Global Mobility Report 2022

Tracking Sector Performance

SUSTAINABLE mobility FOR ALL™

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With the financial support of

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CONTENTS

LIST OF ABBREVIATIONS AND ACRONYMS

BMZ	German Federal Ministry for Economic Cooperation and Development
COP26	26th Conference of the Parties
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
COTIF	Convention concerning International Carriage by Rail
DWT	Deadweight Tonnage
EV	Electric Vehicles
FCDO	Foreign, Commonwealth & Development Office
FIA	Fédération Internationale de l'Automobile
GANP	Global Air Navigation Plan
GASP	Global Aviation Safety Plan
GMR	Global Mobility Report
GRA	Global Roadmap of Action Toward Sustainable Mobility
GSMI	Global Sustainable Mobility Index
GTF	Global Tracking Framework for Transport
HDTs	Heavy Duty Trucks
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICCT	International Council on Clean Transportation
ICE	Internal Combustion Engine
IDDRI	Institut du développement durable et des relations internationales
IEA	International Energy Agency
ILO	International Labor Organization
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
IRF	International Road Federation
IsDB	Islamic Development Bank
ITDP	Institute for Transportation & Development Policy
ITF	International Transport Forum
ITS	Intelligent Transport Systems
LPI	Logistics Performance Index
NDCs	Nationally Determined Contributions
OECD	Organization for Economic Cooperation and Development
PHEV	Plug-in Hybrid Electric Vehicle
RAI	Rural Access Index
ReCAP	Research for Community Access Partnership
RTR	Rapid Transit to Resident Ratio
SDGs	Sustainable development goals
SEforALL	Sustainable Energy for All
SLOCAT	SLOCAT Partnership on Sustainable, Low Carbon Transport
TUMI	Transformative Urban Mobility Initiative
UNCTAD	United Nations Conference on Trade and Development
UNECE	The United Nations Economic Commission for Europe
UNESCAP	United Nations Economic and Social Commission for Asia, and the Pacific
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
WRI	World Resources Institute

FOREWORD

The Global Mobility Report (GMR) is a comprehensive assessment of transport systems globally. The GMR takes stock and assesses progress on transport systems performance. Performance is measured in systemwide sustainability—that is, the capacity of transport systems to deliver on four global goals: universal access, efficiency, safety, and green mobility—irrespective of the mode of transportation, including road, air, waterborne, and rail transport.

The first edition of the GMR was released in 2017, and it concluded that not a single country, developed or developing, was on track to achieve sustainable mobility. This second edition reviews the progress of transport systems toward sustainable mobility over the last five years. The GMR uses the metrics and latest data contained in the "Global Tracking Framework for Transport" (GTF). This analysis of data is complemented by findings from other organizations on recent developments and trends in the transport space since 2017.

Along with the "Mobility Performance at a Glance: Country Dashboards 2022," which was released in September 2022, the *Global Mobility Report 2022: Tracking Sector Performance* (GMR) equips transport practitioners with data and analyses to assess the performance of transport systems, both globally and at the country level.

We hope that the GMR will be a useful resource to support data-driven decision-making in the transport sector.

Sustainable Mobility for All Steering Committee
(On behalf of our 56 Member organizations)
April 2023, Washington, D.C.

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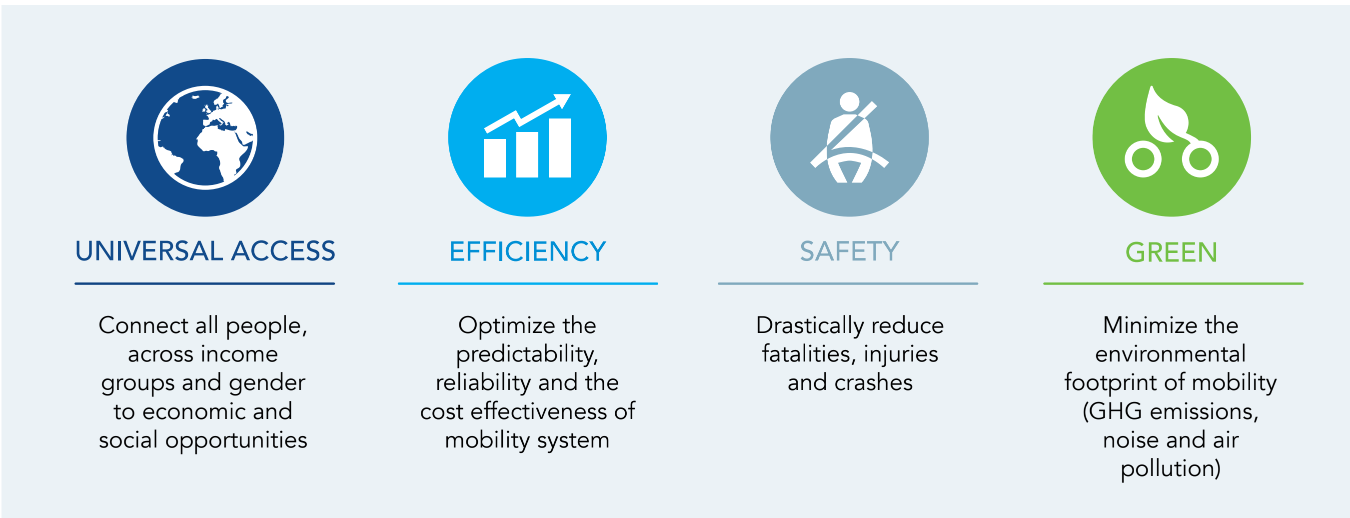
EXECUTIVE SUMMARY

The "Global Mobility Report 2022: Tracking Sector Performance" (GMR) takes stock of transport system performance and evaluates progress toward sustainable mobility over the last five years. As with the first edition released in 2017, GMR 2022 uses the concept of sustainable mobility with its four policy goals (figure ES 1) and targets derived from international agreements to define the ambition for transport systems globally.

Figure ES 1: Sustainable mobility



Source: Sustainable Mobility for All. 2019. Global Roadmap of Action Toward Sustainable Mobility. Washington D.C.: Sustainable Mobility for All. ISBN: 978-1-7341533-0-9. Licensed under Creative Commons Attribution CC BY 3.0. Figure 2.1: Defining Sustainable Mobility, Page 16.

Methodology

The GMR 2022 uses metrics developed by the Sustainable Mobility for All (SuM4All) Partnership in 2017 and contained in the Global Tracking Framework for Transport (GTF 3.0). It relies on a set of principal indicators agreed on by the Partnership to assess countries' transport systems performance on each policy goal (table ES 1). The GMR 2022 also depends on a battery of more than 60 associated transport indicators, to assess the quality of countries' transport systems and quantify the gap between actual performance and ambition.[1] The GMR is also enriched by updated Global Sustainable Mobility Index (GSMI) for 183 countries, which allows us to compare performance across countries. This analysis of data is complemented by findings from other organizations on recent developments and trends in the transport space since 2017.

Table ES 1: Policy goals and principal indicators

Policy Goal (subgoal)	Principal Indicator
Universal Access (Rural)	Rural Access Index (percentage)
Universal Access (Urban)	Rapid transit to resident ratio (km/million)
Universal Access (Gender)	Female workers in transport (percentage)
Efficiency	Logistics Performance Index (Value 0-5)
Safety	Mortality caused by road traffic injury (per 100,000 people)
Green Mobility (GHG Emissions)	Transport-related GHG emissions per capita (tons of CO_2 per capita)
Green Mobility (Air pollution)	PM 2.5. air pollution annual exposure (ug/cu.m)
Green Mobility (Noise Pollution)	Number of Urban Dwellers Exposed to Excessive Noise Levels

Source: Sustainable Mobility for All. 2019. Global Roadmap of Action Toward Sustainable Mobility. Washington DC: Sustainable Mobility for All. ISBN: 978-1-7341533-0-9. Licensed under Creative Commons Attribution CC BY 3.0. Table 3.1: Policy Goals and Aspirational Targets, Page 22.

Data analysis on the principal indicators was conducted by countries' level of development—developing vs developed countries—and income levels[2]—low income, lower middle income, upper middle income, and high income—to quantify gaps between actual performance and ambition and allow for cross-country group comparisons.

The Global Mobility Report 2017 found the world to be off track to achieving sustainable mobility. Although data remains a considerable constraint to reach definite conclusions, the overall message is the same, with no country—developed or developing—having achieved sustainable mobility[3]. However, certain facets have seen some progress (table ES 2).

Table ES 2: Summary of performance by goal

Policy goal and subgoal of principal indicator (unit)	Old Global Average (Year)	New Global Average (Year)	Aspirational Target	Trend (See note on color codes)
Universal Access - Rural Rural access index as percentage	67% (2006)	69% (2016)	100%	n/a
Universal Access - Urban Rapid transit to resident ratio in km/million	10.53 (2017)	11.14 (2021)	>40	off track
Universal Access – Gender Female workers in transport as percentage	n/a	13% (2019 or the latest)	50%	n/a
Efficiency Logistics Performance Index as Value 0 to 5	2.87 (2016)	2.85 (2018 or the latest)	5	slight decline

Safety Mortality caused by road traffic injury per 100,000 people	17.05 (2017)	17.15 (2019 or the latest)	0	slight decline
Green Mobility - GHG Emissions Transport-related GHG emissions per capita tons of CO_2 per capita	1.13 (2017)	1.14 (2019)	<0.2	slight decline
Green Mobility - Air pollution PM 2.5. air pollution annual exposure in ug/cu.m	28.46 (2017)	27.90 (2019)	<5	off track
Green Mobility - Noise Pollution Number of urban dwellers exposed to excessive noise levels	n/a	n/a	n/a	n/a

Source: Authors' analysis.

Note:

a. For the Trend, Green = improvement and on track for aspirational target; Orange = improvement but off track for aspirational target; Red = slight decline; n/a = no comparable data.

b. For the case of rural access, comparability is not available due to a significant difference in methodology between the 2006 data point (household survey methodology) and 2016 data point (geospatial methodology). This is elaborated further in the Universal Access chapter under the Rural Access section.

c. The aspirational targets enumerated in this table reflect an 'upper ceiling' scenario for each policy goal. As such, except for the GHG emissions target for 2050, the others are non-time specific and can be understood as ambitious Long-term objectives.

The overall sense when comparing developed and developing countries in aggregation is that the gap is broadening on more dimensions than those for which the gap is reducing. For example, while developing countries continue to maintain lower greenhouse gas (GHG) emissions from their transport sector relative to the developed countries, progress is slow in improving urban access. This is compounded by a widening gap in safety where, for instance, fatalities owing to road traffic injury continue to decline in developed countries relative to developing countries.

Key Findings and Trends

GREEN MOBILITY

Green mobility is a broad concept that captures the ambition to abate the environmental footprint of mobility. This goal seeks to reduce GHG emissions and carbon impact, noise, and air pollution associated with the transportation of goods and people. The green goal aligns with the sustainable development goals—SDGs 3, 7, 9, and 11 to 14—the Paris Climate Agreement, the international policy frameworks for international aviation on carbon offsetting and reduction schemes for example, and maritime transport, and other frameworks for action at the global and regional levels.

The green mobility goal encompasses three environmental aspects linked to mobility: GHG emissions, air pollution, and noise pollution.

GHG emissions

This subgoal of green mobility policy aims to mitigate the effects of climate change through reducing global transport-related emissions across all modes of transport. Transport emissions per capita should not exceed an average of 0.2 tons of carbon dioxide per year by 2050 to meet the 1.5 degrees Celsius target of the Paris Agreement. In aggregate terms, achieving this target requires bringing annual global transport emissions down to two gigatons of carbon dioxide by 2050, from a level of approximately 7.6 gigatons of carbon dioxide equivalent. This will need to be complemented by net zero emissions at the beginning of the second half of the century.

Transport emissions per capita should not exceed an average of 0.2 tons of carbon dioxide per year by 2050

The SuM4All Global Mobility Report 2017 delineated that the transport sector contributes 23 percent of global energy-related greenhouse gas emissions and 18 percent of all man-made emissions in the global economy. Over time, transport GHG emissions per capita have continued to gradually increase, suggesting that the global transport system is evolving in the wrong direction in carbon footprint. This also means that the gap between the aggregate level of carbon emissions and ambition—0.2 tons of carbon dioxide per capita—has widened.

Analysis of trends in transport-related GHG emissions by countries' income levels, shows that high income countries are historically responsible for 62 percent to 70 percent of annual transport-related global emissions since 1990—with emissions continuously growing until 2008. This underscores the historical responsibility of high income countries in GHG emissions causing climate change, and the apparent green divide that exists between high emitters and high income countries, and low emitters and low income countries. As an example, 23 low income countries in Africa contribute to less than 1 percent of global carbon dioxide emissions from transport.

The prevailing projections indicate a need to scale up global efforts. The Intergovernmental Panel on Climate Change (IPCC) estimates that investments in global mitigation for the transport sector need to increase by a factor of seven to contribute to the 1.5 degrees Celsius target of the Paris Agreement. A huge gap exists in emissions between where we are and the ambition set by the Paris Agreement to limit global warming to well below two degrees Celsius, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. Without increased global action, transport-related GHG emissions will continue to grow. A multisectoral, coordinated effort between the transport and energy sectors is needed to achieve the aspirational target of 0.2 tons of carbon dioxide per capita.

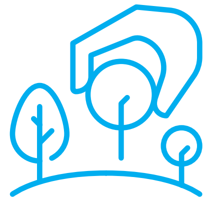
According to a report by EIA in 2021, the global conventional vehicle fleet will peak by 2038 –this is a major transformation and a positive step in the right direction. This brings significant decarbonization benefits, and this advantage becomes even more important as the power sector decarbonizes over time. The growing share of electric vehicles is not limited to high income countries. This reflects efforts made by a number of countries, including China and India, in supporting electrification to reduce the environmental externalities of their transport systems.

Air pollution

This subgoal of the green mobility policy aims to reduce premature deaths and illnesses from air pollution associated with local transport. The target is to lower the mean exposure to air pollution to below 5 micrograms per cubic meter of particulate matter 2.5 air pollution for each country and large city per the latest World Health Organization guideline.

The Global Mobility Report 2017 found that 98 percent of cities in low-and middle-income countries (LMICs) do not meet air quality guidelines, compared with 56 percent of cities in high income countries (HICs). As a result, only 10 percent of people around the world live in cities that comply with WHO air quality guidelines. GMR 2022 analysis showed that the global average exposure to air pollution was reduced by a negligible margin—from 28.46 to 27.90 micrograms per cubic meter of $PM_{2.5}$—between 2017 and 2019.

Further analysis of the trends in global average exposure by the countries' income levels and levels of development, showed that the burden of air pollution has consistently remained high in developing countries compared to developed countries. A time series analysis of the trends in average annual exposure to air pollution by the



Only 10 percent of people around the world live in cities that comply with WHO air quality guidelines

countries' income levels from 2010–2019 showed a higher concentration of $PM_{2.5}$ the lower the country's income. Analysis of the existing levels of average annual exposure to air pollution by the countries' levels of development and income level showed that the challenge of air pollution impacts developing countries more compared to developed countries. Developing countries have an average mean annual exposure of 32.3 micrograms per cubic meter against 18.2 micrograms for the developed countries.

Disparities are apparent between income levels. High income countries followed by upper middle income are the least exposed to air pollution. Although only 1 percent of the world's motor vehicles are in low income countries, they face the highest burden of air pollution. This is because most vehicles imported to low-income countries (LICs) are second-hand vehicles that are typically many years or even decades old, and LICs have weak fuel standards compounded by poor enforcement.

Disparities are also apparent within income groups. For example, the mean annual exposure to air pollution in lower middle income countries can be as low as 6.1 micrograms per cubic meter in Nicaragua and as high as 83.3 micrograms per cubic meter in India. This shows that efforts to reduce air pollution are needed by countries across the board, and not just particular groups of countries based on income level.

Noise Pollution

This subgoal of green mobility policy goal aims to reduce global human mortality and the burden of disease from local transport-related noise levels. In the absence of a global target for transport noise pollution, the Partnership estimated in 2019 that a reasonable target for each country and city is to reduce the number of urban dwellers exposed to excessive noise levels by 50 percent by 2030 compared with 2015 levels. Further to this measure, the European Environmental Agency (EEA) set a target to reduce by 2030 the number of people chronically disturbed by noise from transport in Europe by 30 percent compared with 2017 level.

Target for each country and city is to reduce the number of urban dwellers exposed to excessive noise levels by 50 percent by 2030

Traffic noise is the most significant source of noise in cities and is ranked as a top health risk and the second in harmful environmental stressors behind air pollution. While a standard methodology and data to benchmark and compare noise pollution globally remain elusive, examples from across the globe show that noise pollution is a major issue in many cities. For example, across the European Union, at least 20 percent of citizens are exposed to road traffic noise levels that are considered harmful to health. Additionally, two 15-year-long studies of long-term residents of Toronto, Canada, found that exposure to road traffic noise elevated risks of acute myocardial infarction and congestive heart failure, and increased the incidence of diabetes mellitus by 8 percent, and hypertension by 2 percent.

UNIVERSAL ACCESS

Universal access is a broad concept that captures the ambition of transport services "to connect all people and communities to economic and social opportunities, considering the needs of different groups, including the poor, those in vulnerable situations, women, children, the elderly, and persons with disabilities, across geographical locations". This goal seeks to ensure that everyone's individual travel needs of access to those opportunities are met. The goal accounts for distributional considerations for transport services. Specifically, it reflects concerns for social inclusivity achieved by providing universal access to transport services.

Ensuring universal and equitable access is of paramount importance since infrastructure and services are rarely distributed equitably. The goal reflects concerns for equity and social inclusivity achieved by providing universal access to transport services. The goal should be tailored by location or horizontal equity, and demographic characteristics or vertical equity such as income, age, and gender. However, owing to lack of data and studies on many of these dimensions, the Global Mobility Report will focus on and monitor three dimensions: urban access, rural access, and gender. The urban and rural classifications represent horizontal equity of location, and gender represents a piece of vertical equity, considering specific demographic profiles of individuals.

The universal access goal is consistent with the 2030 Agenda for Sustainable Development—SDGs 5, 9, and 11—and the Habitat III New Urban Agenda.

Ensuring universal and equitable access is of paramount importance since infrastructure and services are rarely distributed equitably

Universal Urban Access

This subgoal refers to the provision of transport services to all in cities, especially the most vulnerable populations to enable access to economic and social opportunities, including jobs, markets, and social facilities. The goal is to seek equity of access in cities. To this tune, SDG 11 identifies indicator 11.2.1: "Proportion of population that has convenient access to public transport, by sex, age, and persons with disabilities". However, in the absence of global data coverage on this indicator, the rapid transit to resident (RTR) ratio is used to proxy performance on urban access to transport. The target is for urban areas to have greater than 40 kilometers of rapid transit per million urban residents.

Analysis showed that the global RTR average increased by 0.61 kilometer per million residents between 2017 and 2021. This suggests that the availability of formal transit in cities is trending in the right direction. However, it is important to note that an increase in the RTR indicator may underestimate access in developing countries where informal transit such as paratransit is dominant in the public transport sector. Latest survey shows that only 49.5 percent of urban residents worldwide have convenient access to public transport. Further analysis of the trends in global RTR by income levels and levels of development, showed that RTR is significantly lower in LMICs compared to high income countries (HICs), and it remained stable over time in LICs. The trend is, however, different in MICs, which show a notable increase over time. The RTR reflects formal public transport because LMICs often rely on informal transport systems. The latest data on the RTR validate the significant divide that exists between developed and developing countries on urban access. The RTR for HICs is four times that in developing countries. Within the latter group, notable differences permeate among countries' income groups, with MICs' RTR eight times larger than in LICs.

Universal Rural Access

Rural access refers to the provision of transport services to all people in rural and remote areas. Equity of access is core to this goal. To this tune, SDG 9 identifies indicator 9.1.1: "Proportion of the rural population who live within two kilometers of an all-season road." The rural access index (RAI), which measures the share of the population who live within two kilometers of the nearest road in good condition in rural areas, is used to proxy access in rural and remote areas. The objective for universal rural access is to ensure that the proportion of rural population who live within two kilometers of an all-season road per SDG Indicator 9.1.1 and as measured by RAI reach 100 percent.

It is estimated that over a billion of the rural population still lack access to an all-weather road and adequate transport services, especially in developing countries, including countries in special situations including least developed countries (LDCs), small island developing states (SIDS), and landlocked developing countries (LLDCs). This represents a major barrier to social and economic development.

The World Bank's original household survey methodology yields more reliable estimates of RAI as it accounts for differences in road types, land cover types, and terrain. Its values tend not to be current since the regular collection of survey data by national governments has proven to be resource intensive. The revised geospatial methodology—while providing newer data points—lacks the precision of proxying actual access since no consideration is given to land cover types or terrain in the two kilometer buffer.

Gender

Gender access refers to the need to make sure that transport considers the needs and the views of all women/girls, men/boys, transgender, and non-binary/gender queer people. Female mobility patterns are known to be different from those of men. Women typically walk longer distances than men and make more frequent, shorter trips with more stops to combine multiple tasks. Men, by contrast, tend to follow more direct and linear patterns. Females engage in more non-work-related travel than males and are more likely to be accompanied by children or elderly relatives. They are also more reliant on public transport. Transport infrastructure and services need to cater to these differentiated travel needs and patterns of women. Implicit to this goal is also the notion that the achievement of this subgoal will require women to participate at all levels of transport decision making—planning, management, and operations. In absence of data on women as transport users, the percentage of workers in transport who are female is used as a proxy for access to transport services by gender. The target is to have 50 percent female workers in the transport sector.

It is estimated that over a billion of the rural population still lack access to an all-weather road and adequate transport services

Analysis of the percentage of female workers in transport by countries' income group and level of development showed that the proportion of women employed in the transport sector in developed countries is twice that in developing countries. The proportion of women employed in the transport sector seems to decline with income level—from 21 percent in developed countries compared to 14 percent, 6 percent, and 5 percent for upper middle income, lower middle income, and low income countries respectively.

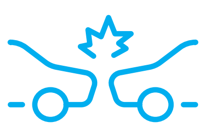
Latest estimates show that the percentage of women in leadership roles in the supply chain and transport industry stood at 21 percent in 2022—an increase of 25 percent compared to 2021. Furthermore, the industry is among the lowest in the overall industry in female representation. Estimates showed that at the prevailing rate of progress, it will take 151 years to close the economic participation and opportunity gender gap globally. This could translate to a longer period for the transport sector, given it is among the industries with the lowest female representation.

