-smart-cities.html

[315] ESCAP has proposed the following definition: *"Intelligent transport systems are an agglomeration of diverse technologies that enhance the sustainability of transport systems in a safer, smarter and greener way."*

[316] McKinsey Global Institute. *Smart Cities: Digital solutions for a more livable future. 2018.* Available at: https://www.mckinsey.com/~/media/McKinsey/Industries/Public%20and%20Social%20Sector/Our%20Insights/Smart%20cities%20Digital%20solutions%20for%20a%20more%20livable%20future/MGI-Smart-Cities-Executive-summary.pdf

[317] ESCAP. *Review of Developments in Transport in Asia and the Pacific*. 2017.Available at: https://www.unescap.org/publications/review-developments-transport-asia-and-pacific-2017

[318] SuM4All. *Global Roadmap of Action Towards Sustainable Mobility.* 2019. *Op. Cit.* Available at: http://pubdocs.worldbank.org/en/350451571411004650/Global-Roadmap-of-Action-Toward-Sustainable-Mobility.pdf

[319] McKinsey. *Cybersecurity in automotive: Mastering the challenge.* 2020. Available at: https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/cybersecurity-in-automotive-mastering-the-challenge#

[320] Union of Concerned Scientists. *Ride-Hailing's Climate Risks.* 2020. Available at: https://www.ucsusa.org/resources/ride-hailing-climate-risks

[321] See for example: World Economic Forum. *How COVID-19 will impact our cities in the long term. Article.* 2020. Available at: https://www.weforum.org/agenda/2020/11/what-will-our-cities-look-like-after-covid-19/

[322] SuM4All. Global Mobility Report 2017. *Op. Cit.*

[323] See for example: ESCWA. *Technology and Innovation for the Development of Land Transport in Arab Countries.* 2021. Available at: https://www.unescwa.org/publications/technology-innovation-development-land-transport-arab-countries

[324] ESCAP. *Enhancing rural transport connectivity to regional and international transport networks in Asia and the Pacific.* 2019. Op. Cit.

[325] ILO. Guidelines on the promotion of decent work and road safety in the transport sector. 2020. Available at: https://www.ilo.org/sector/activities/sectoral-meetings/WCMS_742633/lang--en/index.htm

[326] ESCAP. *Review of Sustainable Transport Connectivity in Asia and the Pacific. Addressing the Challenges of Freight Transport.* 2019. Op. Cit. page 75.

[327] OECD-WTO publication. *Aid for Trade at a Glance 2017: Promoting Trade, Inclusiveness And Connectivity For Sustainable Development.* 2017. Available at: https://www.oecd-ilibrary.org/development/aid-for-trade-at-a-glance-2017_aid_glance-2017-en

[328] eTIR website: https://etir.org/

[329] Star article. *KRA cargo tracking cuts transit time, boost regional trade.* 2020. Available at: https://www.the-star.co.ke/business/kenya/2020-01-29-kra-cargo-tracking-cuts-transit-time-boost-regional-trade/#:~:text=The%20Regional%20Electronic%20Cargo%20Tracking,to%20an%20average%20five%20days.&text=Transit%20goods%20to%20Uganda%20and,introduced%20real%2Dtime%20cargo%20tracking

[330] SuM4All. *Global Roadmap of Action toward sustainable mobility.* 2019. *Op. Cit.*

[331] Victor, D. et al. *Accelerating the Low Carbon Transition: the case for stronger, more coordinated and targeted international action.* 2019. *Op. Cit.*

[332] Website: https://unece.org/transport/inland-transport-committee

[333] UNCTAD has been extensively involved in rule-making and standard setting in the field of transport law, with emphasis on the economic and commercial aspects of shipping, and particularly with a view to considerations arising for the trade and transport of developing countries. A number of international Conventions, mainly in the field of commercial maritime law, were negotiated and adopted at international conferences under the auspices of UNCTAD. In addition, several sets of non-mandatory rules and standards were adopted and have contributed to shaping and harmonizing the international commercial maritime transport law framework. These include international Conventions and model rules covering the economic aspects of shipping, liability for carriage of goods by sea and multimodal transport, as well as the enforcement of maritime claims.