SAFETY

The safety goal seeks to reduce fatalities, injuries, and crashes from transport mishaps across all modes of transport. It aims to integrate safety as a core value within transport systems and within the broader development agenda to avert health, social and economic losses associated with unsafe mobility. On top of the enormous human suffering caused, the economic costs of poor road safety keep hundreds of millions in poverty, with the drain on their productive human resources, and the economic losses estimated at US$1·8 trillion in 2015–30, which is equivalent to an annual tax of 0.12 percent on global Gross Domestic Product. Putting safety at the core of transport systems is an urgent moral imperative. Safety must never be compromised, as the only number of transport-related deaths that can ever be accepted is zero. The target is to achieve zero mortality caused by road traffic injury, with a 50 percent reduction by 2030 in line with SDG 3.6 and the United Nations Second Decade of Action for Road Safety.

The SuM4All Global Mobility Report 2017 relayed that the annual number of road traffic deaths stood at 1.3 million globally. This implied that road traffic accounted for 97 percent of transport related fatalities and corresponded to 93 percent of the costs. Further analysis revealed improvement in HICs with a lack of improvement or worsening in LMICs.

With an average of 7.1 road traffic deaths per 100,000 population, developed countries face less than half the mortality rate of developing countries, which stands at 20.9 road traffic deaths per 100,000 population



Analysis revealed that the state of road safety has degraded compared to 2017. At the prevailing trajectory, it is unlikely that the goal of a 50-percent reduction will be met by 2030. Further analysis of the trends in mortality rates by countries' level of development and income groups revealed that road traffic injury deaths per 100,000 population have consistently been higher in developing countries than in developed countries. This suggests that the lower the country's income, the bigger the safety concern. Moreover, HICs have reduced their mortality rate caused by traffic injury deaths over time, while LICs show a slight increase over time. While the fatality rates per 100,000 population are highest for low-income countries, middle income countries merit close attention, if the problem is to be seriously addressed since the bulk of the fatalities happen in these countries.

The latest data also confirms the significant disparity in the road safety problem between developed and developing countries. With an average number of road traffic deaths per 100,000 population of 7.1, developed countries face less than half of the mortality rate of developing countries, which stands at 20.9. Disparities among developing countries are also notable, varying between 0.2 in the Federated States of Micronesia and 64.6 in the Dominican Republic. This shows that efforts to reduce the number of road traffic deaths are needed by countries across the board, and not just particular groups of countries based on income levels.

Likewise, road traffic deaths disproportionally affect middle-income countries. High-income countries are home to 15 percent of the world's population and approximately 38 percent of the world's registered vehicles, yet they account for only eight percent of the global burden of deaths. Conversely, middle-income countries are home to 85 percent of the world's population and comprise 62 percent of the total number of registered vehicles, yet they account for 92 percent of all deaths.

EFFICIENCY

The efficiency goal seeks to optimize the predictability, reliability, and cost-effectiveness of the transport system in the use of scarce resources—energy, technology, space, institutions, and regulations. Efficiency aspires to avoid losses in travel time owing to congestion or poor organization of traffic flows. This goal seeks to ensure that transport demand is met at the least possible cost for providers and users. The efficiency goal is also at the heart of UN conventions and agreements, as well as being embedded in the Agenda 2030 for Sustainable Development and its SDGs framework, for example, SDG 9.4; SDG 12.3; and SDG 12.c.

The efficiency goal is at the heart of UN conventions and agreements. Infrastructure agreements, for example, managed by the United Nations Economic Commission for Europe (UNECE) and the United Nations Economic and Social Commission for Asia, and the Pacific (UNESCAP) provide a basis for the long term development of coherent international networks for the various modes of inland transport. Thus, they facilitate international travel for people and freight, and border crossing facilitation conventions help establish effective transit systems for moving freight.

The most challenging aspect of efficiency is having the right metrics and the data to measure it

The most challenging aspect of efficiency is having the right metrics and the data to measure it. As a result of data gaps, the logistics performance index (LPI) is leveraged to proxy countries' transport system efficiency. The target is to have a logistics performance index of five. The LPI reflects perceptions of a country's logistics based on: (i) efficiency of customs clearance process, (ii) quality of trade and transport-related infrastructure, (iii) ease of arranging competitively priced shipments, (iv) quality of logistics services, (v) ability to track and trace consignments, and (vi) frequency with which shipments reach the consignee within the scheduled time.

The SuM4All Global Mobility Report 2017 found that developing countries have higher trade costs and lower levels of trade integration compared to developed countries. Similarly, high income OECD countries have more efficient regulations for truck licenses and domestic operations, a more comprehensive system for ensuring the quality of truck operations and a higher degree of openness to foreign competition. Furthermore, global fuel efficiency had consistently improved from 2005 to 2015, but the rate of improvement had slowed down in the succeeding years.

At the aggregate level, the data do not show visible improvements in the global transport system's efficiency over time. Looking at transport system efficiency through the lens of income groups shows a significant gap between HICs and LICs. By all standards, the former group outperforms the latter group—LPI = 3.5 in developed countries against 2.5 in developing countries. The higher the country's income, the more efficient the international supply chains, and the organization of the movement of goods through a network of activities and services in the country. Disparities are also apparent within income levels. For example, upper middle income group has some of the top performers and some of the bottom performers in transport efficiency globally—the top performer has 3.6 out of 5 while the bottom performer has 2.1.

Although efficiency is an important part of sustainable mobility, it is important to mention that transport systems are continuously subject to shocks—such as pandemics and extreme weather events—which need to be effectively managed now and in the future. Starting in 2020, the COVID-19 pandemic disrupted supply networks and laid bare previously unanticipated vulnerability of transport systems. Such vulnerabilities led to shortages in the availability of medical supplies, raw materials, sub-assemblies, and finished goods, as well as logistical issues and inventory build-up. As a result, a critical lesson came through clearly: efficiency is neither all nor everything. Specifically, while fully optimized production and transport systems under typical conditions in the quest for efficiency generate significant global and trade benefits, they are highly vulnerable to risks. Therefore, building redundancy—at the cost of system efficiency losses—could be the price to pay to minimize risk to the global supply chains in the future.

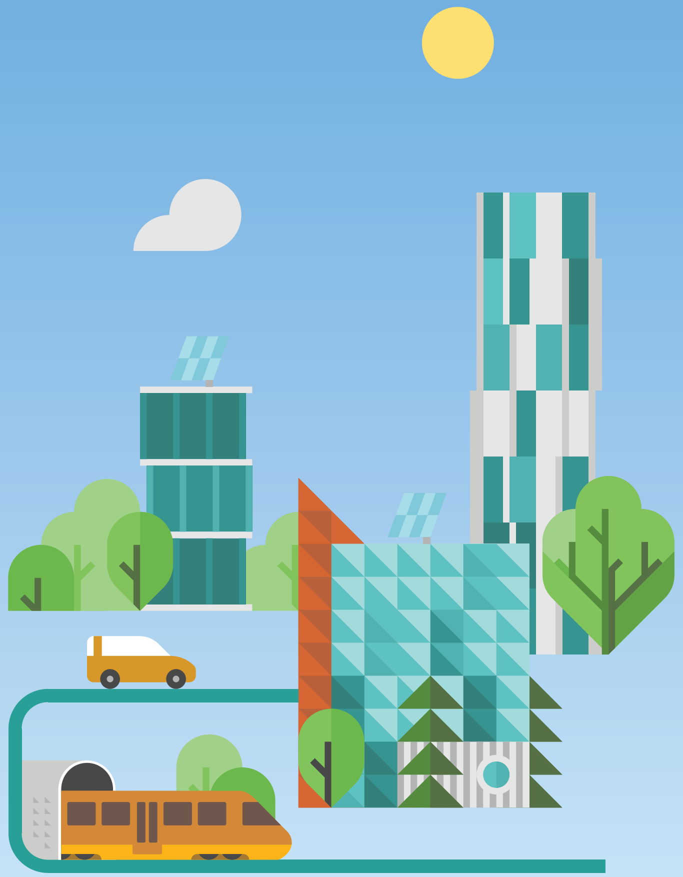
Notes

1 The Elementary GTF was developed in 2017 and expanded to version 2.0 in 2020, and further to version 3.0 in 2022 (see Annex 1). The 60+ supporting indicators can be accessed via https://www.sum4all.org/gra-tool/country-performance/indicators.

2 For the current 2023 fiscal year, low-income economies are defined as those with a GNI per capita, calculated using the World Bank Atlas method, of $1,085 or less in 2021; lower middle-income economies are those with a GNI per capita between $1,086 and $4,255; upper middle-income economies are those with a GNI per capita between $4,256 and $13,205; high-income economies are those with a GNI per capita of $13,205 or more. See more https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups.

3 According to the Global Sustainable Mobility Index, not even the number 1 ranked country, Sweden, has achieved sustainable mobility. Other developed countries like Switzerland and Norway rank in position 4 and 13 respectively on the global ranking. While, these countries are closer to achieving sustainable mobility – and are among the top performing countries – they each still have scope for improvement. For example, neither have met zero road traffic mortalities, zero GHG emissions, acceptable levels of pollution, etc.

CHAPTER 1: CONCEPTUAL FRAMEWORK AND METRICS



1.1 Transport in the Context of Sustainable Development

For decades, the planning and design of countries' transport systems have been shaped by project-by-project considerations. Transport systems are expected to serve long-term objectives of public policy for the well-being of the planet, including the UN's 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) and the Paris Climate Agreement. Ensuring that these long-term objectives are achieved will require radical changes to the shape of transport systems—that is, a system that delivers not only universal access and works efficiently, but one that is safe, with minimal impact on the environment—in greenhouse gas (GHG) emissions, air, and noise pollution.

While these two international agreements are not explicit about the targets to be reached by the transport sector, they carry an implicit vision of transport, and what it will take to ensure that these systems play their critical enabling role in achieving the SDGs.

- SDG 13 relies on global progress in reducing greenhouse gas emissions that cannot be realized without decisive action on energy (SDG 7), with transport as one of the largest energy-consuming sectors.
- Countries cannot provide food security (SDG 2) or healthcare (SDG 3) without providing reliable and sustainable transport to underpin these advances.
- Mobility is at the heart of access to many essential services and opportunities. Young people cannot attend schools (SDG 4), women cannot be assured opportunities for employment and empowerment (SDG 5), and people with disabilities and elderly people cannot maintain their independence and dignity without safe transport that is accessible and that enables access to all that people need (SDG 9 and 11).

Decarbonization of the transport sector is crucial to achieving the Paris Agreement target

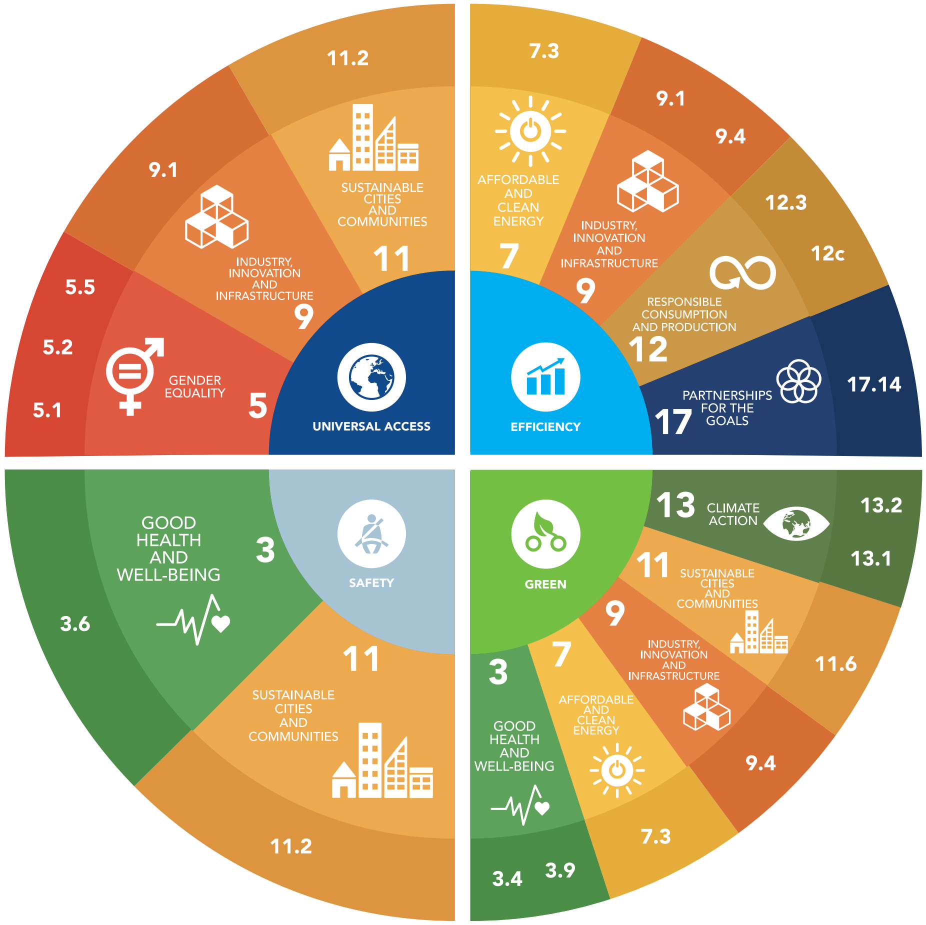
- SDG 15 on biodiversity and SDG 14 on ocean health have significant intersections with the promotion of sustainable transport, including maritime transportation.

Moreover, transport is directly reflected in SDG 3.6 and SDG 11.2 targets and indirectly linked to many others. For example, SDG 3.6 seeks to "halve the number of global deaths and injuries from road traffic accidents by 2030", while SDG 11.2 aims to "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". SDG target 9.1 is also transport-related as it aims at developing quality, reliable, sustainable, and resilient regional and transborder infrastructure to support economic development and human well-being, with a focus on affordable and equitable access for all. Furthermore, decarbonization of the transport sector is crucial to achieving the Paris Climate Agreement target.

1.2 From SDGs to the Four Goals of Sustainable Mobility

Under the umbrella of the Sustainable Mobility for All (SuM4All) Partnership, a group of 30 international organizations gathered in January 2017 in Washington, D.C., and agreed to frame the efforts of their respective organizations around the achievement of four global goals that define sustainable mobility and that are aligned with the spirit of SDGs and Paris Climate Agreement (figure 1.1).

Figure 1.1: Global SDGs and sustainable mobility goals



Source: Vandycke, N., Viegas, J.M. (2022). Defining the Playing Field: The Global Tracking Framework. In: Sustainable Mobility in a Fast-Changing World. Sustainable Development Goals Series. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-031-08961-9_9. Figure 9.1: Sustainable mobility and the 17 sustainable development goals, Page 84.

- **Universal Access:** Connecting all people—including the most vulnerable communities to economic and social opportunities—accounts for distributional considerations of transportation services. This goal ensures that everyone's individual travel needs of access to those opportunities are met. It reflects concerns for equity and social inclusivity achieved by providing universal access to transportation services. This goal has three sub-goals: universal urban access, universal rural access, and gender.

- **Efficiency:** Optimizing the predictability, reliability, and cost-effectiveness of the transport system as well as avoiding travel time losses owing to congestion or poor organization of traffic flows. This goal seeks to ensure that transport demand is met at the least possible cost for providers and users.

- **Safety:** Reducing fatalities, injuries, and road crashes is a goal that aims to improve the safety of mobility across all modes of transport. It averts public health risks and social and economic losses associated with unsafe mobility.

- **Green mobility:** Abating the environmental footprint of mobility seeks to reduce greenhouse gas (GHG) emissions and carbon impact, noise, and air pollution associated with the transportation of goods and people.

1.3 Our Moonshot on Sustainable Mobility

Sustainable mobility ushers major societal benefits on reaching its goals.

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- An additional one billion people would be connected to education, health, and jobs if we close the transport access gap in rural areas.
- Globally, an additional 380 million people would have access to sustainable transport if rapid transit systems were introduced in cities with a population of a million or more that lack it.
- An additional 20 million women would work in transport if the sector achieved gender parity in employment.

EFFICIENCY

- Improvements in border administration, transport, and communication infrastructure could increase global GDP by up to US$2.6 trillion.[1]

SAFETY

- Globally, 800,000 deaths would be avoided per year if all countries reduced their road traffic fatalities to the average in Organisation for Economic Co-operation and Development (OECD) countries.[2]

GREEN MOBILITY

- Globally, an additional 1.6 billion people would breathe cleaner air if transport pollution were halved.
- Transport-related GHG emissions would decrease from 23 to 15 percent of all energy-related emissions—equivalent to a reduction of 1.8 gigatons of carbon dioxide—if top-emitting countries bring their emissions down to their respective income group median.

The expected outcomes of successful actions on sustainable mobility are given in figure 1.2.

Figure 1.2: Economic and social outcomes associated with the four global objectives

EQUITY

- Equity of access across income groups, gender, age, disability status, and geographical location—thus, leaving "no one behind"
- Improved access to jobs and productive opportunities
- Improved access to markets and basic services as health and education
- Reduction of transport barriers for groups such as women and girls

EFFICIENCY

- Better and faster access to world markets
- More efficient use of resources (including energy, technology, space, institutions and regulations)
- Decoupling of GDP growth and energy consumption for transport
- Increase in global trade
- Regional integration
- Simplified border crossings

SAFETY

- Reduction of fatality, injury, and crash rates across all modes of transport
- Reduced risks for vulnerable groups, such as pedestrians, bicyclists, and children
- Reduction of social costs of transport related (such as health costs and forgone productivity)

GREEN

- Curbing the increase of global temperatures due to GHG emissions
- Better quality of air and lower noise pollution
- Resilience to climate disasters
- Preservation of Ecosystems
- Reduction of health costs associated with poor air quality and noise levels

Source: Sustainable Mobility for All. 2017. Global Mobility Report 2017: Tracking Sector Performance. Washington DC: Sustainable Mobility for All. ISBN: 978-0-692-95670-0. Licensed under Creative Commons Attribution CC BY 3.0. Figure 1.2: Economic and Social Outcomes Associated with the Four Global Objectives, Page 28.

1.4 Resilience of the Transport System

The concept of sustainable mobility takes a systemwide approach to transport. It views transport as more than the addition of public transportation, cars, trains, bikes, planes, and ships. Transport is a system that must concurrently deliver on all four global goals of sustainable mobility—universal or equitable access, efficiency, safety, and green mobility. This system does not exist in isolation. It interacts with many other systems like the energy system, and as we learned from the COVID-19 global pandemic, it also interacts significantly with the health system. Three major risks and threats are most critical to the transport system (Vandycke and Viegas 2022).

- Climate change and extreme weather events
- Information and telecommunication vulnerability and failures
- Global pandemics and infectious diseases

Those risks and threats must be considered when making public decisions to make sure that the transport systems are resilient.[3] A resilient transport system should have the potential to maintain minimally appropriate levels of functionality during crises and support a quick recovery to normal levels, and preferably even stronger and more resilient levels after the crisis (Vandycke and Viegas 2022).

1.5 Global Tracking Framework for Transport

Global mobility report (GMR) uses the "Global Tracking Framework for Transport" (GTF) to assess a country's quality of its transportation system and the extent to which it delivers sustainable mobility.[4] The GTF is a global dashboard of 60 transport-related indicators with data for 183 countries, structured to measure and compare country transport systems performance. It uses the definition of sustainable mobility around four goals and associated targets as a framework. The 60 indicators of the GTF are classified into principal and supporting indicators, for each of the four goals. This provides metrics to measure the quality of countries' transportation systems and progress toward sustainable mobility (SuM4All 2017).

The GTF remedies the absence of a dedicated transport SDG and related metrics for transport in the agenda 2030 and the SDG framework. It also complements ongoing efforts from the UN Statistical Commission to develop a robust monitoring framework for sustainable development.

A country's data are used to provide a snapshot of a country's transport system.[5] This report compiles the profiles of transportation and mobility systems of 183 countries, using the latest data available for 60 transport indicators, and ranks these countries based on their systems performance, using their global sustainable mobility index (GSMI) (SuM4All 2022) (table 1.1).

Table 1.1: Principal indicators in the global tracking framework for transport with data sources

	Principal Indicator (Units)	Indicator Definition	Data Source
Universal Access	The rural access index (percentage)	The rural access index (RAI) is used as a proxy for universal rural access. The RAI measures the proportion of the rural population who live within two kilometers of an all-season road. It is included in the SDGs as indicator 9.1.1, providing a way of measuring progress toward Goal 9 and Target 9.1.	Research for Community Access Partnership (RECAP)
	Rapid transit to resident ratio (km/million)	The rapid transit to resident ratio (RTR) is used as a proxy for universal urban access. This indicator compares a country's urban population (cities with more than 500,000 people) with the length of the rapid transit lines such as heavy rail, light rail or metro, and bus rapid transit (BRT) that serve the population. This metric offers a snapshot of the access, equity, and quality of life that come with increased transport options and that allow countries to track progress over time. While informal transportation is the primary mode of transportation in most developing countries, it should be noted that this indicator covers formal transportation only.	Institute for Transportation & Development Policy (ITDP)
	Female workers in transport (percentage)	Proxy indicators have increasingly been used to characterize two important aspects of gender and mobility–women as transport users and women as transport workers. Because no single indicator exists at the global level to measure female use of transport, the percentage of female workers in transport is used as a proxy for the gender sub-goal of sustainable mobility.	International Labor Organization (ILO)
Efficiency	Logistics performance index (value 0–5)	The logistics performance index (LPI) is a proxy for efficiency. The LPI is a comprehensive measure of the efficiency of international supply chains, the organization of the movement of goods through a network of activities and services operating at global, regional, and local levels.	World Bank
Safety	Mortality caused by road traffic injury (per 100,000 people)	Mortality caused by road traffic injury is estimated by road traffic fatal injury deaths per 100,000 population.	World Health Organization (WHO)
Green Mobility	Transport-related GHG emissions per capita (tons of CO_2 per capita)	This ratio is expressed in tons of carbon emitted per capita. It has been calculated using the transport CO_2 emissions expressed as a fraction of the population.	Climate Watch (CAIT)
	$PM_{2.5}$ air pollution, mean annual exposure (micrograms per cubic meter)	Air pollution is measured by looking at population-weighted exposure to ambient $PM_{2.5}$ pollution. It is the average level of exposure of a nation's population to concentrations of suspended particles measuring less than 2.5 microns in aerodynamic diameter, which are capable of penetrating deep into the respiratory tract and causing severe health damage. $PM_{2.5}$ particles in the air also reduce visibility and cause air to appear hazy when levels are elevated.	Global Burden of Disease Study and UNHABITAT
	Number of Urban Dwellers Exposed to Excessive Noise Levels	Noise pollution is measured by the number of urban dwellers exposed to excessive noise levels.	Data source not yet available

Source: Sustainable Mobility for All. 2022. Mobility Performance at a Glance: Country Dashboards 2022 Washington D.C. ISBN: 979-8-9860188-2-9. License: Creative Commons Attribution CC BY 3.0 IGO, pages 378–387.

1.6 Global Sustainable Mobility Index

The GTF computes a global sustainable mobility index (GSMI) to compare and rank countries on their transport systems' performance. The GSMI measures the extent to which the mobility system of a given country is sustainable, and how it fares relative to other countries in the world.

The GSMI is calculated as the average country on universal access, efficiency, safety, and green mobility.[6]

For example, Japan's GSMI on sustainable mobility is calculated as the average of scores on universal access (69.53), efficiency (92.20), safety (90.50), and green mobility (65.56).

Therefore, Japan's GSMI is 79.45. The GSMI countries' scores are used to rank 183 countries on a global scale. Using this calculation, Japan ranks eighth on sustainable mobility, in a global ranking of 183 countries.

Equation:

$$\text{Sustainable Mobility Index} = \text{Universal Access} + \text{Efficiency} + \text{Safety} + \text{Green Mobility} = \frac{\sum(\textit{policy goal score})}{4}$$

Japan's GSMI calculation:

$$\frac{(69.53+92.2+90.5+65.56)}{4} = \frac{(317.79)}{4} = 79.4$$

The 2022 GSMI and ranking for the top 10 and bottom 10 countries are shown in table 1.2.

Table 1.2: Global sustainable mobility index and ranking for top and bottom performing countries

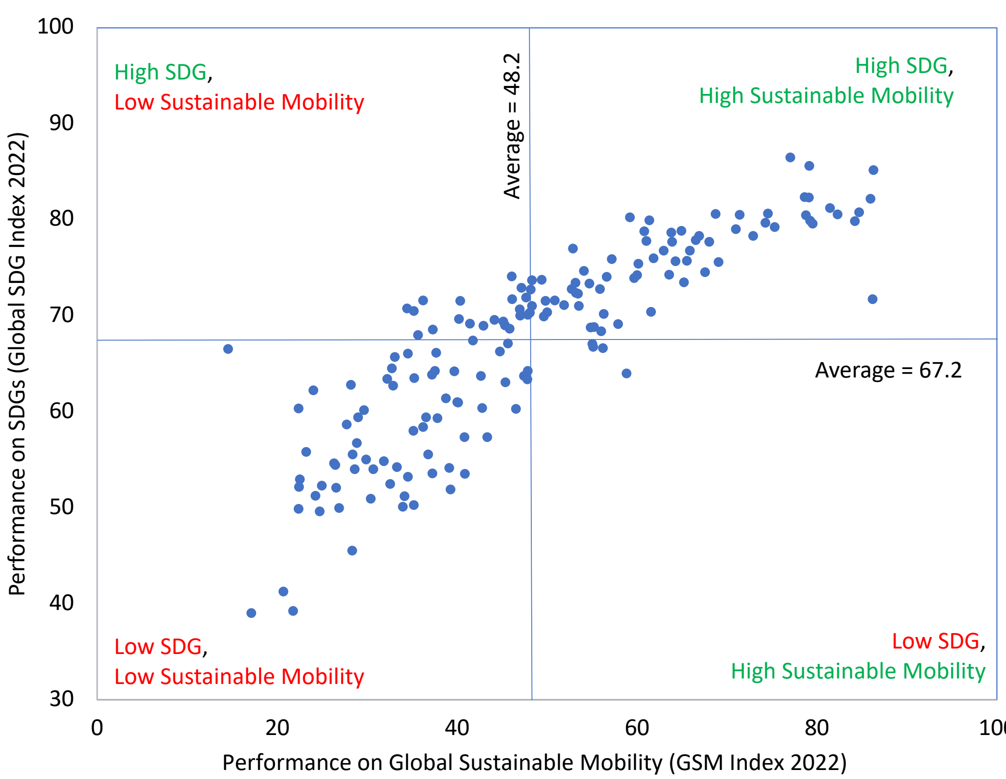
Country	Ranking 2022	Global Sustainable Mobility Index (GSMI) 2022
Sweden	1	86.22
Singapore	2	86.11
Germany	3	85.91
Switzerland	4	84.64
Netherlands	5	84.15
United Kingdom	6	82.21
France	7	81.41
Japan	8	79.45
Spain	9	79.21
Denmark	10	79.07
Guinea-Bissau	173	22.56
Sierra Leone	174	22.50
Niger	175	22.42
Libya	176	22.41

Country	Ranking 2022	Global Sustainable Mobility Index (GSMI) 2022
Liberia	177	22.37
Venezuela, RB	178	22.37
Central African Republic	179	21.76
Chad	180	20.65
Eritrea	181	19.14
South Sudan	182	17.10
Saudi Arabia	183	14.51

Source: Sustainable Mobility for All. 2022. Mobility Performance at a Glance: Country Dashboards 2022 Washington D.C. ISBN: 979-8-9860188-2-9. License: Creative Commons Attribution CC BY 3.0 IGO. Table 1: Global Sustainable Mobility Index and Country Ranking, 2022, pages 4–9.

Performance on sustainable mobility and progress closely correlate SDG progress as measured by the global SDG index 2022.[7] Countries with the highest scores on the SDGs have, on average, more robust and sustainable transport systems (figure 1.3). In contrast, those with the lowest progress on the SDGs score poorly in their transport system. This result suggests that transport systems performance is essential if countries are to make considerable progress toward or attain the SDG targets.

Figure 1.3: Global SDG index and global sustainable mobility index, 2022.



Source: Authors elaboration using data from Global Sustainable Mobility Index 2022 (Sustainable Mobility for All. 2022. Mobility Performance at a Glance: Country Dashboards 2022 Washington D.C. ISBN: 979-8-9860188-2-9. License: Creative Commons Attribution CC BY 3.0 IGO) and the Global SDG index 2022 (Sachs, J., Kroll, C., Lafortune, G., Fuller, G., & Woelm, F. (2022). Sustainable Development Report 2022. Cambridge: Cambridge University Press. doi:10.1017/9781009210058, URL: https://dashboards.sdgindex.org/rankings)


COM:
dex (82.05)
09.15
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POT:
rlg (82.05)

Notes

1 "Enabling Trade: Valuing Growth Opportunities." (2013). Geneva, World Economic Forum. Retrieved from: http://www3.weforum.org/docs/WEF_SCT_EnablingTrade_Report_2013.pdf

2 The moonshot on safety is based on data and analysis on mortality caused by road traffic injury from WHO for OECD high income countries.

3 Resilient transport systems can absorb risks and threats at the least possible costs. Resilience in the context of transport refers to the ability of the transport system to recover or bounce back to the original state before exposure to shock.

4 The GTF is available on the SuM4All website via https://www.sum4all.org/global-tracking-framework with data feely downloadable by accessing the Data Module of the *Policy Decision-Making Tool for Sustainable Mobility* 3.0. The GTF is regularly updated since 2017 with new data and new indicators.

5 In Mobility Performance at a Glance: Country Dashboards 2022. https://www.sum4all.org/data/files/mobilityataglancereport-2022-pageby-page_web.pdf.

6 In the case of Universal Access—which is defined by 3 subgoals of urban access, rural access, and gender equity—equal weight is applied to each subgoal.

7 The countries' Global SDG index 2022 is available at https://dashboards.sdgindex.org/rankings

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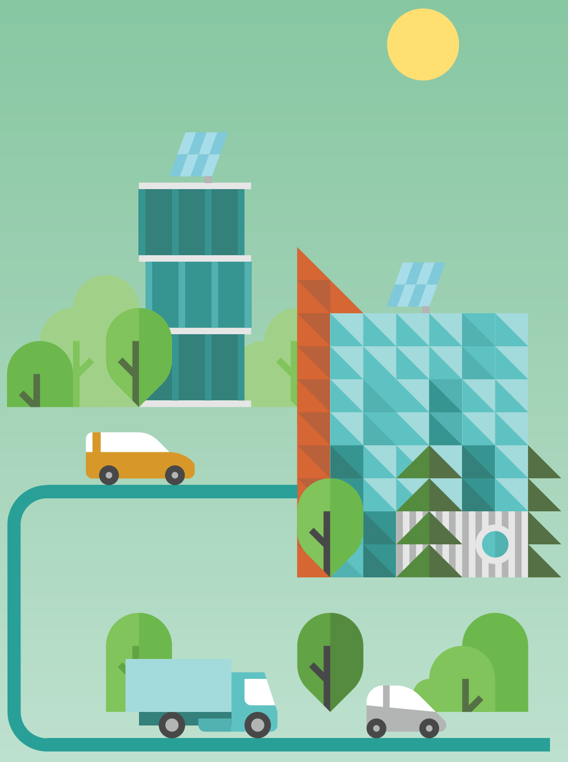
Vandycke, N., and Viegas, J.M. (2022). A Systemic Approach to Transport and Mobility. In: Sustainable Mobility in a Fast-Changing World. Sustainable Development Goals Series. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-031-08961-9_7

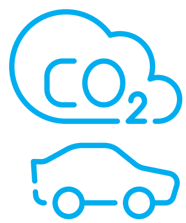
CHAPTER 2:
GREEN MOBILITY



2.1 Goal Definition

Green mobility is a broad concept that captures the ambition to abate the environmental footprint of mobility. This goal seeks to reduce greenhouse gas (GHG) emissions and carbon impact, noise, and air pollution associated with the transportation of goods and people.

The transport sector accounts for one-quarter of total energy-related carbon dioxide emissions



Specifically, the green mobility goal seeks to reduce the environmental impact of mobility.

- **Climate change mitigation**—reduce GHG emissions across all modes of transport (SuM4All 2019). The transport sector accounts for one-quarter of total energy-related carbon dioxide emissions (IEA 2019), and its share is increasing. Transport-related GHG emissions are expected to grow up to 60 percent by 2050 compared to 2015 levels (ITF 2019).

- **Air pollution reduction**—reduce premature deaths and illnesses from air pollution associated with local transport.[1] Transport is also one of the largest sources of both urban and regional air pollution (UNEP n.d.). Nine out of ten people now breathe polluted air, which kills 7 million people every year (WHO 2022).

- **Noise pollution reduction**—reduce global human mortality and the burden of disease from local transport-related noise levels (SuM4All 2019). Evidence from a few countries suggests that traffic noise ranks second in environmental impact on health after air pollution (WHO 2011).

2.2 Global Commitments and Targets

The green goal is aligned with the sustainable development goals—SDGs 3, 7, 9, and 11–14—the Paris Climate Agreement, the international policy frameworks for international aviation, on carbon offsetting and reduction schemes for example, and maritime transport, and other frameworks for action at the global and regional levels. Those international agreements and frameworks provide indicative targets for each sub-goal.

- **Climate change mitigation:** A recent study estimates that in order to meet the 1.5 degrees Celcius target of the Paris Agreement, transport emissions per capita should not exceed an average of 0.2 tons of carbon dioxide per year by 2050 (Gota et al. 2019). In aggregate terms, achieving this target requires bringing annual global transport emissions down to two gigatons of carbon dioxide by 2050 (Gota et al. 2019), from a level of approximately 7.6 gigatons of carbon dioxide equivalent (UNEP 2022). This will need to be complemented by net zero emissions at the beginning of the second half of the century.

- **Air pollution:** The World Health Organization set a guideline value of five micrograms per cubic meter particulate matter $_{2.5}$ air pollution for each country and large city (WHO 2021).

- **Noise pollution:** In the absence of a global target for transport noise pollution, the Partnership estimated in 2019 that a reasonable target for each country and city is to reduce the number of urban dwellers exposed to excessive noise levels by 50 percent by 2030 compared with 2015 levels (SuM4All 2019). The European Environmental Agency set a target to reduce by 2030 the number of people chronically disturbed by noise from transport in Europe by 30 percent compared with 2017 levels (EEA 2022).

2.2.1 SDGs Targets

The green mobility goal is related to SDG 13, which is to take urgent action to combat climate change and its impacts.[2] Transport plays a critical role in the achievement of SDG targets 13.1 and 13.2:

- **SDG 13.1:** Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.

- **SDG 13.2:** Integrate climate change measures into national policies, strategies, and planning.

The objective is also reflected indirectly in seven SDG targets.

- **SDG 3.4:** By 2030, reduce by one-third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being.

- **SDG 3.9:** By 2030, reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination.

- **SDG 7.3:** By 2030, double the global rate of improvement in energy efficiency.

- **SDG 9.4:** By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource–use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.

- **SDG 11.6:** By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.

- **SDG 12.c:** Rationalize inefficient fossil fuel subsidies that encourage wasteful consumption by removing market distortions. This is established in accordance with national circumstances, by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts. It considers specific needs and conditions of developing countries and minimizes possible adverse impacts on their development in a manner that protects the poor and the affected communities.

2.2.2 Paris Climate Agreement Targets

The Paris Climate Agreement[3] aims to keep global average temperature rise well below two degrees Celsius above pre-industrial levels, and to pursue efforts to further limit temperature increases to 1.5 degrees Celsius. Transportation is the second-largest source of energy-related carbon dioxide emissions globally, contributing 25 percent of total energy-related carbon dioxide emissions (IEA 2021). Meeting climate mitigation thus requires a rapid and deep reduction in global GHG emissions to reach global net zero emissions by 2050. Although the Paris Climate Agreement does not include global targets for emissions reduction for transport, the Intergovernmental Panel on Climate Change (IPCC) Climate Change 2022 report estimates that global transport-related carbon dioxide emissions should fall by 59 percent from the prevailing level by 2050 to limit global warming to 1.5 degrees Celsius (IPCC 2022).

At the heart of the Paris Agreement are two country-driven tools to define and set mitigation and adaptation targets at the country level: (i) nationally determined contributions (NDCs)[4] and long term strategies (LTS).[5] However, very few NDCs and LTS include quantitative targets for emissions reduction in transport.

- As of 12 October 2021, 41 percent of second-generation NDCs[6] had transport targets—either transport GHG mitigation targets or non-GHG targets for transport—representing 70 percent of total transport carbon dioxide emissions, excluding international aviation and shipping ((SLOCAT 2021a).

- By October 12, 2021, 32 countries and the EU—on behalf of 15 member countries—had submitted LTSs. The LTSs submitted at that time covered 35 percent of total carbon dioxide emissions and 51 percent of transport carbon dioxide emissions, excluding international aviation and shipping. Majority of the LTSs—61 percent of all submissions—are from Europe with no LTS submissions from low income countries. In second-generation NDCs, a clear shift emerged away from actions related to public transport and toward e-mobility[7]-related actions. Freight remains overlooked in NDC measures despite the sector's large contributions to GHG emissions (SLOCAT 2021a).

- Updated NDCs submitted to the UN after COP26 shaved off less than one percent of projected emissions (UNEP 2022).

- All NDCs include food systems. However, demand-side measures and actions to reduce emissions from food processing, storage, and transportation of the food systems are frequently overlooked (UNEP 2022).

- To have a chance at 1.5 degrees Celsius, global emissions must drop 45 percent by 2030. But countries' NDCs will only cut emissions by 5 to 10 percent by that date (UNEP 2022).

- Most of the 193 Parties to the Paris Agreement mentioned the transport sector in their intended NDCs. This broadly falls into three categories: (i) 81 percent mentioned the transport sector in carbon dioxide mitigation efforts; (ii) 60 percent proposed specific transport mitigation measures; and (iii) 10 percent defined a specific transport sector carbon dioxide reduction target. The transport sector is largely acknowledged as a relevant source of carbon dioxide emissions. Therefore, transport is an important sector to focus on when defining carbon dioxide reduction ambitions and measures. The share of Parties that defined specific transport mitigation targets is 10 percent, which is relatively low. According to SLOCAT (2016), the reason for this lack of sector-specific targets, is that countries often do not allocate emissions targets to specific sectors, including transport. They do not have detailed data on the costs and benefits of carbon dioxide mitigation for a specific sector. As a result, the 2030 targets established in NDCs of most countries are typically only economywide (ITF-OECD 2018; SLOCAT 2016).

2.2.3 IMO Maritime Transport Targets

Maritime transport is responsible for 11 percent of the total transport GHG emissions. It accounts for nearly three percent of global GHG emissions annually. In 2018, the International Maritime Organization (IMO) introduced its initial greenhouse gas strategy[8] to reduce emissions from international shipping. The strategy aims to cut absolute GHG emissions by at least 50 percent from the 2008 level by 2050. It also targets reducing the carbon intensity of international shipping by at least 40 percent by 2030 and 70 percent by 2050, relative to the 2008 baseline. The IMO has set out to identify measures for the short term (approved in 2020), medium term (between 2023 and 2030), and long term (beyond 2030).

In April 2022, Clydebank Declaration for green shipping corridors[9] asserted the need for the formation of an international coalition between ambitious governments, to act together and demonstrate that maritime decarbonization is possible, while unlocking new business opportunities and socioeconomic benefits for communities across the globe. The signatories[10] of the Declaration are to support the establishment of green shipping corridors – zero-emission maritime routes between 2 (or more) ports. The collective aim is to support the establishment of at least 6 green corridors by the middle of this decade while aiming to scale activity up in the following years, by inter alia supporting the establishment of more routes, longer routes, and/or having more ships on the same routes. The aspiration is to see many more corridors in operation by 2030. The signatories will assess these goals by the middle of this decade, with a view to increasing the number of green corridors. The signatories pledged to (i) facilitate the establishment of partnerships, with participation from ports, operators, and others along the value chain, to accelerate the decarbonization of the shipping sector and its fuel supply through green shipping corridor projects; (ii) identify and explore actions to address barriers to the formation of green corridors. This could cover, for example, regulatory frameworks, incentives, information sharing, or infrastructure; (iii) consider the inclusion of provisions for green corridors in the development or review of National Action Plans; and (iv) work to ensure that wider consideration is taken for environmental impacts and sustainability when pursuing green shipping corridors (UK Department for Transport 2022).

In 2023, IMO will release its second greenhouse gas strategy. In this perspective at COP26, a coalition of 15 countries[11] and a coalition of 230 private sector organizations[12] called for an ambition increase of the 2050 IMO's objective to net zero. However, these coalitions did not integrate a broader set of mitigation actions and options to reach this higher ambition. They include demand-side and systemic mitigation options like the reorganization of business value chains toward supply chains that are shorter and less dependent on long-distance overseas transport. The 2022 IPCC report highlighted the role of considering demand-side and systemic changes to reach the Paris Agreement goal. This is related to SDG 12, "Ensure sustainable consumption and production patterns." In particular, it considers the responsibility of the development of long and scattered business value chains in the fast increase of maritime emissions (IPCC 2022).

2.2.4 ICAO Air Transport Targets

Aviation transport accounts for 12 percent of the total transport emissions and is a source of approximately three percent of global carbon emissions. The global Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) was launched in 2021.[13] Although it is not an emission reduction target, CORSIA complements the other elements of the basket of measures by offsetting the amount of carbon dioxide emissions that cannot be reduced using technological improvements, operational improvements, and sustainable aviation fuels with emissions units from the carbon market.

The International Air Transport Association (IATA) made the Fly Net Zero Commitment[14] at the 77th Annual General Meeting on October 4, 2021, to achieve net zero carbon emissions by 2050 for the global air transport industry. This commitment will align with the Paris Agreement goal for global warming not to exceed 1.5 degrees Celsius. (IATA 2021).

2.3 Current State of Play

The SuM4All Partnership identified three principal indicators to proxy progress on the green goal. It also identified targets for each subgoal, using international agreements whenever available. The use of principal Indicators allows for measuring the distance that remains between actual country performance and the target and comparing year-to-year progress to conclude the direction in which the global transport system is evolving in environmental footprint (table 2.1).

Over time, transport GHG emissions per capita has continued to increase, suggesting that the global transport system is evolving in the wrong direction in carbon footprint. This also means that the gap between the aggregate level of carbon emissions and ambition—0.2 tons of carbon dioxide per capita—has widened. Without increased global action, transport-related GHG emissions will continue to grow. A multisectoral, coordinated effort between the transport and energy sectors is needed to achieve the aspirational target of 0.2 tons of carbon dioxide per capita.

The global average exposure to air pollution was reduced by a negligible margin between 2017 and 2019. However, meeting the aspirational target of 5 micrograms per cubic meter will require significant efforts to curb air pollution. This suggests that globally, the air pollution target is far from being achieved.

Local data collection and reporting lack standard methodology on noise pollution as well as an internationally agreed target or global data coverage to benchmark and compare noise pollution globally. Moreover, capacity is limited to collect and aggregate data on transport-related noise pollution, particularly in developing countries. The proposed principal indicator for tracking noise is the percentage of urban dwellers exposed to day-evening-night and nighttime (L_{den}/L_{nigh})[15]annual average noise levels from transport above 55 decibels (dB)/40 decibels (dB) (percent of total inhabitants) (SUM4All 2017).

Table 2.1: Principal indicators on green mobility targets–average global performance

Indicator	Previous Data	Latest Data	Aspirational Target
GHG emissions - Transport-related GHG emissions per capita (tons of CO_2 per capita)	1.13 (2017)	1.14 (2019)	0.2[a]
Air pollution - $PM_{2.5}$ air pollution, mean annual exposure (micrograms per cubic meter)	28.46 (2017)	27.90 (2019)	< 5[b]
Noise pollution - Number of urban dwellers exposed to excessive noise levels	No global data are available on noise pollution	No global data are available on noise pollution	n/a

Source: Authors analysis on data: On transport-related GHG emissions per capita CAIT retrieved from Climate Watch Data; On $PM_{2.5}$ air pollution, mean annual exposure from UN Habitat.

Notes:

a. According to SuM4All's Global Roadmap of Action Toward Sustainable Mobility in 2019 (p.22), the global aspirational target for transport-related GHG emissions per capita was estimated to be less than 0.3 tonnes of CO_2 per capita. This figure was based on computations from the IEA's Energy Technology Perspectives Report in 2017. The aspirational target has since been revised as a newer study, by Gota, S., Huizenga, C., Peet, K. et al in 2022 showed that in order for transport to meet the 1.5 degrees C target of the Paris Agreement by 2050, then the average transport emissions per capita need to be less than 0.2 tonnes CO_2 per capita per year.