[334] E.g., Code of Safety for Fishermen and Fishing Vessels, 2005. Available at: http://www.fao.org/fishery/safety-for-fishermen/50769/en/

[335] See for example: ESCWA. *Technology and Innovation for the Development of Land Transport in Arab Countries.* 2021. Available at: https://www.unescwa.org/publications/technology-innovation-development-land-transport-arab-countries

[336] UNECE. Vehicle regulations. Available at: https://unece.org/transport/vehicle-regulations.

[337] Directive 2014/52/EU (in force since May 2017). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L0052

[338] Climate Change Policy Framework for Jamaica. Available at: https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2016/05/Jamaica-Climate-Change-Policy-fwL-2015.pdf

[339] ISO 14090: Adaptation to climate change — Principles, requirements and guidelines Adaptation to climate change — Principles, requirements and guidelines. 2019. Available at: https://www.iso.org/obp/ui/#iso:std:iso:14090:ed-1:v1:en

[340] ISO 14091:2021 - Adaptation to climate change-Guidelines on vulnerability, impacts and risk assessment. Available at: https://www.iso.org/standard/68508.html

[341] World Health Organization Regional Office of Europe. *Health economic assessment tool (HEAT) for walking and for cycling.* 2017. Available at: https://cdn.who.int/media/docs/default-source/air-pollution-documents/heat.pdf?sfvrsn=ba0969b9_1&download=true

[342] GloBallast e-learning portal: http://archive.iwlearn.net/globallast.imo.org/learning/index.html

[343] Outcome of the Discussions at 10th session of the World Urban Forum (WUF 10). Available at: https://wuf.unhabitat.org/node/145

[344] Ruiru Sustainable Urban Mobility Plan. Available at: https://unhabitat.org/sites/default/files/download-manager-files/Sustainable%20Urban%20Mobility%20Plan%20for%20Ruiru%2C%20Kenya.pdf.

[345] ACOLA. *Delivering Sustainable Urban Mobility.* 2015. Available at: https://acola.org/wp-content/uploads/2018/08/saf08-urban-mobility-report.pdf.

[346] UNDESA. *World Public Sector report 2019. Op. Cit.*

[347] See for example: Thirteenth Intergovernmental Regional Environmentally Sustainable Transport (EST) Forum in Asia. Website: https://sdgs.un.org/events/thirteenth-intergovernmental-regional-environmentally-sustainable-transport-est-forum-asia

[348] Bangkok Declaration for 2020. Available at: https://sustainabledevelopment.un.org/content/documents/bangkok_declaration.pdf

[349] SLoCaT. 2030 *Road Map for Sustainable Transport in Asia: Aligning government policy with sustainable development goals (SDG).* Presented at the Intergovernmental Tenth Regional Environmentally Sustainable Transport (EST) forum in Asia, 14–16 March 2017. Available at: https://slocat.net/1817-2/

[350] OECD. Financing Climate Futures: rethinking infrastructure. 2018. Available at: https://www.oecd.org/environment/cc/climate-futures/policy-highlights-financing-climate-futures.pdf

[351] IMF. *Fiscal Policy and Development: Human, Social, and Physical Investment for the SDGs.* 2019. Staff Discussion Note. Available at: https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2019/01/18/Fiscal-Policy-and-Development-Human-Social-and-Physical-Investments-for-the-SDGs-46444

[352] Climate Policy Initiative. *Global Landscape of Climate Finance 2019.* Available at: https://climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2019/.

[353] The 2017/18 figures incorporate several new types of data: EV charging infrastructure investments; private investment in sustainable infrastructure; and use of proceeds of bonds issued by the private sector and regional and municipal governments.