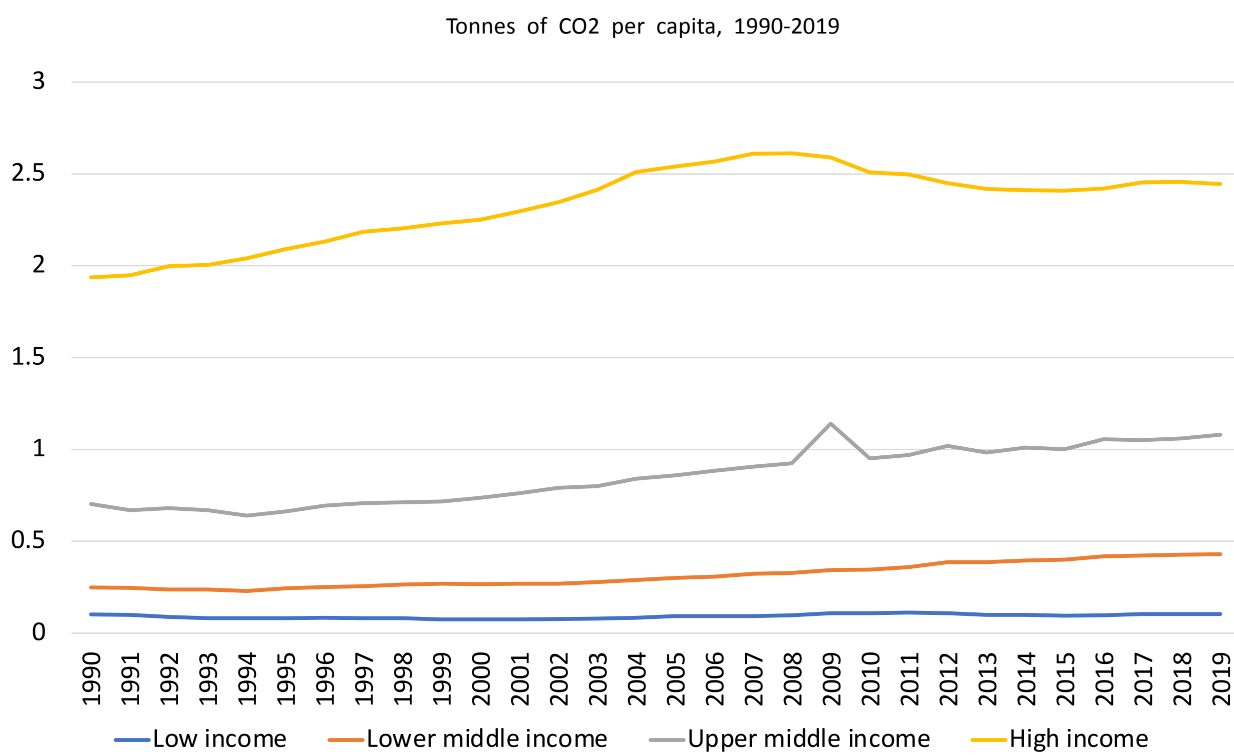
b. Based on the World Health Organization (WHO) mean guideline at the time, SuM4All's GRA report in 2019 set the global aspirational target for $PM_{2.5}$ mean annual exposure as 10 micrograms per cubic meter. This has since been revised by WHO to 5 micrograms per cubic meter under the air quality guidelines 2021 – which is the first major update to the standards in 15 years.

2.3.1 GHG emissions

The transport sector contributed 7.6 gigatones of carbon dioxide in 2020. In the same year, Brazil, China, the European Union, India, Indonesia, the Russian Federation, the United States of America, and international transport accounted for more than 55 percent of the total global GHG emissions (UNEP 2022).

The Global Mobility Report 2017 (SuM4All 2017) reported that the transport sector contributes 23 percent of global energy-related GHG emissions and 18 percent of all man-made emissions in the global economy. Based on the latest data, the state of transport sector emissions is worse compared to 2017. Analysis of trends in transport-related GHG emissions by the countries' income levels, shows that high income countries are historically responsible for approximately 62 to 70 percent of annual transport-related global emissions since 1990—with emissions continuously growing until 2008. Figure 2.1 illustrates the historical responsibility of high income countries in the GHG emissions problem causing climate change, and the apparent green divide that exists between high emitters/high-income countries, and low-emitters/low-income countries. As an example, 23 low income countries in Africa contribute to less than one percent of global carbon dioxide emissions from transport (SuM4All 2022).

Figure 2.1: Average transport-related GHG emissions per capita by income level



Source: CAIT retrieved from Climate Watch Data with authors' analysis.

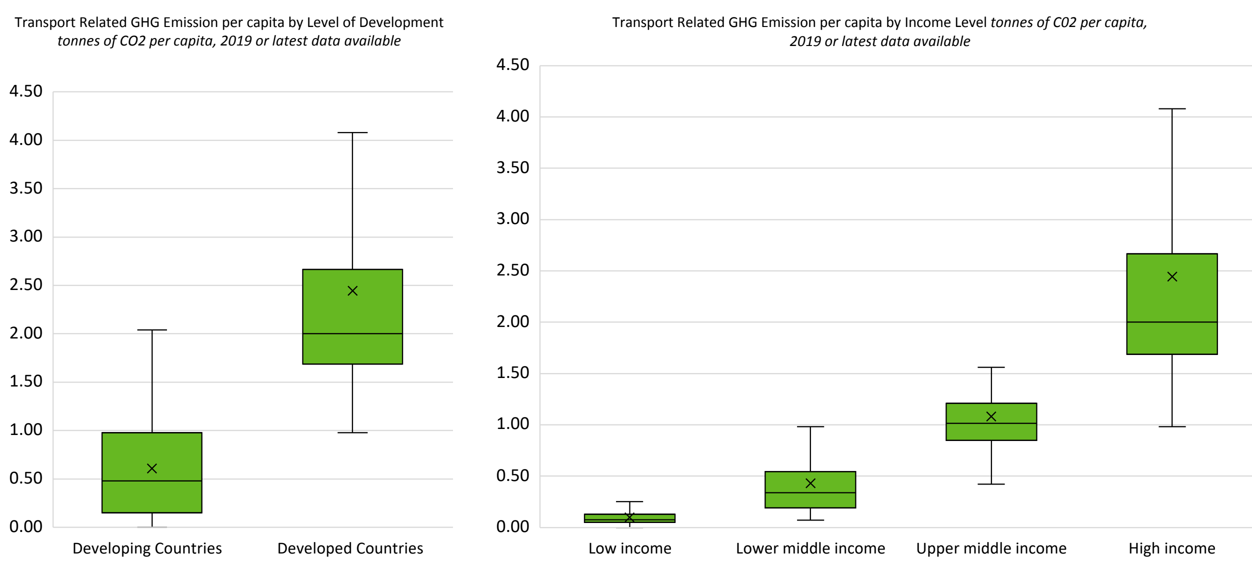
The top 10 emitters of transport-related carbon dioxide emissions per capita are Australia, Brunei Darussalam, Canada, Kuwait, Luxembourg, New Zealand, Qatar, Saudi Arabia, United Arab Emirates, and the United States, which are all high income countries.

The latest data on transport-related GHG emissions by countries' level of development and income level (figure 2.2) reinforces the view that developing countries contribute little to GHG emissions. Developing countries contribute an average of 0.6 tons of annual transport carbon dioxide emissions per capita compared to 2.4 tons from developed countries while the global average is 1.14 tons of carbon dioxide emissions per capita.

A study on future transport emissions concluded that average transport emissions per capita needed to achieve 0.2 tonnes of carbon dioxide per year by 2050 for transport to contribute to the 1.5 degrees Celsius target of the Paris Agreement (Gota et al. 2019). This means that the global average should be below the prevailing average level for developing countries that are the least emitters.

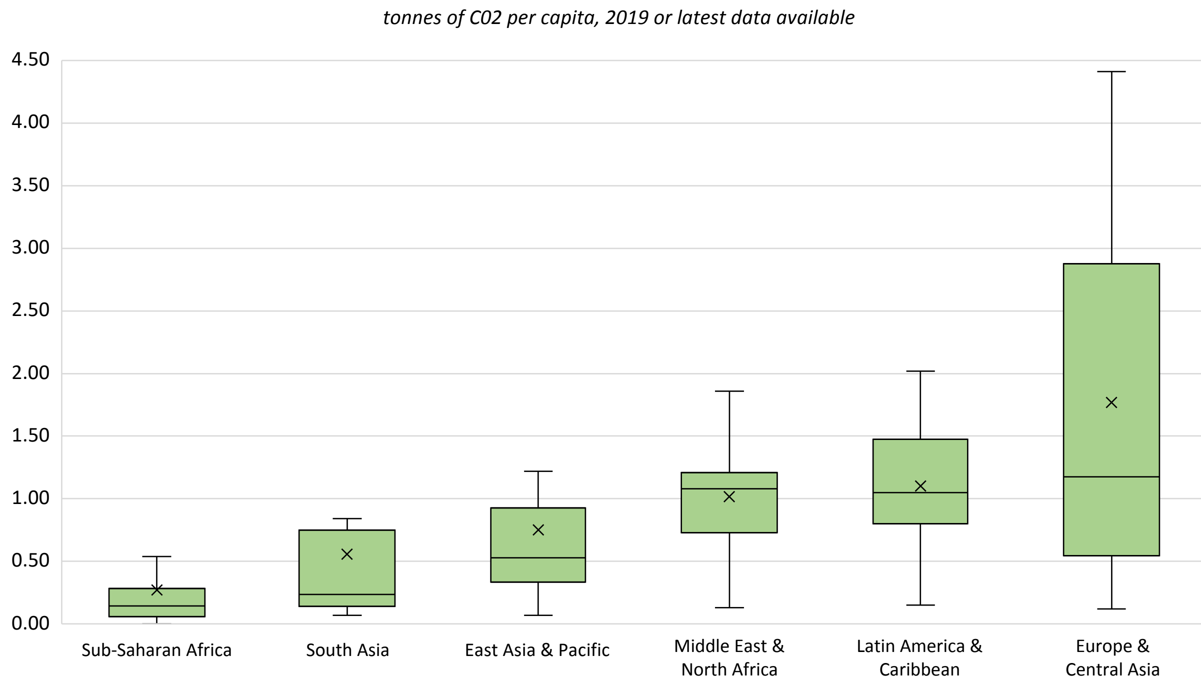
Analysis of data on transport-related GHG emissions by regions found that developing countries in Middle East & North Africa have the highest carbon emissions per capita while developing countries in Sub-Saharan Africa have the least carbon emissions per capita (Figure 2.3).

Figure 2.2: Performance on GHG emissions per capita by the level of development and by income group classifications



Source: CAIT retrieved from Climate Watch Data with authors' analysis.
Note: The height of the box on either side of the median shows the spread of the observations between the first and third quartiles (i.e., the 25 percent and 75 percent largest values). The whiskers show where the more spread-out observations lie, while X marks the mean value.

Figure 2.3: Performance on GHG emissions per capita by regions for developing countries

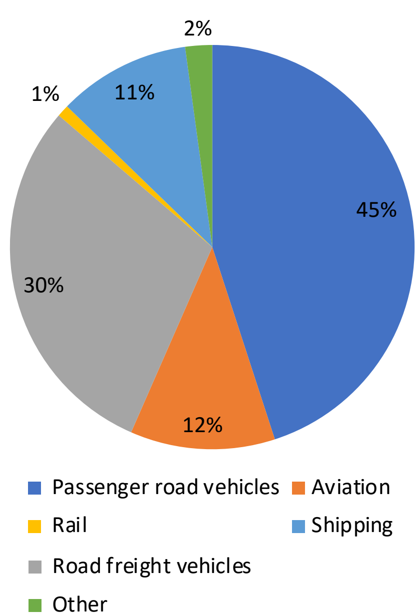


Source: CAIT retrieved from Climate Watch Data with authors' analysis.

Road transport accounts for 75 percent of transport emissions (figure 2.4). It is among the high-emitting subsectors that drive global emissions growth accounting for 5.6 Gt gigatons carbon dioxide equivalent or 10 percent of global emissions (UNEP 2022). Most of the emissions from road transport come from passenger road vehicles, which contribute 60 percent, whereas the rest is from road freight vehicles, which contribute 40 percent. Road freight emissions, in particular, come from approximately three million companies operating about 217 million vehicles including vans, trucks, and buses (Shell Int. 2021). Approximately 60 percent of the sector's carbon dioxide emissions are generated by nearly 63 million medium and heavy duty trucks (MDTs and HDTs respectively) (IEA 2017). Road freight is rapidly improving its emission efficiency, but the amount of emission reduction is limited to what can be achieved with improvements to technology using diesel engines. If the industry continues with the prevailing trajectory, carbon dioxide emissions are expected to grow (Shell Int. 2021a). On the road passenger dimension, emissions come from cars, two- and three-wheelers, buses and mini-buses, and taxis. Passenger cars are the biggest source of road passenger emissions, followed by buses and minibuses, with the rest being from taxis, and two- and three-wheelers (Our World in Data 2020; Statista 2021).

Rail travel and freight emit the least number of emissions—only one percent of transport emissions (figure 2.3). Rail accounts for eight percent of global passenger travel and about nine percent of freight activity, but only three percent of transport energy use. Extensive expansion of urban and high speed rail has occurred over the past decade, with China leading the way. On average, rail requires 12 times less energy and emits 7–11 times less GHG per passenger-kilometer traveled than private vehicles and airplanes, making it the most efficient mode of motorized passenger transport. Aside from shipping, freight rail is the most energy efficient and least carbon intensive way to transport goods. Despite being one of the lowest emitting transport modes, oil accounted for 55 percent of total energy consumption in rail and powered 28 percent of all passenger rail transport activity in 2020 (Tracking Transport 2021). Rail uses 80 percent less energy than trucks per ton of freight carried and holds a four-to-one advantage over cars in its emissions intensity. However, in most countries, rail is underrepresented in freight carried, measured in metric ton-kilometers, and passenger kilometers traveled. To make matters worse, rail has been losing share to higher polluting transport modes in most major markets across the globe. Furthermore, the ongoing shift in freight transport from bulk shipping to container-based intermodal transport, particularly for consumer goods, may continue to favor trucks over rail (Zawadzki et al. 2022).

Figure 2.4: Global Transport sector carbon dioxide emissions by mode in 2020



Source: International Energy Agency raw data with authors' analysis.
Note: "Other" includes pipeline and non-specified transport. In terms of the absolute level of emissions, road passenger transport contributed 3.64 $GtCO_2e$, while road freight transport contributed 2.41 $GtCO_2e$, aviation contributed 0.94 $GtCO_2e$, shipping contributed 0.86 $GtCO_2e$, rail transport contributed 0.08 $GtCO_2e$ and others including pipeline and non-specified transport contributed 0.17 $GtCO_2e$.

Aviation accounts for 12% of total transport emissions

Aviation transport accounts for 12 percent of the total transport emissions. If aviation were a country, it would be the twelfth largest emitter (figure 2.4) (ATAG 2020). Passenger flights account for 85 percent of emissions from aviation while cargo flights account for the remaining 15 percent. Out of approximately 800 million air passengers worldwide, 150 to 300 million account for about half of all aviation emissions. Short-haul flights—those under 1,000 kilometers—account for 13 percent of passenger air travel and 19 percent of emissions. Medium- and long-haul flights—more than 1,500 kilometers—drive 87 percent of passenger aviation volume and 81 percent of emissions (Shell Int. 2021b). Operational improvements leading to increased load capacities and reduced share of empty-seat kilometers have increased energy efficiency per aircraft kilometer. However, despite these significant energy-efficiency improvements, air transport remains one of the most energy-intensive transport modes. Additionally, the increase in the number of flights taken is causing an upward trajectory for emissions. Its unique facilitation of long-distance travel radically expands the size of its carbon footprint (ITF 2021). In 2019, fossil fuel combustion in commercial flights emitted close to one billion tons of carbon dioxide globally. Pre-COVID-19, direct emissions of carbon dioxide from air transport were made up of 40 percent of domestic and 60 percent of international air and nearly 2.5 percent of total energy-related carbon dioxide emissions. These emissions are distributed unevenly across countries. For instance, the United States alone accounts for almost a quarter of the global total, while less developed countries with half of the world's population account for approximately 10 percent of direct carbon dioxide emissions from air transport (ITF 2021).

Global shipping is responsible for 11% of total transport emissions

Global shipping is responsible for 11 percent of the total transport emissions (Figure 2.3). In 2018 Global shipping energy demand resulted in approximately one billion tons of carbon dioxide from international shipping and domestic navigation. Approximately 99 percent of the energy demand from the international shipping sector is met by fossil fuels, with fuel oil and marine gas oil (MGO) comprising as much as 95 percent of the total demand (IMO 2020). International shipping enables 80–90 percent of global trade and comprises about 70 percent of global shipping energy emissions. If the international shipping sector were a country, it would be the sixth or seventh-largest carbon dioxide emitter, comparable to Germany (IRENA 2021). The global maritime fleet comprises 92,251 vessels. Large and exceptionally large ships representing nearly 20 percent of global fleet are responsible for about 85 percent of net GHG emissions associated with the international shipping sector (IRENA 2021).

Are we on Track to Achieve GHG Emissions Targets and Commitments?

Despite the drastic pandemic's impact on transport demand, which resulted in almost empty streets, transport emissions did not reach the desired level of less than 0.2 tonnes CO_2 per capita in 2020. The transport sector was the fastest growing fossil fuel combustion sector worldwide from 2010 to 2019, with sectoral emissions rising more than 17 percent during this period. To meet the Paris Agreement targets and to keep the rise in the average global temperature below 1.5 degrees Celsius, transport emissions will need to drop by 74 percent to two gigatons of carbon dioxide by 2050 (Gota et al. 2019), compared to 7.6 gigatons carbon dioxide equivalent in 2020 (UNEP 2022). Therefore, the temporary reduction in transport emissions experienced during the pandemic in 2020 is equal to the reductions needed annually to meet 2050 targets and to close the transport emissions gap (SLOCAT 2021b).

Progress has been achieved as more countries embrace GHG mitigation targets for transport, but it is far from enough to put the world on a path to achieving the Paris Agreement goals. Prevailing transport decarbonization policies are insufficient to pivot passenger and freight transport onto a sustainable path (AQR 2020). Achieving the NDCs will require climate action in cities, but NDCs lack national frameworks to support local action. Coherence is notably lacking between domestic and international commitments to decarbonize aviation and shipping (SLOCAT 2021a).

Aviation has received insufficient climate policy attention, despite a 40 percent increase in emissions between 2010 and 2019. Passenger and freight aviation was responsible for about 10 percent of global transport carbon dioxide emissions in 2018. The aviation sector is challenging to decarbonize due to high energy requirements, constraints to the scale-up of biofuels, and challenges with electrification (SLOCAT 2021b).

Public transport warrants more attention both for COVID-19 post-pandemic trends and for its sectoral climate mitigation potential. It is more energy efficient than other motorized modes across greenhouse gas (GHG) emissions per person and reduces fossil fuel dependency (SuM4All 2022a). Public transport can support public health through fewer air pollutants and increased physical activity—people walk and cycle to and from stations—and through improved traffic safety for all road users (APTA 2018). Furthermore, whereas cycling has gained momentum during the pandemic, further investment is needed to maintain increased demand. Optimizing cycling's potential to mitigate transport emissions will require investing in bike lanes and parking, planning and institutional capacity, and increasing the affordability of e-bikes across regions. Shared mobility services will need to be more integrated and electrified to achieve untapped decarbonization potential. It should be noted that e-mobility will only fully decarbonize transport if it is powered with renewable energy. Walking is the dominant, zero emission transport mode in much of the Global South, yet a significant investment gap remains between walking and motorized transport infrastructure (UNEP 2022). Electric vehicles emit less carbon per vehicle-kilometer compared to conventional vehicles per vehicle-kilometer travelled. This brings significant decarbonization benefits but the benefits this advantage only becomes further accentuated as the power sector pursues the necessary decarbonization trajectory over time (Briceno et al 2023). Freight transport accounts for around 40 percent of transport emissions globally, yet green freight measures are not proportionally reflected among policy priorities. More must be done to stem rising freight emissions such as investments in freight rail and inland waterways and emission standards for heavy duty vehicles.

The World Bank's Climate Change Development Reports (CCDRs) are new core diagnostic reports that integrate climate change and development considerations. They will help countries prioritize the most impactful actions that can reduce greenhouse gas (GHG) emissions and boost adaptation, while delivering on broader development goals. CCDRs build on data and rigorous research and identify main pathways to reduce GHG emissions and climate vulnerabilities, including the costs and challenges as well as benefits and opportunities from doing so. The reports suggest concrete, priority actions to support the low-carbon, resilient transition. Box 2.1 and 2.2 below highlight some key elements of examples from CCDRs in South Africa and Türkiye respectively.

Box 2.1: Adapting to a Changing Climate—The Resilient Transition for the Transport Sector the Case of South Africa

South Africa has the most developed transport and logistics sector in sub-Saharan Africa, but challenges remain in terms of efficiency and access to services, especially for rural communities and the poor. The sector is dominated by road-based transportation but also operates regionally important ports and hosts the largest rail and air network on the continent. The transport sector's contribution to GDP was R310 billion in 2021, of which 78 percent was generated by the freight subsector, and it employed over 600,000 people. Key challenges in the sector include: (i) unequal and inefficient public transport services, partly an apartheid legacy; (ii) difficulties in the migration of freight from road to rail; (iii) underinvestment in transport infrastructure, including in maintenance, particularly in rail; and (iv) continued underperformance of key transport SOEs. As a result, logistics costs in SA were at 12.8 percent of GDP in 2013, compared to only 8 percent for the United States and 8.7 percent for the European Union, reducing the country's competitiveness in global markets and making imports more expensive. Some of SA's freight transport infrastructure network (rail and port) was built to service coal exports and may need to be repurposed to serve other growing industries as a result of the low-carbon transition.

As detailed below, actions that will reduce GHG emissions in the sector can also help achieve development objectives.

- Adopting a low-carbon pathway in the transport sector requires a reduction in fossil fuel consumption and a shift in the modality of transportation.
- If properly implemented, the Green Transport Strategy (GTS), issued in 2018 by the Department of Transport, can further support the low-carbon transition while reducing the investments required for the transition. Key goals of the GTS include:
  - *A shift from private to public passenger transport.* A 20 percent relative shift to public transport by 2030.
  - *Alternative vehicles.* A minimum of 10 percent of the vehicle population will comprise EVs and hybrid vehicles by 2030, reaching 40 percent by 2050.
  - *Minibus conversion to biofuel vehicles.* Ten percent of the minibus taxi fleet will be converted to use biofuels by 2030, reaching 40 percent by 2050.
  - *Metrobus to gas.* Ten percent of the municipal bus fleet will be converted to use gas by 2030, reaching 30 percent by 2050.
  - *A shift from road to rail for corridor freight transport.* By 2030, the rail share of corridor freight transport will be 30 percent, and by 2050, 50 percent.
- The CCDR estimates the net present value of the investments required for low carbon transition in the sector to be around R380 billion over the period 2022–2050. The bulk of these costs will arise from the shift to EVs, followed by the investments required to expand rail along major corridors. These estimates do not include the investments required for the transition in the maritime and aviation subsectors.

Recommendations

- Restoring and improving commuter rail services while enhancing the efficiency of public road transport should be an immediate priority.
- Developing low-carbon minibus taxis is a priority, but it will require some sector formalization to be viable at scale.
- In the medium to long term, developing more inclusive and spatially integrated urban multi-modal planning is an effective way of improving public transport systems in cities.
- As the major automotive producer and importer in sub-Saharan Africa, SA has a unique opportunity to take the first mover advantage of the worldwide shift toward EVs.
- To further reduce the carbon emissions and operating costs of the railway sector, actions should be taken to improve the efficiency of long-distance freight transport by rail.
- The low-carbon transition in the transport sector should be done in a way that addresses the sector's objectives of improved inclusion and strengthened maintenance.

Source: The World Bank Group. 2022. Country Climate Development Report: Africa Region: South Africa. https://openknowledge.worldbank.org/bitstream/handle/10986/38216/SA_CCDR_MainReport.pdf?sequence=1&isAllowed=y.

Box 2.2: World Bank Climate Change Development Report – Türkiye

Türkiye's geographic, climatic, and socioeconomic conditions make it highly vulnerable to the impacts of climate change and other environmental hazards, making adaptation and resilience important priorities. Türkiye has high vulnerability in most climate vulnerability dimensions selected by the World Bank. Its transport system is more vulnerable than comparable countries, and the country is experiencing food security issues, increasing water stress, and unprecedented disaster events, such as the 2021 forest fire season. This vulnerability is due to a combination of climate factors, population exposure (for example, share of population exposed to floods and forest fires), and socioeconomic factors (such as share of agriculture in the economy).

Climate risk and vulnerability in Türkiye and selected countries

	Australia	Germany	Italy	Mexico	Türkiye	United States
Agriculture, forestry, and fishing (% of GDP)	Medium	Low	Medium	High	High	Low
Annual extreme heat days increase in 2050	High	Medium	Medium	High	High	High
Average annual risk to assets	Medium	Low	High	Medium	Medium	Medium
Average annual risk to wellbeing	Medium	Low	High	Medium	High	Medium
Forcibly displaced population	Medium	High	Medium	Low	High	Medium
Population exposed (% of total)	Low	High	Low	High	High	Low

Low Medium High

Although the increase in Türkiye's greenhouse gas (GHG) emissions has been slower than economic growth and its per capita emissions are lower than in the OECD or EU countries, there is a strong case for a forceful mitigation agenda in Türkiye. The energy sector—which includes the power, transport, building, and industrial sectors—is the country's single largest contributor to GHG emissions, accounting for three-quarters of total emissions. Türkiye's power, transport, and agriculture sectors are less carbon intensive than the EU average—partly due to the large penetration of renewable energy in Türkiye's power system and low motorization rates.

Türkiye has made ambitious climate change commitments, ratifying the Paris Agreement in October 2021, and committing to net zero emissions by 2053. The country is establishing new institutional arrangements for climate change issues, including the recently formed Ministry of Environment, Urbanization and Climate Change and the updating of the National Climate Change Action Plan.

The World Bank Group's Country Climate and Development Report (CCDR) on Türkiye explores opportunities and trade-offs for aligning the country's development goals with its recent commitments on climate change. It explores how climate action would affect Türkiye's growth and development path and can contribute to achieving the country's development objectives, help capture opportunities offered by green technologies and sectors, protect the economy against longer-term risks, such as large-scale disasters or carbon lock-in as the world transitions towards reduced greenhouse gas emissions, and support a just and inclusive transition.

A resilient and net zero development pathway (RNZP) can help Türkiye achieve its development and climate objectives but it implies a significant departure from current trends and important policy changes. For the transport sector – which contributed 15 percent of Türkiye's total gross emissions for 2020 – the CCDR report identifies the following 2030 milestones for the country:

- Share of rail in total freight transport: 8% (4% in 2020)
- Public transit (buses and rail) modal share for surface transport: 49% (47% in 2020)
- Electrification of cars and buses: 12% and 19%, respectively (both 0% in 2020)
- New investments screened for risks; critical assets identified and strengthened

Source: The World Bank Group. 2022. Country Climate Development Report: Europe and Central Asia Region: Türkiye https://openknowledge.worldbank.org/bitstream/handle/10986/37521/T%c3%bcrkiye%20CCDR%20Full%20Report.pdf?sequence=1&isAllowed=y

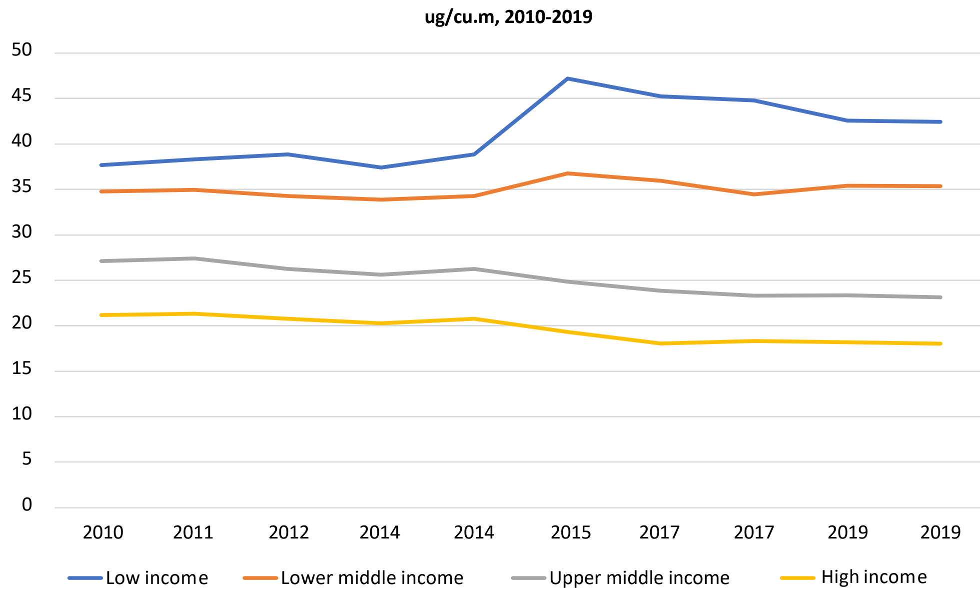
2.3.2 Air Pollution

It is estimated that the global cost of health damage associated with exposure to air pollution is US$8.1 trillion, equivalent to 6.1 percent of the global GDP (World Bank 2022). Air pollution from the burning of fossil fuels—with transport and private cars major contributors—is an issue that plagues cities around the world and is responsible for approximately 8.7 million deaths each year. In the UK alone, 40 cities and towns exceed the WHO pollution limits, with more than one in 19 deaths in these cities and towns related to long term exposure to $PM_{2.5}$—one of the dominant emissions from car exhaust. Other than long-term exposure, courts and coroners in the UK have ruled in a few cases that air pollution—whose principal source of which were traffic emissions —has caused death for example by triggering an asthma attack[16].

In the Asian subregion, urban areas follow a similar trend with 46 Indian cities, six Pakistani cities, and four Bangladeshi cities appearing among the 100 most polluted cities in the world in 2020, according to the concentration of $PM_{2.5}$ (AQR 2020). In India, 1.67 million deaths were attributable to air pollution in 2019, accounting for 17.8 percent of the total deaths in the country (Dash 2020). Without radical and targeted action from governments and citizens, the issue of air pollution is only going to get worse (RTA 2021).

The burden of air pollution has consistently remained high in developing countries compared to developed countries. A time series analysis of the trends in average annual exposure to air pollution by the countries' income levels from 2010-2019 (figure 2.5) showed a higher concentration of $PM_{2.5}$ the lower the country's income.

Figure 2.5: $PM_{2.5}$ Air pollution average annual exposure by the income level



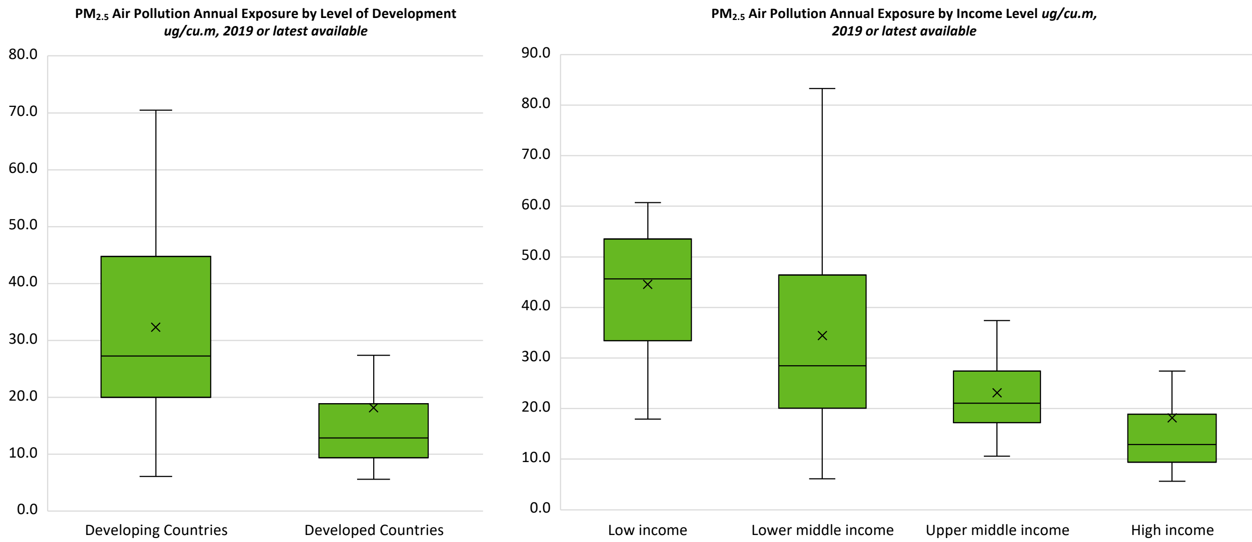
Source: UNHABITAT and Global Burden of Disease Study raw data with authors' analysis.

Analysis of the existing levels of average annual exposure to air pollution by the countries' levels of development and income level (figure 2.6) showed that the challenge of air pollution impacts developing countries more compared to developed countries. Developing countries have an average mean annual exposure of 32.3 micrograms per cubic meter against 18.2 micrograms for the developed countries.

Disparities are apparent between income levels. High income countries followed by upper middle income are the least exposed to air pollution. Although only one percent of the world's motor vehicles are in low income countries (WHO 2018), they face the highest burden of air pollution. This is because most vehicles imported to low income countries (LICs) are second-hand vehicles that are typically many years or even decades old, and LICs have weak fuel standards compounded by poor enforcement (Sarriera and Sehmi 2019). In addition, most of the used cars imported to low and middle income countries (LMICs) are of inferior quality and would fail roadworthiness tests in the exporting countries (UNEP 2020). This has led to vehicle stocks in LICs being inferior, which results in large negative externalities that compromise the air quality (World Bank 2021). Transport-related carbon emissions per capita are not correlated with exposure to air pollution. For example, high-income countries (HICs) with the least exposure to air pollution are leading with the highest tons of carbon dioxide emissions per capita. High emissions are due to the high motorization rates in (HICs) while the low exposure to air pollution is due because vehicles and fuels in (HICs) are cleaner.

Disparities are also apparent within income groups. For example, the mean annual exposure to air pollution in lower middle income countries can be as low as 6.1 micrograms per cubic meter in Nicaragua and as high as 83.3 micrograms per cubic meter in India. These values would respectively reflect the top three lowest and highest readings on air pollution in the world, which shows that efforts to reduce air pollution are needed by countries across the board, and not just particular groups of countries based on income level. Electric mobility adoption brings the potential to reduce local air pollution (Briceno et al 2023).

Figure 2.6: Performance on air pollution by the level of development and by income group classifications

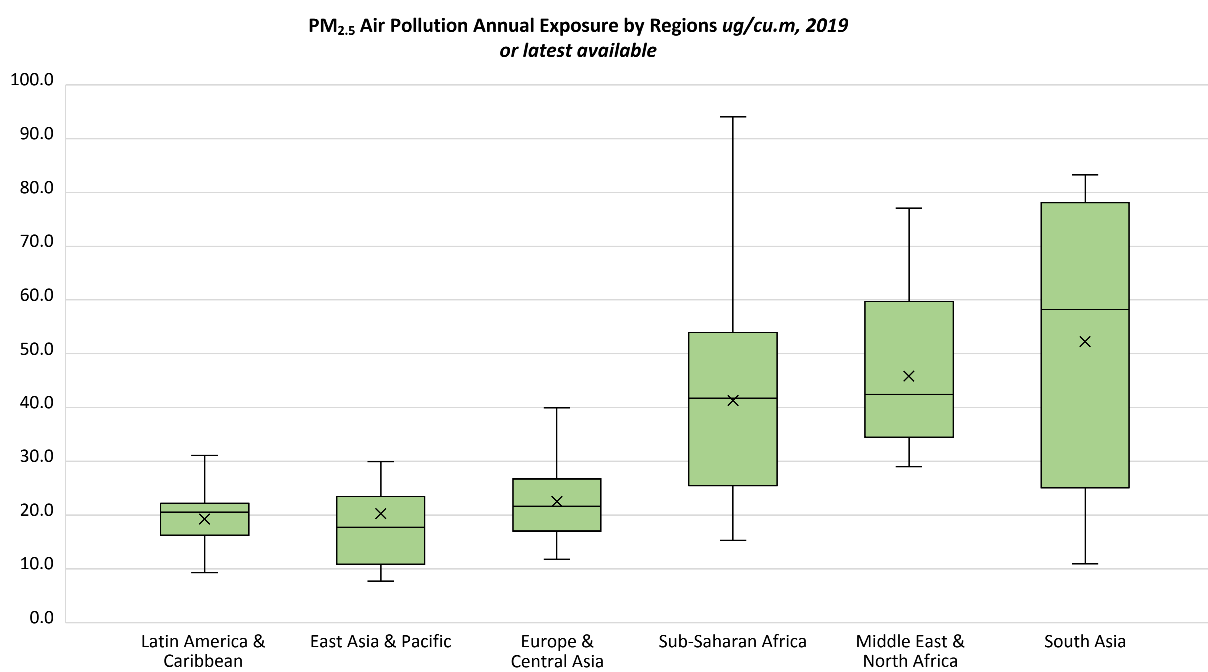


Source: UNHABITAT and Global Burden of Disease Study raw data with authors' analysis.

Note: The height of the box on either side of the median shows the spread of the observations between the first and third quartiles (the 25 percent and 75 percent largest values). The whiskers show where the more spread-out observations lie, while X marks the mean value.

Analysis of the existing levels of average annual exposure to air pollution by regions (figure 2.7) showed that a higher burden of exposure to air pollution is faced by developing countries in South Asia, Sub-Saharan Africa, and Middle East & North Africa while developing countries in Latin America and the Caribbean face the lowest burden.

Figure 2.7: Performance on air pollution by regions for developing countries



Source: UNHABITAT and Global Burden of Disease Study raw data with authors' analysis.

2.3.3 Noise Pollution

Noise pollution continues to be a major environmental problem, cited as a top environmental risk to health across all age and social groups and an addition to the public health burden. Traffic noise is the most significant source of noise in cities. The noise pollution comes from conventional sources, such as roads, railways, airports, and industry. Many cars and other road vehicles that have internal combustion engines are making road traffic noise a leading noise pollution source. Electric and hybrid cars give rise to lower noise levels in urban areas as their engines are silent.

While a standard methodology with data to benchmark and compare noise pollution does not yet exist, a review of the literature shows that:

- Across the European Union, at least 20 percent of citizens are currently exposed to road traffic noise levels that are considered harmful to health.
- Nine in 10 mass transit users in New York City are exposed to noise levels exceeding the recommended limit of 70 decibels and may be at risk of irreversible hearing loss.
- Over 72 percent of the city's residents in Barcelona are exposed to noise levels of over 55 decibels. More than half of the residents of large European cities live in areas where noise levels may adversely affect their health and well-being.
- In Ho Chi Minh City, cyclists are exposed to noise levels above 78 decibels, which can cause irreversible hearing loss.
- Two in five residents of Hong Kong are exposed to road traffic noise above the permissible limit. Residents with lower income and poor housing are more exposed to traffic noise compared to wealthier residents.
- In Europe, noise pollution affects one in five citizens and leads to 12,000 premature deaths every year and contributes to 48,000 new cases of ischemic heart disease yearly. In addition, 22 million and 6.5 million people suffer from chronic noise annoyance and sleep disturbance, respectively because of exposure to noise pollution.
- Two 15-year-long studies of long term residents of Toronto, Canada found that exposure to road traffic noise elevated risks of acute myocardial infarction and congestive heart failure, and increased the incidence of diabetes mellitus by eight percent, and hypertension by two percent (UNEP 2022; Grubesa and Suhanek 2020).

Over the past several decades, policy makers have achieved some progress in addressing noise pollution.

2.4 Outlook

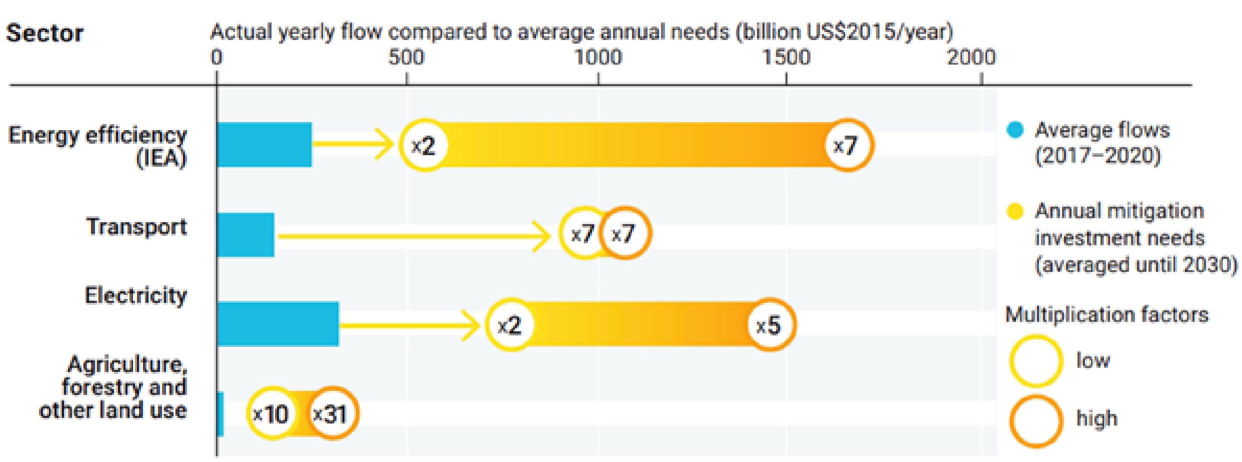
According to the latest ITF-OECD Transport Outlook Report, Total transport activity will more than double by 2050 compared to 2015 (ITF-OECD 2021). Passenger transport will increase 2.3-fold. Freight transport will grow 2.6-fold. Continuing economic development and a growing world population will translate into more demand for transportation overall. This means that transport carbon dioxide emissions could increase from eight gigatons in 2019 to 14.5 gigatons in 2050, under the business-as-usual pathway. Carbon dioxide emissions from transport will increase by 16 percent by 2050 even if today's commitments to decarbonize transport are fully implemented. The expected emissions reductions from these policies will be more than offset by increased transport demand (ITF 2021).

The overall transport sector emissions can be expected to increase by almost 80 percent between 2020 and 2050 without further policy interventions beyond those already adopted or committed to by governments around the world. It is expected that rapid growth in travel demand in China, the Asia-Pacific region, India, and Africa will outpace the effects of adopted policies and lead to substantial emissions growth in those regions (ICTT 2021).

The IPCC estimates that global mitigation investments for the transport sector need to increase by a factor of seven for transport to contribute to the 1.5 degrees Celsius target of the Paris Agreement (IPCC 2022) (figure 2.8).

In an ambitious scenario with the successful deployment of efficiency standards, zero emission vehicle mandates, emissions standards, and renewable fuel standards and fuel suppliers, 85 percent of the total required reduction would be achieved. It would leave a gap of approximately 1.4 gigatons to achieve our target in 2050. The gap must be filled by implementing additional policies outside of those that address the new vehicle fleet and fuels, such as fiscal incentives, city-level vehicle restrictions, carbon pricing, infrastructure investments, road-toll differentiation, vehicle scrappage schemes, and more (ICTT 2021).

Figure 2.8: Finance flows and mitigation investment needs by sector



Source: United Nations Environment Programme. 2022. Emissions Gap Report 2022: The Closing Window — Climate crisis calls for rapid transformation of societies. Nairobi. https://www.unep.org/emissions-gap-report-2022. Figure 7.1 Finance flows and mitigation investment needs by sector, type of economy, and region, Page 66.

Road transport: The road freight sector accounts for about 9 percent of global carbon dioxide emissions – and demand for road freight is set to double before 2050. To meet the targets set out in the Paris Agreement, absolute emissions from road freight will need to decline almost 60 percent by 2050, despite a doubling of road freight volume over the same period. On the current trajectory, the road freight sector will not meet the targets of the Paris Agreement. This is also coupled with the challenge of the road freight sector being a hard-to-abate sector given the long asset lifespans, high energy dependency, and complexity of electrification (Shell Int. 2021a). On the road passenger side, even under the most optimistic decarbonization scenarios, more than two billion new internal combustion engine (ICE) vehicles will be sold over the next 30 years. These vehicles must be as efficient as possible (ICTT 2021).

It is worth noting that according to EIA (2021), the global conventional fleet will peak by 2038 – which is at least a step in the right direction. This has been reflected in recent trends of large emitters of GHGs, such as China and India, are making positive progress on electrification of their fleets to reduce the environmental externalities of their transport systems. See box 2.3, which unpacks the global EV outlook.