[354] Lefevre, B. et al. *The Trillion Dollar Question: Tracking public and private investment in transport.* 2014. *Op. Cit.*

[355] Climate Bonds Initiative. *Green bond issuance tops $200bn milestone - New global record in green finance: Latest Climate Bonds data.* 2019. *Op. Cit.*

[356] Belgium, Chile, France, Indonesia, Ireland, Nigeria and Poland.

[357] S&P Global. *Why the Transportation Sector is on a Fast Track to Get Greener.* 2019. Available at: https://www.spglobal.com/en/research-insights/articles/why-the-transportation-sector-is-on-a-fast-track-to-get-greener

[358] HSBC. *HSBC Global Asset Management and IFC raise $474M for climate action in Emerging Markets*. Article. 2020. Available at: https://investorfunds.us.hsbc.com/FP/news-and-announcements.fs.

[359]Climate Bonds Initiative. Green bond issuance tops $200bn milestone - New global record in green finance: Latest Climate Bonds data. 2019. Available at: https://www.climatebonds.net/2019/10/green-bond-issuance-tops-200bn-milestone-new-global-record-green-finance-latest-climate.

[360] Climate Policy Initiative. Global Landscape of Climate Finance 2019. Available at: https://www.climatepolicyinitiative.org/wp-content/uploads/2019/11/2019-Global-Landscape-of-Climate-Finance.pdf.

[361]United Nations Secretary-General High-level Advisory Group on Sustainable Transport. Mobilizing Sustainable Transport for Development: Analysis and Policy Recommendations. 2015. *Op. Cit.*

[362] Technical Working Group. *Financing Sustainable Transport.* Issue Brief No. 1. *Op. Cit.*

[363] O'Sullivan, K. *Land Value Capture for Mass Transit Finance: Strengthening the Land Use – Transportation Connection.* 2014. Available at: https://planning-org-uploaded-media.s3.amazonaws.com/legacy_resources/divisions/transportation/papercompetition/2015/OSullivan.pdf.

[364] *Ibid.*

[365] Vivid Economics. Greenness of Stimulus Index. 2021. Available at: https://www.vivideconomics.com/casestudy/greenness-for-stimulus-index/

[366] *Ibid.*

[367] International Energy Agency. *World Energy Outlook 2020*. Available at: https://www.iea.org/reports/world-energy-outlook-2020.

[368] Climate Action Tracker website: https://climateactiontracker.org/

[369] Rhodium Group. 2020 *Green stimulus spending in the world's major economies.* 2021. Available at: https://rhg.com/wp-content/uploads/2021/02/2020-Green-Stimulus-Spending-in-the-Worlds-Major-Economies.pdf

[370] IATA. *Best practices for COVID-19 market stimulation.* 2021. Available at: https://www.iata.org/en/pressroom/pr/2020-12-08-02/

[371] Technical Working Group. *Financing Sustainable Transport. Issue Brief No. 1. Op. Cit*.

[372] ESCAP. *Review of Sustainable Transport Connectivity in Asia and the Pacific. Addressing the Challenges of Freight Transport. 2019.* Op. Cit. page 83.

[373] OECD-ITF. *The Role of Private Investment in Transport Infrastructure.* 2019. Available at: https://www.itf-oecd.org/sites/default/files/docs/role-private-investment-transport-infrastructure.pdf

[374] Lefevre, B. et al. *The Trillion Dollar Question: Tracking public and private investment in transport*. 2014. Op. Cit.

[375] For the first half of 2019.

[376] Road transport investments dominated, accounting for 76% of the total; see: World Bank. *Private Participation in Infrastructure (PPI).* 2019. Available at: https://ppi.worldbank.org/content/dam/PPI/documents/H12019_PPI-report_small.pdf.