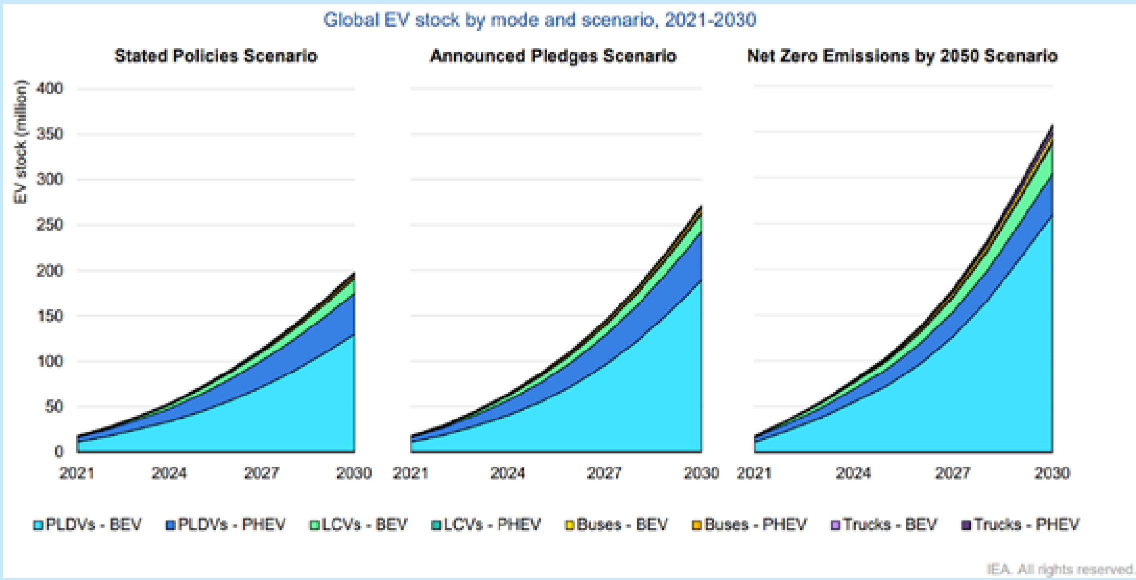
Aviation transport: Air transport is a source of around 3 percent of global carbon dioxide emissions, and aviation volume is expected to more than double by 2050, driven by population and global economic growth—with new parts of society joining the middle class. Aviation is excluded from some major efforts to tackle climate change because decarbonizing the sector is perceived as complex. However, as other sectors decarbonize, aviation's share of total emissions will increase. Unless the aviation sector takes action, emissions are expected to more than double by 2050 (Shell Int. 2021b). Sustainable aviation fuels are required to meet 13–18 percent of aviation fuel needs in 2030 and 78–100 percent in 2050, requiring a significant increase in uptake. (IEA 2021; Graver et al. 2022; University Maritime Advisory Services 2021).

Maritime transport: The International Maritime Organization (IMO) indicates that by 2050 maritime trade could increase between 40 percent and 115 percent in comparison to 2020 levels. If no actions are taken, IMO has flagged that GHG emissions associated with the shipping sector could grow between 50 percent and 250 percent by 2050 in comparison to 2008 emission levels (IRENA 2021). Maritime shipping vessels have not yet begun to use zero emission shipping fuels, but zero emissions fuels will need to meet 5–17 percent of maritime shipping needs in 2030 and 84–93 percent by 2050 (IEA 2021; Boehm et al. 2022).

The projections suggest that scaling up action is required because a huge emissions gap still exists between where we are and the ambition set by the Paris Agreement to limit global warming to well below two, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. To achieve this, the global transport sector will need to cut down emissions from 7.6 gt gigatons carbon dioxide equivalent as of 2020 to two gigatons carbon dioxide equivalent (Gota et al. 2019). Meeting this ambition will require transformative changes including a combination of demand management solutions combined with modern technologies, such as the rapidly growing use of electromobility for land transport and the emerging options in advanced biofuels and hydrogen-based fuels for shipping and aviation.

Box 2.3: Global EV (Electric Vehicles) Outlook

Prevailing trends in EV sales and government policies bring projected EV adoption closer to being on track with the trajectory to net zero emissions by 2050.[a]



EVs take a share of road vehicle sales in all modes in the short term

If all existing policies and measures, as well as policy ambitions and targets that have been legislated by governments around the world are implemented (Stated Policies Scenario), the global EV stock across all road transport modes, excluding two or three-wheelers, expands rapidly from almost 18 million in 2021 to 200 million vehicles by 2030, an average annual growth of more than 30 percent. In this scenario, EVs account for about 10 percent of the road vehicle fleet by 2030. Total EV sales reach 18 million in 2025 and over 30 million vehicles in 2030, representing respectively 13 percent and over 20 percent of all road vehicle sales. This compares to almost seven million in 2021.

If all announced ambitions and targets made by governments around the world, including the most recent ones, are met in full and on time (Announced Pledges Scenario), the global EV stock reaches over 85 million vehicles in 2025 and 270 million vehicles in 2030, excluding two or three-wheelers). The share of EVs in the stock reaches 14 percent in 2030. EV sales in this scenario reach over 45 million vehicles in 2030, achieving a sales share of 33 percent.

For comparison, in the net zero scenario, the global EV stock reaches more than 100 million vehicles in 2025 and 350 million vehicles in 2030, excluding two or three-wheelers). The share of EVs in the stock reaches 20 percent in 2030. In 2030, EV sales reach over 65 million vehicles, representing a sales share of almost 60 percent. This sales share is 80 percent higher than the announced pledges scenario, indicating that government pledges fall short of reaching net zero by 2050.

Light duty vehicles

In the stated policies scenario, the electric light commercial vehicles (LCVs) stock rises from about 17 million in 2021 (95 percent of the total EV market) to nearly 70 million vehicles in 2025 and over 190 million vehicles in 2030, remaining over 95 percent of total EVs through 2030. Globally, the share of electric LDVs in the total stock of LDVs increases from just over one percent today to 10 percent in 2030. Sales of electric LDVs rise from almost seven million in 2021 to over 17 million in 2025 (a sales share of about 15 peercent) and over 30 million in 2030 (more than 20 percent).

In the Announced Pledges Scenario, about 265 million electric LDVs are projected to be circulating worldwide by 2030 (of which less than 25 million are LCVs), corresponding to an almost 15 percent share in the LDV stock. Sales of electric LDVs are projected to reach 45 million in 2030 (a sales share of 35 percent), 50 percent above the Stated Policies Scenario. These results reflect government net zero emissions pledges and electrification targets, including the COP26 declaration on accelerating the transition to 100 percent zero emissions cars and vans.[b]

In the Net Zero Scenario, the sales share of electric LDVs is more than 60 percent in 2030, which is over one-and-a-half times higher than in the Stated Policies Scenario and 80 percent higher than in the Announced Pledges Scenario

Buses

The global electric bus fleet is the second largest EV market today when excluding two or three-wheelers; it increases from 670 000 in 2021 to 1.7 million in 2025 and three million in 2030 in the Stated Policies Scenario, representing over five percent and 11 percent stock shares, respectively. Most of the electrification is limited to urban buses, in particular, driven by efforts to reduce air pollution. Intercity buses have lower levels of electrification, as they have longer routes and require longer charging times. In the Stated Policies Scenario, electric buses reach just under 20 percent sales share in 2030.

In the Announced Pledges Scenario, the deployment of electric buses accelerates to about 4.5 million in 2030, corresponding to over 15 percent of the stock. In 2030, almost one-third of buses sold are electric, a 50 percent higher sales share than in the Stated Policies Scenario. In the Net Zero Scenario, electrification of buses is further accelerated to a 55 percent sales share and almost 25 percent stock share in 2030.

Medium and heavy duty trucks

More than 65,000 electric trucks are in operation. In the Stated Policies Scenario, the electric truck fleet expands to 2.8 million in 2030, reaching about 2.5 percent of the total truck stock. In the Announced Pledges Scenario, the electric truck stock reaches over three million (a 2.8 percent stock share) based on government net zero emissions pledges and electrification targets. The share of electric trucks in total sales today is very small but rises to 7 percent over the projection period (10 percent in the Announced Pledges Scenario).

In the Net Zero Scenario, the sales share of electric trucks reaches around 25 percent in 2030, three-and-a-half times higher than in the Stated Policies Scenario and two-and-a-half times higher than in the Announced Pledges Scenario. This underlines the need for further government ambitions and the need to implement the required policies to put trucks on a pathway to reaching net zero emissions by 2050.

Two or three-wheelers

Electric two or three-wheelers are projected to continue to be the largest EV fleet among all road transport modes. Asia is the main center of growth, where two or three wheelers are prevalent. The global stock of electric two or three-wheelers in the Stated Policies Scenario increases from more than 35 million in 2021 to 245 million in 2030, accounting for over a quarter of the total stock in 2030. Sales of electric two or three-wheelers increase from almost 10 million in 2021 to 40 million in 2030, when they account for more than half of all sales.

In the Announced Pledges Scenario, the global stock of electric two or three-wheelers rises to over 330 million in 2030, 35 percent of the total stock for two or three-wheelers. This corresponds to sales close to 55 million in 2030, amounting to about 65 percent of all sales.

In the Net Zero Scenario, electric two or three-wheelers reach a sales share of 85 percent in 2030, 60 percent and 30 percent higher than the Stated Policies and Announced Pledged scenarios, respectively.

Source: International Energy Agency (IEA). 2022. Global EV Outlook 2022 Securing supplies for an electric future. France. https://iea.blob.core.windows.net/assets/ad8fb04c-4f75-42fc-973a-6e54c8a4449a/GlobalElectricVehicleOutlook2022.pdf.

Note:

a. PLDVs = passenger light-duty vehicles; BEV = battery electric vehicle; LCVs = light commercial vehicles; PHEV = plug-in hybrid electric vehicle. The figure does not include electric two/three-wheelers. For reference, total road vehicle stock (excluding two/three-wheelers) in 2030 is 2 billion in the Stated Policies Scenario, 2 billion in the Announced Pledges Scenario, and 1.8 billion in the Net Zero Emissions by 2050 Scenario.

b. COP26 declaration on accelerating the transition to 100% zero emissions cars and vans

Notes

1 Transport is a key contributor to urban air pollution, but its share varies strongly across cities and data are often not available. In addition, the difference between on-road and test cycle emissions (both air pollution and GHG) should be considered. Black carbon reduction contributes significantly to climate change objectives as well (ICCT, 2018).

2 The SDGs are available at https://sdgs.un.org/goals.

3 The Paris Climate Agreement is available at: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement.

4 More information on the Nationally determined contributions (NDCs) is available at: https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs/nationally-determined-contributions-ndcs.

5 More information on the long-term strategies (LTSs) is available at: https://unfccc.int/process/the-paris-agreement/long-term-strategies.

6 NDCs are submitted in a five-year cycle, with the first generation of NDCs submitted in 2015 and subsequent generations submitted every five years thereafter. Parties to the UNFCCC were requested to submit second-generation NDCs by the end of 2020. Second Generation NDCs refer to second NDCs and updated/enhanced NDCs. Source: https://slocat.net/wp-content/uploads/2021/11/Climate-Strategies-for-Transport-An-Analysis-of-NDCs-and-LTS-SLOCAT-8-November-2021-NEW.pdf.

7 Electromobility (e-mobility) as the systems, services, and equipment that support the movement of passengers and freight by electric-powered means of transport. Source: Sustainable Mobility for All. 2022. E-mobility in Low-Income Countries in Africa: Finance, Governance, and Equity. Washington DC, ISBN: 979-8-9860188-3-6. License: Creative Commons Attribution CC BY 3.0 IGO. https://www.sum4all.org/data/files/e-mobility_in_low-income_countries_in_africa-finance_governance_and_equity.pdf.

8 The Initial IMO GHG Strategy is available on https://www.imo.org/en/MediaCentre/HotTopics/Pages/Reducing-greenhouse-gas-emissions-from-ships.aspx.The mandatory regulations to cut the carbon intensity of existing ships that were approved by the International Maritime Organization (IMO) Marine Environment Protection Committee (MEPC) are available on https://www.imo.org/en/MediaCentre/PressBriefings/pages/42-MEPC-short-term-measure.aspx.

9 The COP 26 Clydebank Declaration for green shipping corridors is available at: https://www.gov.uk/government/publications/cop-26-clydebank-declaration-for-green-shipping-corridors/cop-26-clydebank-declaration-for-green-shipping-corridors.

10 The signatories of the COP 26: Clydebank Declaration for green shipping corridors include: Australia, Belgium, Canada, Chile, Costa Rica, Denmark, Fiji, Finland, France, Germany, Ireland, Italy, Japan, Republic of the Marshall Islands, Morocco, Netherlands, New Zealand, Norway, Palau, Singapore, Spain, Sweden, The United Kingdom of Great Britain and Northern Ireland, and The United States of America

11 The Declaration on Zero Emission Shipping by 2050 by 15 countries at the UN Climate Change Conference 2021 (COP26) – Glasgow – 1 November 2021 is available at: https://em.dk/media/14312/declaration-on-zero-emission-shipping-by-2050-cop26-glasgow-1-november-2021.pdf

12 The Call for Action for Shipping Decarbonization by 230 private sector industry leaders and organizations is available at: https://www.globalmaritimeforum.org/content/2021/09/Call-to-Action-for-Shipping-Decarbonization.pdf.

13 The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) is available at https://www.icao.int/environmental-protection/CORSIA/Pages/default.aspx.

14 More information on the Fly Net Zero Commitment is available at: https://www.iata.org/en/programs/environment/flynetzero/.

15 L_{den} corresponds to average day-evening-night noise levels, and Lnight corresponds to nighttime noise levels.

16 See https://www.theguardian.com/environment/2020/dec/16/girls-death-contributed-to-by-air-pollution-coroner-rules-in-landmark-case.

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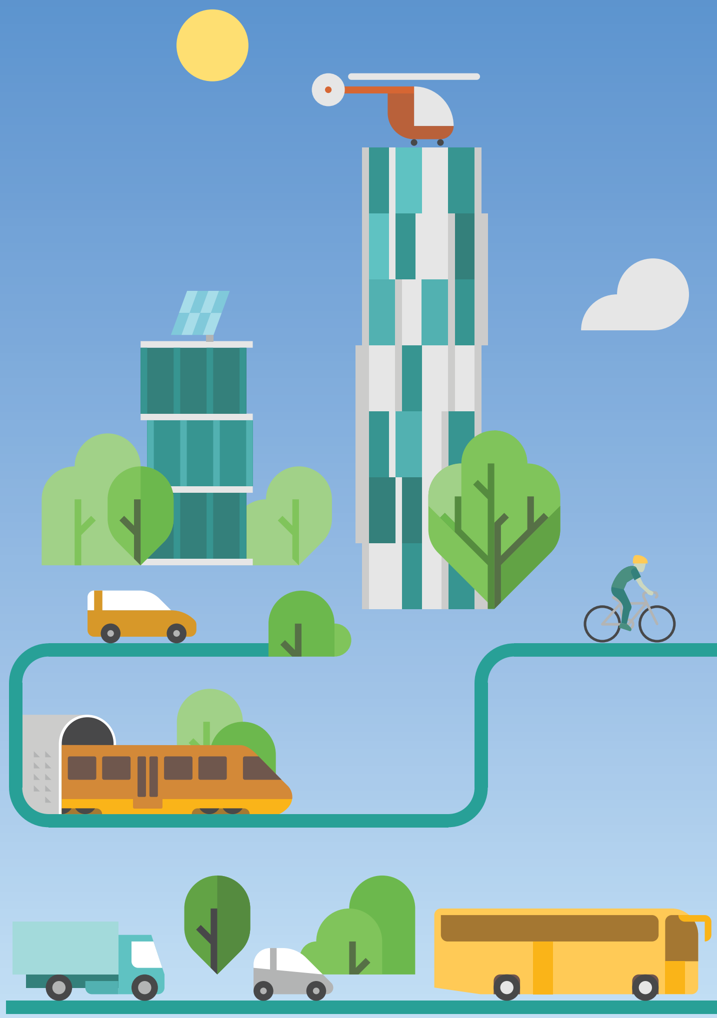
CHAPTER 3: UNIVERSAL ACCESS



3.1 Goal Definition

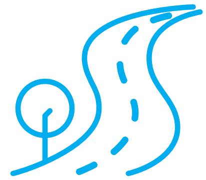
Universal access is a broad concept that captures the ambition of transport services "to connect all people and communities to economic and social opportunities, considering the needs of different groups, including the poor, those in vulnerable situations, women, children, the elderly, and persons with disabilities, across geographical locations". This goal seeks to ensure that everyone's individual travel needs of access to those opportunities are met. The goal accounts for distributional considerations for transport services (SuM4All 2019). It reflects concerns for social inclusivity achieved by providing universal access to transport services. Ensuring universal and equitable access is of paramount importance since infrastructure and services are rarely distributed equitably (SuM4All 2019a).

The goal reflects concerns for equity and social inclusivity achieved by providing universal access to transport services. This goal should be tailored by location or horizontal equity, and demographic characteristics or vertical equity such as income, age, and gender. However, owing to lack of data and studies on many of these dimensions, the Global Mobility Report will focus on and monitor three dimensions only: urban areas, rural areas, and gender. The urban and rural classifications represent horizontal equity of location, and gender represents a piece of vertical equity, considering specific demographic profiles of individuals.

The goal of universal access consists of three sub-goals.

- **Universal Urban Access** refers to the provision of transport services to all in cities, especially the most vulnerable populations to enable access to economic and social opportunities, including jobs, markets, and social facilities. The goal is to seek equity of access in cities (SuM4All 2019).

- **Universal Rural Access** refers to the provision of transport services to all in rural and remote areas. Equity of access is core to this goal. It will go through the design, building, management, and maintenance of infrastructure, with in-built climate resilience and services that support economic development and human well-being (SuM4All 2019). Over a billion of the rural population still lack access to an all-weather road and adequate transport services, especially in developing countries, including countries in special situations including Least Developed Countries (LDCs), small island developing States (SIDS), and landlocked developing countries (LLDCs). This represents a major barrier to social and economic development (World Bank 2022.)



Over a billion of the rural population still lack access to an all-weather road and adequate transport services

- **Gender** refers to the provision of transport services to women, girls, and transgender people. Female mobility patterns are known to be different from those of men. Women typically walk longer distances than men and make frequent, shorter trips with more stops to combine multiple tasks. Men, by contrast, tend to follow more direct and linear patterns. Females engage in more non-work-related travel than males and are more likely to be accompanied by children or elderly relatives. They are also more reliant on public transport. Transport infrastructure and services need to cater to these differentiated travel needs and patterns of women (Legovini et al. 2022). Implicit to this goal is also the notion that the achievement of this subgoal will require the participation of women at all levels of transport decision making—planning, management, and operations (SuM4All 2019).

Equity and inclusivity are at the heart of universal access. Universal or equitable access needs to be part of mainstream thinking in the process of adopting and implementing policy measures to achieve other goals. For instance, the transition to electromobility—viewed as a major solution for net zero emissions to achieve the green goal—should not have negative implications on the affordability of transport services and access to facilities. Instead, such a transformation should be used as an opportunity to: (i) improve social inclusion by removing systemic barriers to access services; (ii) address violence toward vulnerable groups; and (iii) introduce equity measures to achieve equal access (SuM4All 2021).

3.2 Global Commitments and Targets

The universal access goal is consistent with the 2030 Agenda for Sustainable Development—SDGs 5, 9, and 11—and the Habitat III New Urban Agenda.[1] However, the goal has no internationally agreed quantitative target, except the ambition to leave no one behind. Applied to transport, the goal embodies the notion that provision of transport services enables access to economic and social opportunities, and as such, greater equity in society (SuM4All 2017).

SDG 9 and SDG 11 embed the concept of universal access by location, urban and rural, but they do not specify precise quantitative targets.

- *SDG 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.
- *SDG 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.
- *SDG 11.7:* By 2030, provide universal access to safe, inclusive, and accessible, green and public spaces for women and children, older persons, and persons with disabilities.

The SDG framework provides the following indicators:

- *Urban Access:* Indicator 11.2.1: Proportion of population that has convenient access to public transport, by sex, age, and persons with disabilities
- *Rural Access:* Indicator 9.1.1: Proportion of the rural population who live within two kilometers of an all-season road.

The SDG targets 5.1, 5.2, and 5.5 embody the concept of gender balance that is important in transport and many other sectors. The SDGs provide indicators, not quantitative targets. The indicators are not transport specific.

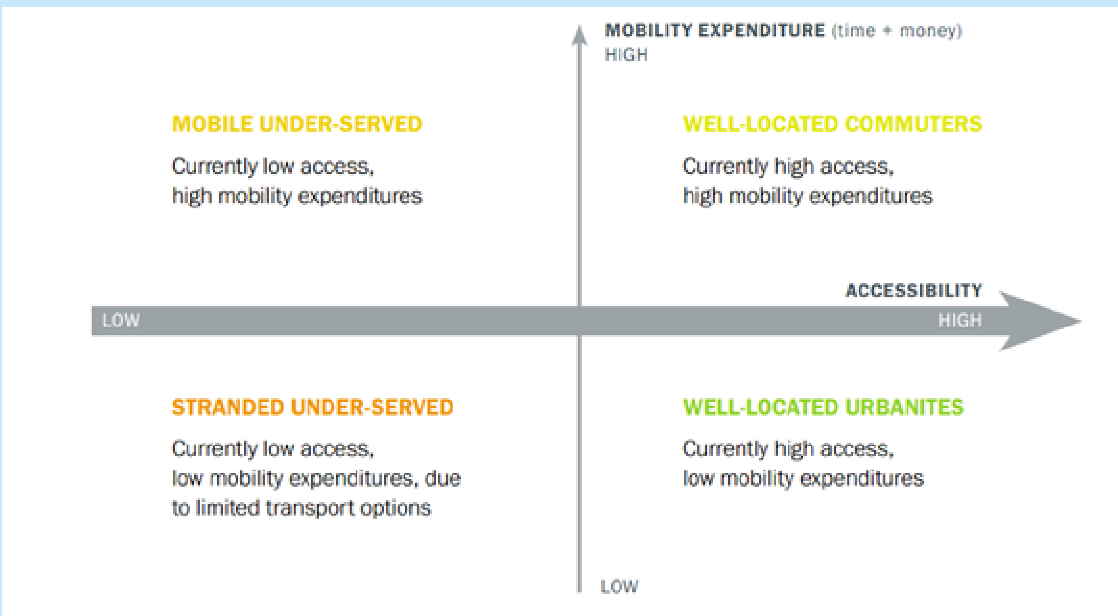
- *SDG 5.1:* End all forms of discrimination against all women and girls everywhere.
- *SDG 5.2:* Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation.
- *SDG 5.5:* Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic, and public life.

The goal of universal access is also included in the Habitat III New Urban Agenda. It calls for: (i) sustainable and inclusive urban economies, (ii) equitable access for all to economic and productive resources, (iii) equal access for all to physical and social infrastructure and basic services, and (iv) sustainable, people-centered, age and gender-responsive and integrated approaches to urban development and a focus on the needs of marginalized groups (box 3.1).

Box 3.1: Access-mobility framework to identify underserved population groups

The World Resources Institute (WRI) developed a framework, which uses jobs as a proxy for access to opportunities. The framework examines accessibility levels along with time and money spent on transportation. It identifies two groups of urban residents underserved by transportation: the stranded underserved and the mobile underserved. The stranded underserved face such severe access constraints that they travel little or not at all. This group includes many of the urbanites who can only commute on foot or by bicycle or those stuck in such poor locations that travel is completely unaffordable. The mobile underserved spend above-average amounts of time and money on commuting, as much as 35 percent of income, and are often located in peripheral suburbs far from economic opportunity. They include two subgroups—car and motorcycle users—who, because of inadequate transit alternatives, are forced to use vehicles they can barely afford. The framework also identifies two other categories—well-located commuters and well-located urbanites—who are better off in access to opportunities.

Box figure 3.1.1: Access-mobility framework to identify city residents under-served by transport



Note: Accessibility is the number of opportunities reachable within 60 minutes; mobility expenditure is the actual amount of time and money spent traveling.
Source: Authors.

Source: Venter, C., A. Mahendra, and D. Hidalgo. 2019. "From Mobility to Access for All: Expanding Urban Transportation Choices in the Global South." Working Paper. Washington, DC: World Resources Institute. https://files.wri.org/d8/s3fs-public/from-mobility-to-access-for-all.pdf.

3.3 Current State of Play

The Partnership identified three principal indicators to proxy countries' progress on universal access. In the absence of quantitative targets set by international agreements, the Partnership identified indicative, aspirational targets for each indicator (table 3.1).

- **Universal Urban Access:** The rapid transit to resident ratio (RTR) is used to proxy access in cities. Each country and each large and medium-sized city have developed a plan to ensure that the population has convenient access to public transport per SDG indicator 11.2.1. The goal for universal urban access is to have greater than 40 kilometers of rapid transit per million urban residents.

- **Universal Rural Access:** The rural access index (RAI)[2] is used to proxy access in rural and remote areas. Every country has developed a plan to ensure that the proportion of rural population lives within two kilometers of an all-season road per SDG Indicator 9.1.1 and as measured by RAI reach 100 percent.

- **Gender:** The percentage of workers in transport who are female is used as a principal indicator for gender. Each country has developed a plan to achieve gender equality and empower all women and girls as per SDG 5. In absence of data on women as transport users, the proxied goal is to have 50 percent female workers in the transport sector.

The use of principal indicators for each subgoal allows for first-level assessment of potential issues, and quantifies gaps between actual performance and ambition, and cross-country comparisons. For example, with a target set for each subgoal using principal indicators, it becomes possible to proxy the distance that remains between actual country performance and the target and compare year-to-year progress to conclude the evolution of the transport system in service provision, across location and gender.

Table 3.1: Principal indicators on universal access targets – average global performance

Indicator	Previous Data	Latest Data	Aspirational Target
Rural access - rural access index (RAI) (percentage)	67% (2006)	69% (2016)	100%
Urban access - Rapid transit to resident ratio (km/million)	10.53 (2017)	11.14 (2021)	>40
Gender - Female workers in transport (percentage)	n/a	13% (2019 or the latest data available)	50%

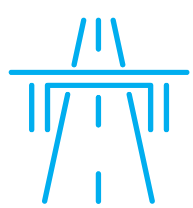
Source: Authors analysis. Data: On rural access, 2006 data was retrieved from the World Bank (Household survey methodology), and 2016 is retrieved from ReCAP (Geospatial methodology); On urban access retrieved from Institute for Transportation & Development Policy (ITDP); and on gender retrieved from International Labor Organization (ILO).

Note: The global averages in the Rural Access Index logged in 2016 vis-à-vis 2006 are leveraged and analyzed in parallel, rather than comparatively, due to a difference in methodology. This implies that making this direct comparison of the values would be misleading. The World Bank is the custodian agency for this indicator and revised the methodology based on the same concept formulated in 2006 but using emerging advanced technologies and datasets in 2016.

The global RTR average increased by 0.61 kilometers per million residents between 2017 and 2021 (table 3.1). This suggests that the availability of formal transit in cities is trending in the right direction. However, it is important to note that an increase in the RTR indicator may underestimate access in developing countries where informal transit such as paratransit is dominant in the public transport sector.

RAI is among the most important global indicators for measuring people's transport accessibility in rural areas, where higher incidences of poverty exist. It is estimated that between 30 and 33 percent of people in rural areas lack access to transport—reflecting approximately one billion people. The lack of precision in this estimate stems from the difficulty in accurately measuring rural accessibility. Specifically, while the World Bank's original household survey methodology yields more reliable estimates of RAI as it accounts for differences in road types, land cover types, and terrain, its values tend to be outdated since the regular collection of survey data by countries tends to be costly. The revised geospatial methodology—while providing newer data points—lacks the precision of proxying actual access because no consideration is given to land cover types or terrain in the two-kilometers buffer.

The goal for universal urban access is to have at least 40 kilometers of rapid transit per million urban residents

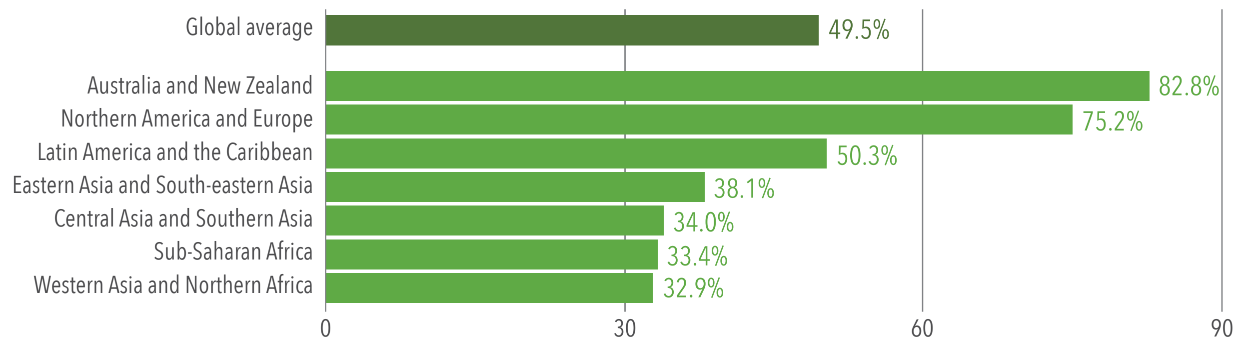


The principal indicator used as a proxy for gender accessibility is a supply side indicator that measures the percentage of workers who are female in the transport sector. Data taken from ILO labor surveys differ in the timeline from country to country. As such, a global comparison of previous and existing data logging is not possible. It inhibits comment on the extent to which global progress is or is not being made on access from a gender perspective. The existing gender principal indicator is leveraged owing to its global coverage as compared to other indicators which measure demand side aspects but lack adequate coverage or a standard methodology for data collection. These desirable indicators are identified and enumerated in Annex 1.

3.3.1 Urban Access

The indicator associated with SDG target 11.2 seeks to assess the "proportion of the population that has convenient access to public transport, by sex, age, and persons with disabilities," with a focus on urban populations (UN 2021). Adequate public transport infrastructure and affordable transport services are widely lacking in many countries of the world, especially for the most vulnerable groups (UN 2021). Only 49.5 percent of urban residents worldwide have convenient access to public transport, based on data from more than 1,500 cities. Broken down by region, western Asia, northern Africa, and Sub-Saharan Africa lag, with only about 33 percent of inhabitants having convenient access to public transport (figure 3.1). Informal transport modes such as motorcycle taxis, auto-rickshaws, and pedicabs 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 (UN 2019).

Figure 3.1: Proportion of urban population with convenient access to public transport (2021)



Source: United Nations. 2021. Sustainable transport, sustainable development. Interagency report for second Global Sustainable Transport Conference. https://sdgs.un.org/sites/default/files/2021-10/Transportation%20Report%202021_FullReport_Digital.pdf. Page 19.

Affordability, inclusion, and access remain challenges in many cities. Urban centers 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 (UN 2019). In Africa, up to 78 percent of people walk or use public transport for travel every day to access healthcare, education, shops, and jobs, often because they have no other choice. On average one billion people walk or cycle for 56 minutes every day, putting their lives at incredible risk since they must navigate streets without accessible sidewalks. Africa also has the lowest level of accessibility to public transport in the world (UNEP and UNHSP 2022).

Data available from 106 of the largest cities or 51 percent of the world revealed that residents of Portugal at 98.71 percent are most connected to public transport, while Saudi Arabian citizens at 8.63 percent are least connected to public transport (Walk21 2021). Box 3.2 shows the percentage of the population that has convenient access to public transport by sex, age, and persons with disabilities in 2021 for the top 25 cities and bottom 25 cities.

Box 3.2: The proportion of population that has convenient access to public transport, by sex, age, and persons with disabilities in selected cities (2021).

This indicator is computed as the estimated share of the urban population who can access a public transport stop within a walking distance of 500 meters for low capacity public transport systems such as buses, and 1000 meters for high-capacity public transport systems such as trains or ferries along the street network. Only public transport stops that are mapped are included in the analysis, which may include both formal and informal stops.

All the 25 top cities with the highest proportion of the population with convenient access to public transport are in high income countries. On the other hand, 76 percent of the cities with the lowest proportion of the population with convenient access to public transport are in low income and middle income countries. This calls for more investments to make public transport accessible in cities in low and middle income countries where access is low.

Bottom 25 Cities	The proportion of population that has convenient access to public transport, by sex, age, and persons with disabilities in 2021 (Percentage) (from lowest to highest)	Top 25 cities	The proportion of population that has convenient access to public transport, by sex, age, and persons with disabilities in 2021 (Percentage) (from highest to lowest)
Al-Madinah,Saudi Arabia,	4.38	Koekelberg, Belgium	100
Bur Sudan, Sudan,	4.49	Saint-Gilles, Belgium	100
Songnim, North Korea	4.52	Saint-Josse-ten-Noode, Belgium	100
Lubumbashi, Congo Dem. Rep.	4.56	Jerusalem, Israel	100
Irbid, Jordan	4.64	Tel Aviv - Yafo, Israel	100
Makkah, Saudi Arabia	5.49	Haifa, Israel	100
Sannar, Sudan	5.54	Rishon Leziyyon, Israel	100
Sinjah, Sudan	5.6	Petah Tiqwa, Israel	100
Port Elizabeth, South Africa	5.61	Netanya, Israel	100
Gujranwala, Pakistan	5.63	Ashdod, Israel	100
Tijuana, Mexico	5.92	Ostia, Italy	99.89
Peshawar, Pakistan	6.2	Pesaro, Italy	99.73
Kassala, Sudan	6.86	Barcelona, Spain	99.68
Honiara, Solomon Islands	7.12	Etterbeek, Belgium	99.63
Parepare, Indonesia	7.28	Genova, Italy	99.5
Acapulco, Mexico	7.42	Igualada, Spain	99.33
Gombe, Nigeria	7.46	Brighton, United Kingdom	99.31
Al-Khafji, Saudi Arabia	7.54	Kavala, Greece	99.29
Copiapó, Chile	7.68	Arezzo, Italy	99.26
Ghazzah, Palestinian territories	7.71	Stalowa Wola, Poland	99.23
Beira, Mozambique	7.85	Bayreuth, Germany	99.16
Cirebon, Indonesia	8.03	Parla, Spain	99.12
Pematangtiantar, Indonesia	8.04	Chester, United Kingdom	99.11
Baghdad, Iraq	8.11	Grosseto, Italy	99.11
Bukhara, Uzbekistan	8.17	Be'Er Sheva, Israel	99.1

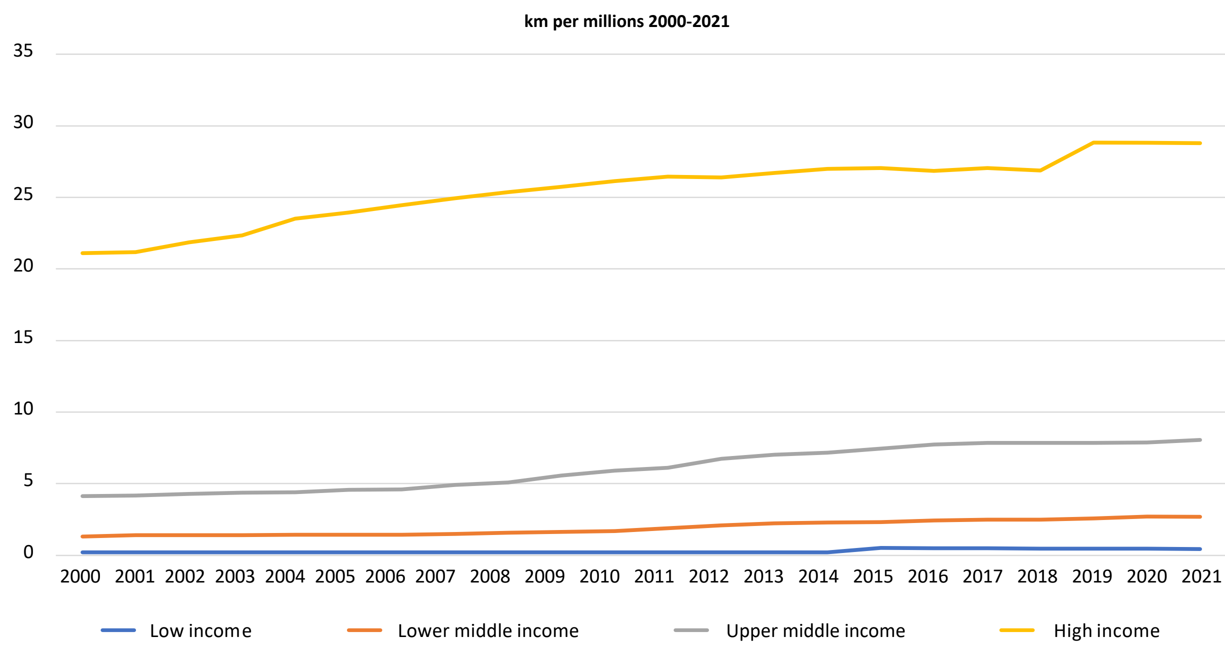
Source: https://data.unhabitat.org/datasets/04c64cb5553843b8a644af6429b6633c_0/explore.

Figure 3.2 showed that the RTR is significantly lower in LMICs compared to high income countries (HICs), and it remained stable over time in LICs. The trend is, however, different in MICs, which show a notable increase over time. The RTR reflects formal public transportation. Because LMICSs often rely on informal transport systems, this indicator may thus overestimate access issues.[3]

The latest data on the RTR validate the significant divide that exists between developed and developing countries on urban access (figure 3.3). The RTR for high income countries (HICs) is four times that in developing countries. Within the latter group, notable differences permeate among countries' income groups, with MICs' RTR eight times larger than in LICs. However, as Box 3.3 shows, much work on public transport has been made in regions such as Latin America, for example. This provides hope for a better, cleaner and more inclusive urban mobility.

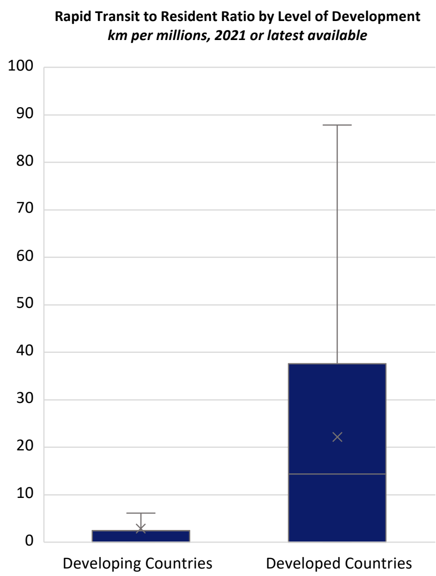
Analysis of data on rapid transit to resident ratio by regions (figure 3.4) showed that developing countries in Europe and Central Asia on average perform better in universal urban access while Sub-Saharan Africa faired the lowest.

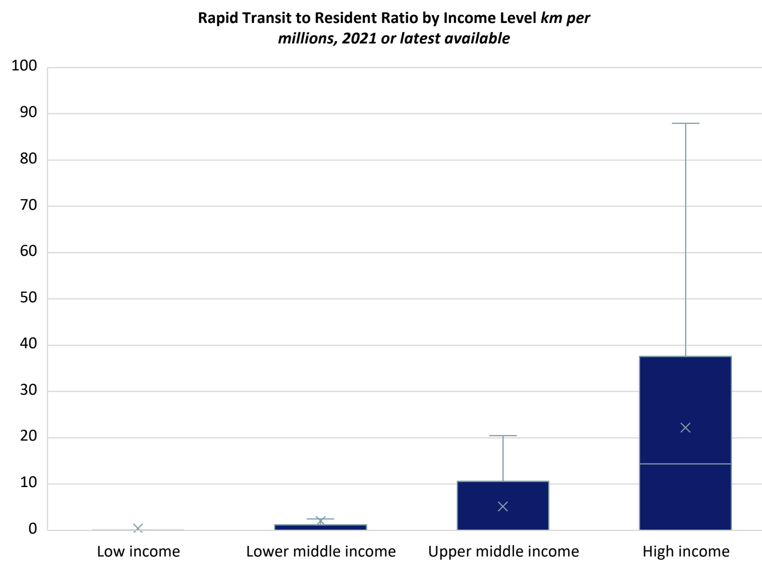
Figure 3.2: Average rapid transit to resident ratio by countries' income levels



Source: Institute for Transportation and Development Policy (ITDP) raw data and authors' analysis.

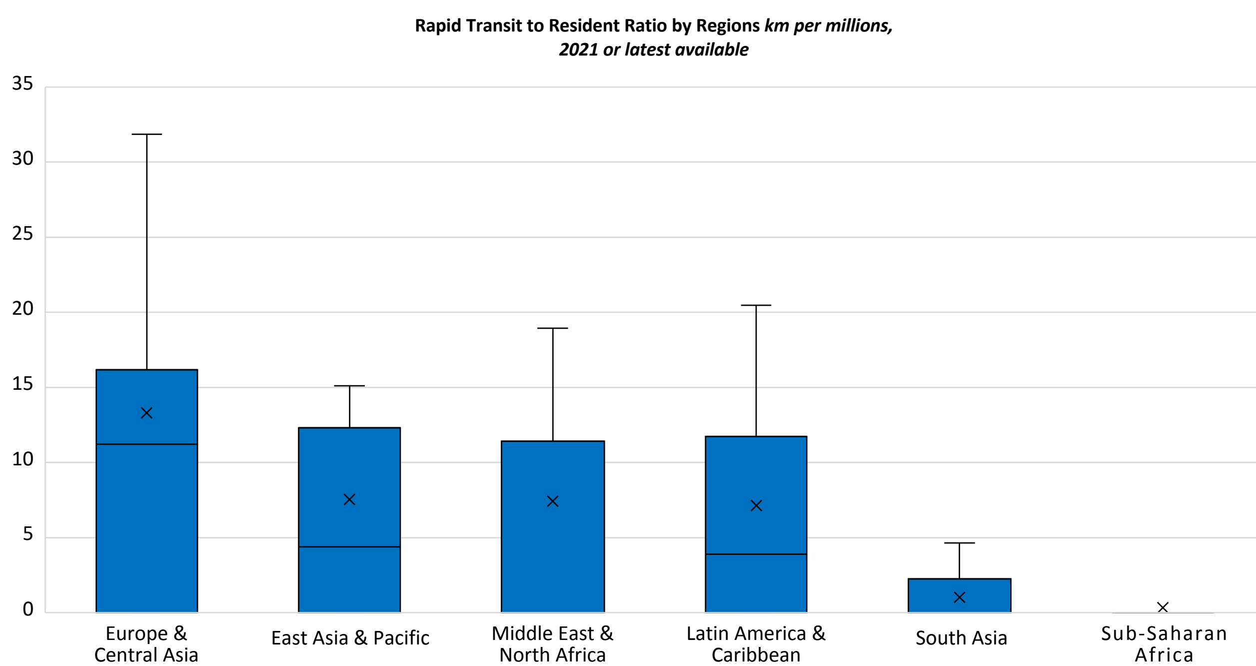
Figure 3.3: Performance on universal urban access by countries' level of development and by income levels





Source: Institute for Transportation and Development Policy (ITDP) raw data and authors' analysis.

Figure 3.4: Performance on universal urban access by regions for developing countries



Source: Institute for Transportation and Development Policy (ITDP) raw data and authors' analysis.

Box 3.3: Progress in Latin America on the Transformation of Urban Mobility via Electric Buses

Latin America has a reason to hope: the region can inspire the world to increasingly adopt electric buses, which will ultimately help post-pandemic cities become more sustainable. This is among the main findings of the study Leading a Clean Urban Recovery with Electric Buses – Innovative Business Models Show Promise in Latin America, by the International Finance Corporation – IFC (the World Bank Group arm for the private sector) and C40 (a network of cities committed to curbing climate change).

The document highlights the significant progress made by countries like Chile and Colombia. In Santiago, 776 electric buses are in place, all of which operating under private contracts. Additionally, the City of Bogotá announced in January it will update its Transmilenio fleet with 596 new buses, thus totaling 1,485 battery-powered vehicles ("the largest electric fleet outside China", local authorities emphasized; the Asian country features almost 98% of the planet's e-buses).

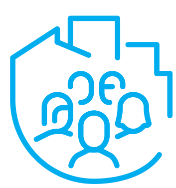
Source: (Graham and Courreges, 2020).

3.3.2 Rural Access

Approximately 300 million rural dwellers from a total rural population of approximately 520 million, still lacked good access to roads in 2021 based on data from 25 countries. This contributes to deprivation in access to timely healthcare, education, jobs, and markets for agricultural produce. Rural isolation disproportionately harms the poor, older persons, persons with disabilities, children, and women (UN 2021).

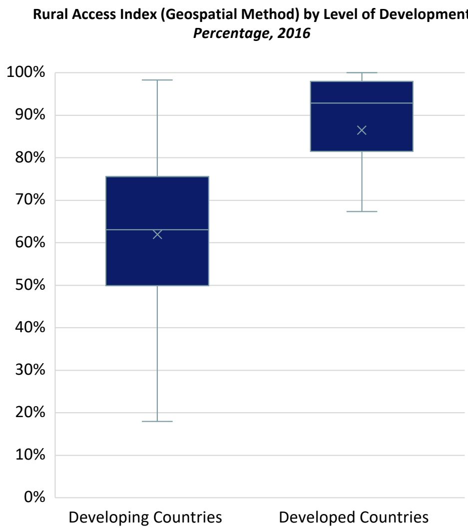
The indicator 9.1.1. for the SDG target 9.1—"*proportion of the rural population who live within two kilometers of an all-season road*"—or RAI is used as a proxy to measure equity of access in rural areas. Looking at RAI by countries' income group (figure 3.5) shows significant disparities, with an average access index of 86.5 percent of the rural population with access to a road in developed countries, compared to 62 percent in developing countries. However, this average number masks significant disparities among countries. For example, in developing countries, RAI varies between 18 percent in Gabon and 98 percent in Lebanon.