[377] Technical Working Group. *Financing Sustainable Transport. Issue Brief No. 1. Op. Cit.*

[378] United Nations. *Financing for Sustainable Development Report.* 2019. *Op.Cit.*

[379] Global Infrastructure Hub website: https://www.gihub.org/

[380] PPP Knowledge Lab website: https://pppknowledgelab.org/

[381] Global Infrastructure Facility website: https://www.globalinfrafacility.org/

[382] Sustainable Infrastructure Foundation -Source website: https://public.sif-source.org/sif-source-news/source-option-g20-principles-infrastructure-project-preparation

[383] See for example: Third Meeting of the Infrastructure Financing and Public Private Partnership Network of Asia and the Pacific. 2019. Available at: https://www.unescap.org/events/third-meeting-infrastructure-financing-and-public-private-partnership-network-asia-and

[384] UNECE PPP Website: https://unece.org/ppp

[385] Private Infrastructure Development Group website: https://www.pidg.org/

[386] Technical Working Group. *Financing Sustainable Transport. Issue Brief No. 1. Op. Cit.*

[387] Based on the World Bank's City Creditworthiness Initiative. For more information, see: https://www.worldbank.org/en/topic/urbandevelopment/brief/city-creditworthiness-initiative.

[388] Technical Working Group. *Financing Sustainable Transport. Issue Brief No. 1. Op. Cit.*

[389] White, R. and Wahba, S. *Addressing constraints to private finance of urban (climate) infrastructure in developing countries.* 2019. Available at: https://www.tandfonline.com/doi/abs/10.1080/19463138.2018.1559970?journalCode=tjue20

[390] For more information: United Nations. Financing for Sustainable Development Report. 2019. *Op. Cit.* See page 61.

[391] e.g. the Indonesia Infrastructure Guarantee Fund created in 2009 (Available at: https://www.iisd.org/credit-enhancement-instruments/institution/indonesia-infrastructure-guarantee-fund) or the Korean Infrastructure Credit Guarantee fund established in 1994 (Available at: https://www.kodit.co.kr/html/english/serv_kodit/infra_guar_serv/intro.jsp)

[392] Technical Working Group. *Financing Sustainable Transport. Issue Brief No. 1. Op. Cit*.

[393] Smart Freight Procurement Framework and Guidelines. 2019. Available at: https://docs.wbcsd.org/2019/09/WBCSD_Smart_Freight_Centre_procurement_guidelines.pdf

[394] Poseidon principles website. Available at: https://www.poseidonprinciples.org

[395] Technical Working Group. *Financing Sustainable Transport.* Issue Brief No. 1 for Secretary-General's High-level Advisory Group on Sustainable Transport. 2015. Available at: https://sustainabledevelopment.un.org/content/documents/7627Compiled%20issue%20briefs_final%20version.pdf

[396] A/HRC/30/49: *Role of local government in the promotion and protection of human rights – Final report of the Human Rights Council Advisory Committee.* Paragraph 76. Available at: https://digitallibrary.un.org/record/848739?ln=en

[397] See for example: GIZ. *Fighting corruption in the Road Transport Sector.* 2018. Available at: http://sutp.transport-nama.org/files/contents/documents/resources/B_Technical-Documents/GIZ_SUTP_TD10_Fighting-Corruption-in-the-Road-Transport-Sector_EN.pdf

[398] Tew, R. *ODA loans: tracking a growing source of development financing.* 2015. Development Initiative. Available at: http://devinit.org/wp-content/uploads/2015/06/ODA-loans-tracking-a-growing-source-of-development-financing.pdf

[399] Clean Technology Fund. Available at: https://www.climateinvestmentfunds.org/topics/clean-technologies

[400] African Development Bank, Asian Development Bank, CAF – Development of Latin America, European Bank of Reconstruction and Development, European Investment Bank, Inter-American Development Bank, Islamic Development Bank, and World Bank.

[401] ADB. *Progress Report (2016-2018) of the MDB Working Group on Sustainable Transport*. 2019. Available at: https://www.adb.org/sites/default/files/institutional-document/536306/mdb-progress-report-2016-2018.pdf

[402] Latek, M.: *EU aid for trade: Taking stock and looking forward.* 2018. Briefing of European Parliamentary Research Service. Available at: http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/620221/EPRS_BRI(2018)620221_EN.pdf

[403] World Trade Organization. *Aid for trade global review 2019.* Available at: https://www.wto.org/english/tratop_e/devel_e/a4t_e/gr19_e/glossy_summary_report_e.pdf

[404] WTO and OECD. *Aid for Trade at a Glance 2015: reducing trade Costs for Inclusive, Sustainable Growth.* 2015. Available at: https://www.wto.org/english/res_e/booksp_e/aid4trade15_e.pdf

[405] Latek, M.: *EU aid for trade: Taking stock and looking forward.* 2018. Op. Cit.

[406] United Nations Road Safety Fund (UNRSF) website: https://unece.org/un-road-safety-fund

[407] Ibid.

[408] Zong, Y. *Presentation at ADB Transport Forum. Capacity Building for Sustainable Urban Transport.* 2010. Available at: https://cleanairasia.org/wp-content/uploads/portal/files/presentations/ADB_Yan_Zong.pdf

[409] SuM4All. *Global Roadmap of Action toward sustainable mobility. 2019. Op.* Cit.

[410] Addis Ababa Action Agenda of the Third International Conference on Financing for Development. 2015. Available at: https://www.un.org/esa/ffd/wp-content/uploads/2015/08/AAAA_Outcome.pdf

[411] Technical Working Group. *Financing Sustainable Transport. Issue Brief No. 1. Op. Cit.*

[412] UNFCCC. *Potential of South-South and triangular cooperation on climate technologies for advancing implementation of nationally determined contributions and national adaptation plans* (TEC/2018/17/10). 2018. Available at: https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/brief9/7a74a2f17f204b6ba17f1ec965da70d7/f4e361cd56d4463a8daa4ab29a1254db.pdf

[413] UN Technology Facilitation Mechanism website: https://sustainabledevelopment.un.org/tfm

[414] United Nations Technical Support Team for UN GA Open Working Group on SDGs. *Issues brief 15: Means of implementation; global partnership for achieving sustainable development.* 2014. Available at: https://sustainabledevelopment.un.org/content/documents/2079Issues%20Brief%20Means%20of%20Implementation%20Final_TST_141013.pdf

[415] UNCTAD. *Navigating through the coronavirus crisis and uncertainty: How maritime transport data can help. Transport and Trade Facilitation Newsletter.* 2020. Available at: https://unctad.org/news/navigating-through-coronavirus-crisis-and-uncertainty-how-maritime-transport-data-can-help

[416] See UNCTADStat Data Centre available at: https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx.

[417] See UNCTADStat Data Centre available at: https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx; See also: UNCTAD. *Launch of global transport costs database by UNCTAD and World Bank.* 2020. Available at: https://unctad.org/meeting/launch-global-transport-costs-database-unctad-and-world-bank

[418] Roland Berger. *Bike Sharing 5.0. Market insights and outlook. 2018*. Available at: https://www.scribd.com/document/431138343/roland-berger-study-bike-sharing-5-0-pdf

[419] Second Global Sustainable Transport Conference website: https://www.un.org/en/conferences/transport2021

[420] Energy Policy Tracker. https://www.energypolicytracker.org/ Accessed on 8 September 2021

[421] Global Green Growth Initiative & Global Climate Fund (2021). Briefing Note: The Fiji low emission development strategy. https://www.economy.gov.fj/images/CCIC/uploads/Mitigation/Brief__The_Fiji_Low_Emissions_Development_Strategy_Policy.pdf

[422] Energy Policy Tracker. https://www.energypolicytracker.org/ Accessed on 8 September 2021.

[423] Energy Policy Tracker. https://www.energypolicytracker.org/ Accessed on 8 September 2021.

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