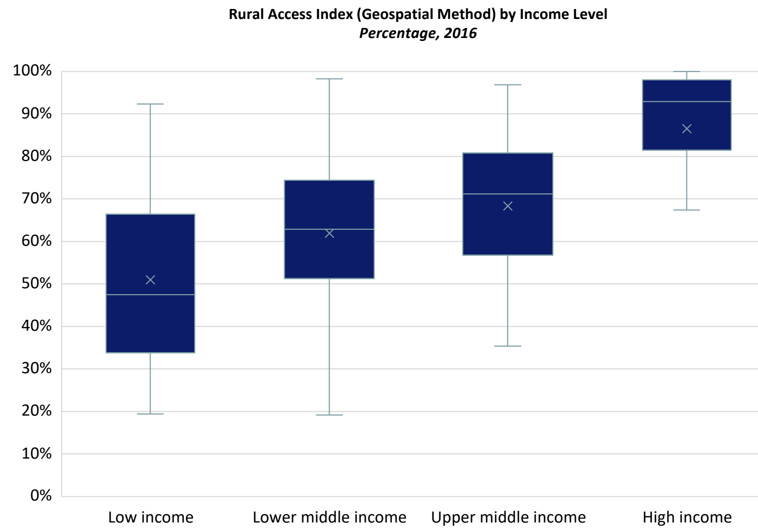
Analysis of RAI by regions (figure 3.6) showed that developing countries in Europe and Central Asia on average perform better in universal rural access while Sub-Saharan Africa faired the lowest.



Based on data from 25 countries, approximately 300 million rural dwellers still lacked good access to roads in 2021

Figure 3.5: Performance on universal rural access by level of development and by income level

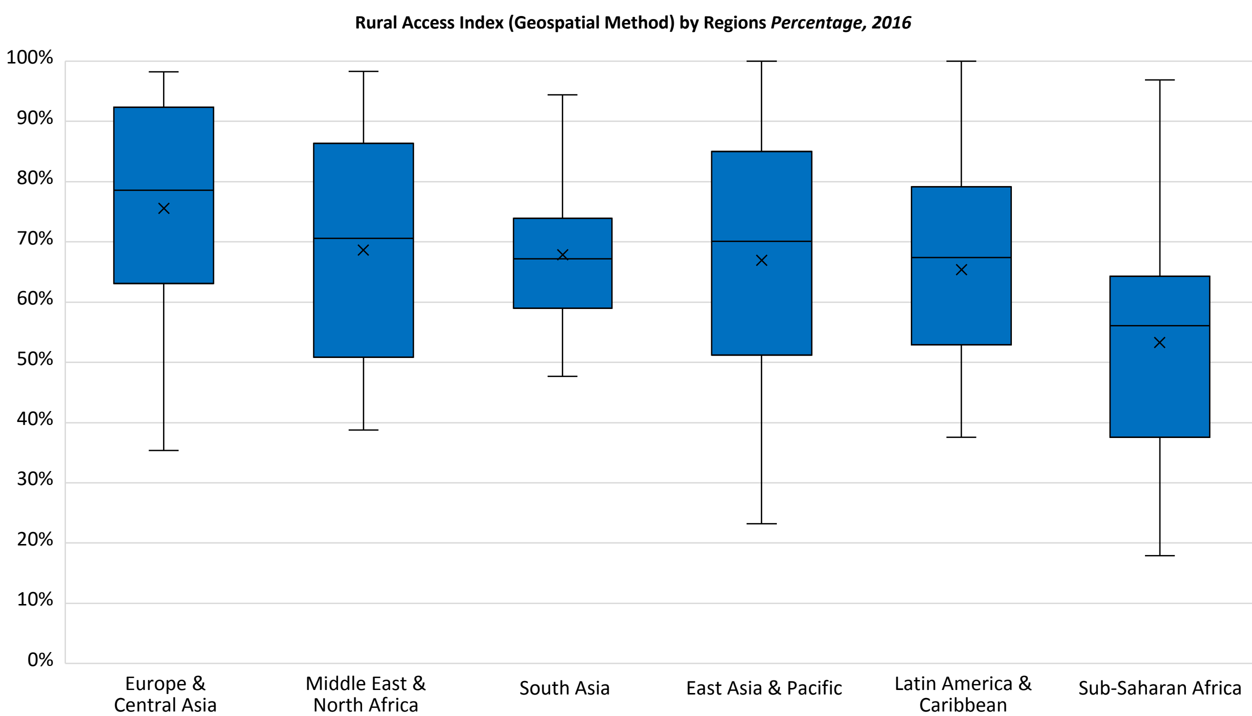




Source: ReCAP raw data and authors' analysis.[4]

Note: The height of the box on either side of the median shows the spread of the observations between the first and third quartiles (i.e., the 25 percent and 75 percent largest values). The whiskers show where the more spread-out observations lie, while X marks the mean value.

Figure 3.6: Performance on universal rural access by regions for developing countries



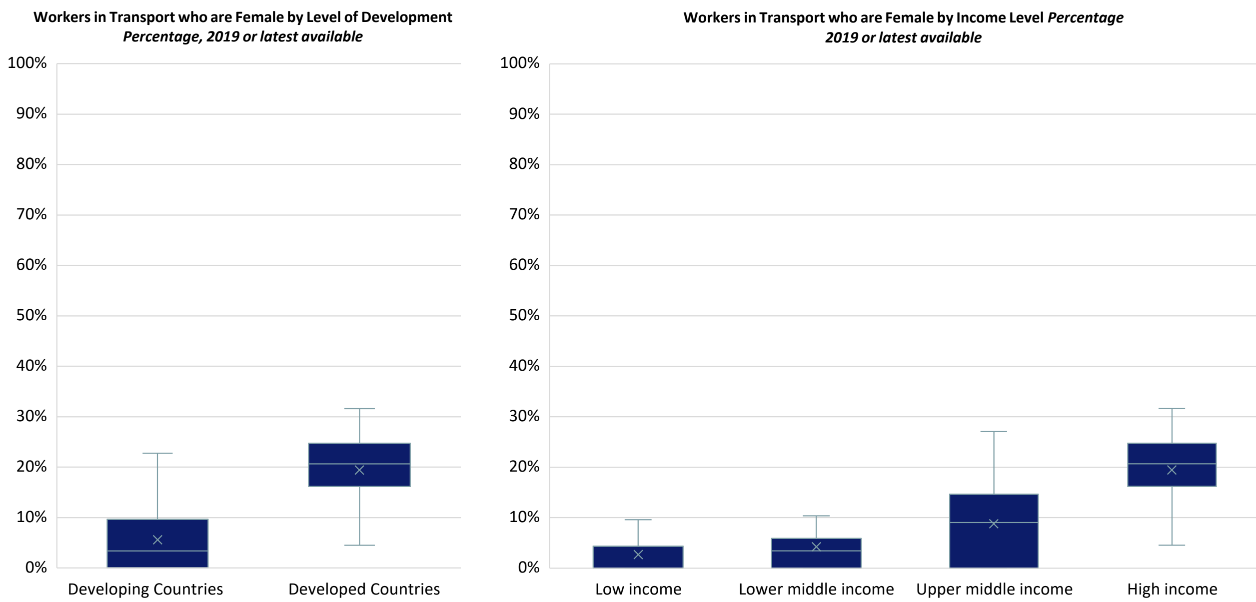
Source: ReCAP raw data and authors' analysis.

3.3.3 Gender

The percentage of workers in transport who are female is used as a proxy for access to transportation services by gender. Looking at access by gender with countries' income group and level of development (figure 3.7) shows that the proportion of women employed in the transport sector in developed countries is twice that in developing countries. The proportion of women employed in the transport sector seems to decline with income level—from 21 percent in developed countries compared to 14 percent, 6 percent, and 5 percent for upper middle income, lower middle income, and low income countries respectively.

Analysis of data on gender access by regions (figure 3.8) shows that developing countries in Europe and Central Asia on average perform better in gender while Sub-Saharan Africa faired the lowest. This indicator is particularly low in developing countries of the Middle East and North Africa, South Asia, and Sub-Saharan Africa where countries have only about 5 percent of women on average in the transport labor force.

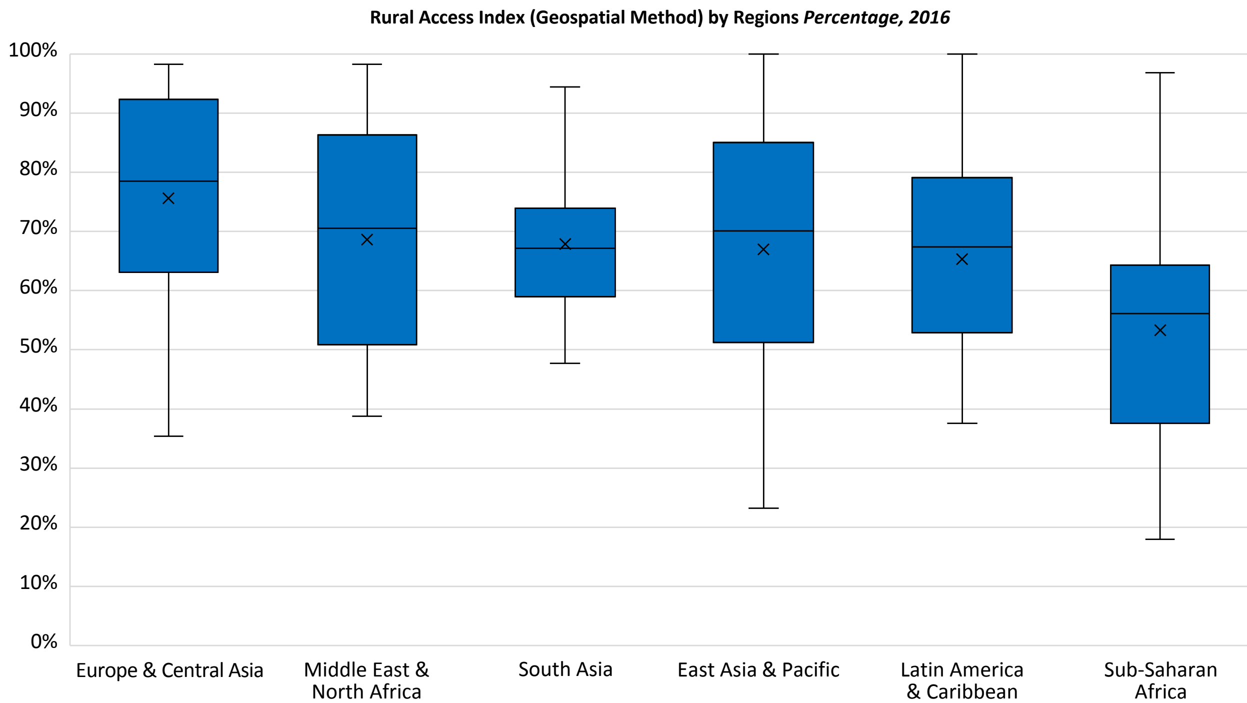
Figure 3.7: Performance on gender by the level of development and income level



Source: International Labor Organization (ILO) raw data and authors' analysis.

Note: The height of the box on either side of the median shows the spread of the observations between the first and third quartiles (i.e., the 25 percent and 75 percent largest values). The whiskers show where the more spread-out observations lie, while X marks the mean value.

Figure 3.8: Performance on gender by regions for developing countries



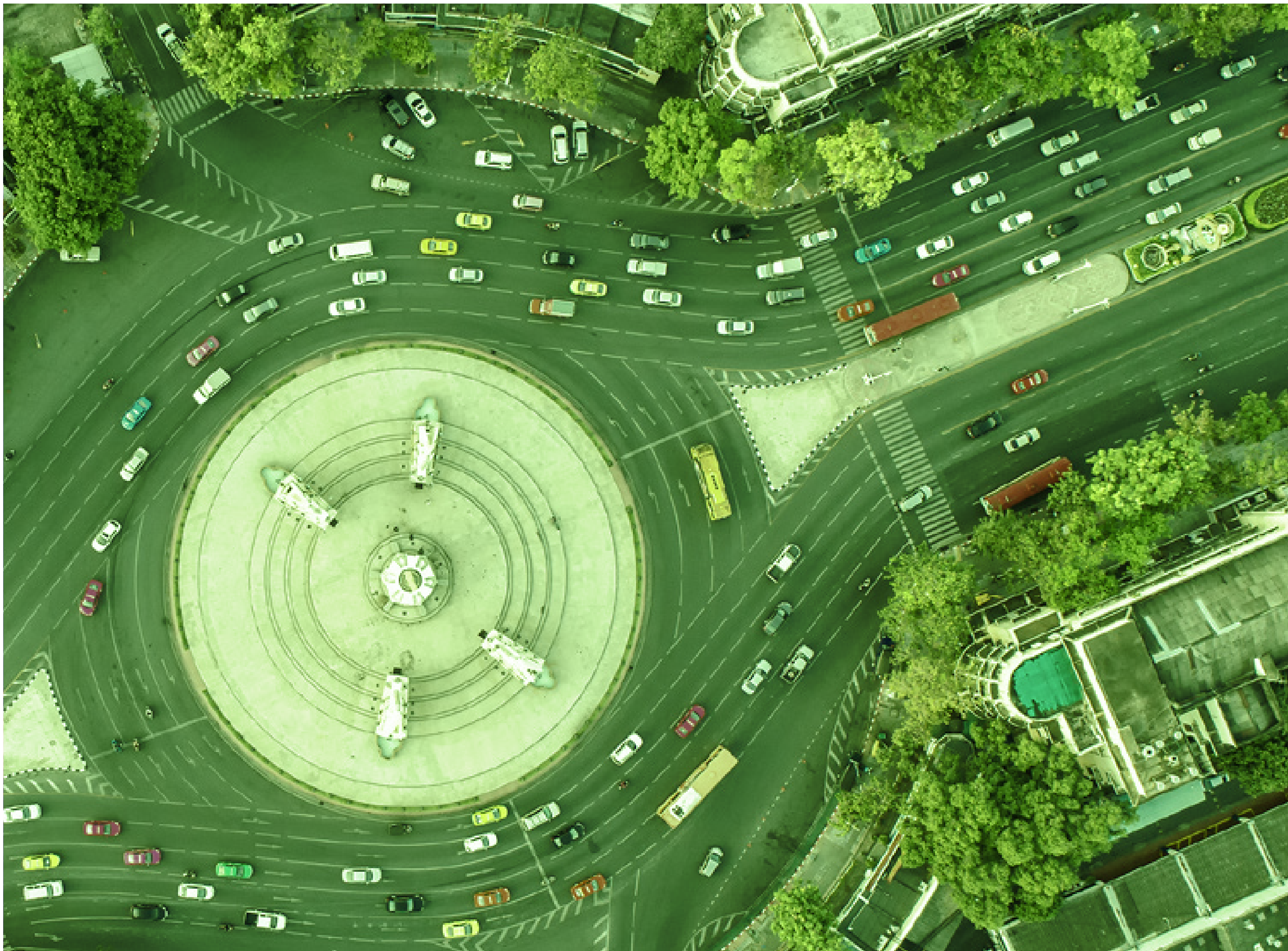
Source: International Labor Organization (ILO) raw data and authors' analysis.

The World Economic Forum's (WEF) indicator of the percentage of women in leadership roles in the supply chain and transportation industry is used as a reliable proxy of women in leadership roles in the transportation industry. It shows that women in leadership roles stood at 21 percent in 2022—an increase of 25 percent compared to 2021. The supply chain and transportation industry is among the lowest in the overall industry in female representation. Nonetheless, the sector has seen an acceleration in the hiring of women into leadership. Relative to 2016, the supply chain and transportation industry was among the industries showing the biggest improvement in their hiring rate for women into leadership alongside the energy and technology industries. At the prevailing rate of progress, it will take 151 years to close the economic participation and opportunity gender gap globally. This could translate to a longer period for the transport sector, given it is among the industries with the lowest female representation (WEF 2022).

3.4 Outlook

As the population grows and income increases, the global demand for transport of goods and people will continue to grow over the next three decades. Passenger transport will increase threefold by 2050, from 44 trillion to 122 trillion passenger kilometers. Global freight demand will also triple, according to projections (ITF 2019). With this increase, inclusive access to transport and mobility will be a key enabler for equitable access to jobs, education, healthcare, and other social services. This will have a significant bearing on economic development, inequality, and poverty levels.

The universal access goal seeks to ensure equitable access for all. Equity, an under-researched dimension of transport, is of paramount importance in the transport sector since the infrastructure and services are rarely distributed equitably. This is especially true in developing countries where the pressure on infrastructure and service provision will be tremendous. If infrastructure and services are not provided and supported by public resources, it will create increased social tensions and growing inequities. The future will thus need to factor these dimensions in infrastructure design and planning. Otherwise, it will be a potential source of social unrest and inequities in economic opportunities. Additionally, based on the literature limitations and data gaps outlined in the preceding section, scaled-up efforts are required to close these data gaps. This will enable transport policy makers and practitioners to forecast transport needs better and, through a lens of equity, be able to pay appropriate attention to market segments that are deprived of equitable access to transport.



Notes

1 The Habitat III New Urban Agenda is available at https://habitat3.org/the-new-urban-agenda/

2 The metric is conceptually simple – it measures the share of the population who live within 2 km of the nearest road in good condition in rural areas and relies on high-resolution population distribution data along with digitized road network data including road condition information for its computation.

3 SDG Indicator 11.2.1: Proportion of the population that has convenient access to public transport disaggregated by age group, sex, and persons with disabilities. This indicator is computed as the estimated share of urban population who can access a public transport stop within a walking distance of 500 meters (for low capacity public transport systems eg buses) and/or 1000 meters (for high capacity public transport systems eg trains, ferries) along the street network.. Only public transport stops which are mapped are included in the analysis which may include both formal and informal stops. Source: https://data.unhabitat.org/datasets/11-2-1-percentage-access-to-public-transport/explore.

4 The prevailing assessment is high level and does not include the nuance within cities and countries such as the fact that rapid transit systems may serve wealthier residents or preference one gender over others within cities and countries.

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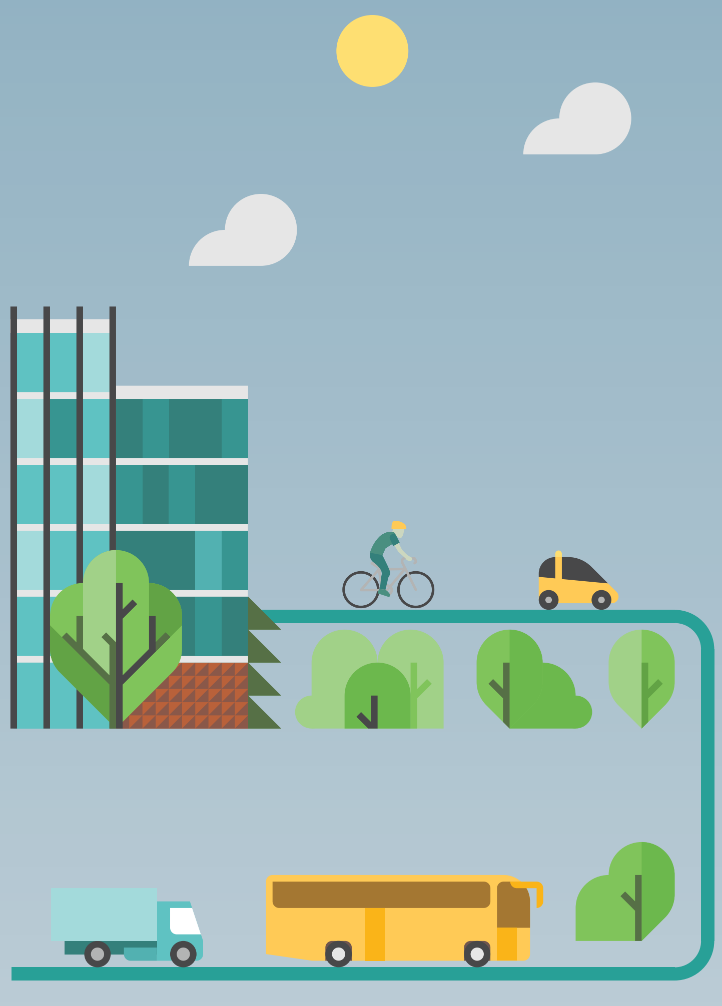
CHAPTER 4: SAFETY



4.1 Goal Definition

The safety goal seeks to reduce fatalities, injuries, and crashes from transport mishaps across all modes of transport—road, railway, air, and waterborne. It aims to integrate safety as a core value within transport systems and also integrate transport safety within the broader development agenda to avert health, social and economic losses associated with unsafe mobility (ITWF 2017). Putting safety at the core of transport systems is an urgent moral imperative. Safety must never be compromised, as the only number of transport-related deaths that can ever be accepted is zero.

4.2 Global Commitments and Targets

Among transport-related fatalities and injuries,[1] the vast majority are from road transport. While there has been a lot of emphasis on an integrated approach to road safety, the goal of zero deaths and serious injuries remains a challenge. Unlike other modes of transport such as aviation, railway, or maritime transport, road transport is an open system with entry/exit conditions far looser which makes it more difficult to control. For example, sea and air transport are transnational in nature with international controlling bodies that have the authority to act more effectively than international bodies simply expressing concern for road safety from a distance. As a consequence, deaths from other modes of transport are rare events that are considered anomalies and unacceptable while road traffic deaths and injuries are still tolerated in many countries as an unavoidable cost of mobility. For this reason, a target to halve the number of global deaths and injuries from road traffic accidents by 2020 was included among the 17 Sustainable Development Goals.[2] The commitment to halving the number of deaths by 2030 was reaffirmed by the United Nations in 2020.[3]

In an important development in November 2017, Member States, with the support of United Nations Agencies and Regional Commissions, including the World Health Organization, UNICEF, and the United Nations Economic Commission for Europe, reached a consensus on a set of 12 voluntary global performance targets for road safety risk factors and service delivery mechanisms.[4] While the targets are good to help countries help to set up a course of action and guide future direction on road safety policies, there is need to first take account of countries' capacity to implement an effective road safety management system.

4.2.1 Road Transport

The United Nations' 2030 Agenda for Sustainable Development, adopted by all Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet. The agenda is based on 17 SDGs and 169 indicators. Unlike the Millennium Development Goals, SDGs include two targets:

- **SDG 3.6:** By 2020, halve the number of global deaths and injuries from road traffic accidents.

- **SDG 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.

The specific inclusion of road safety targets in the UN 2030 Agenda for Sustainable Development reflects universal recognition that fatalities, injuries, and crashes from transport are now among the most serious threats to the future of our people. This means that road safety is no longer a need that can be compromised or traded off to achieve other social needs.

The announcement of the "Second Decade of Action for Road Safety" by the United Nations General Assembly, along with a renewed political commitment from Member States and the strong foundations laid by the previous "Decade of Action for Road Safety", has provided a tremendous opportunity for progress.[5] In addition, three Global Ministerial Conferences, the appointment of a United Nations Special Envoy for Road Safety by the United Nations Secretary-General, and the establishment of the United Nations Road Safety Fund indicate clearly the increased importance accorded to road safety and enhanced mechanisms to improve it globally (UNECE 2015).

At the Third Global Ministerial Conference for Road Safety[6] in February 2020, the Special Envoy concluded with an urgent call for action to make the world's roads safe and to put safety first, especially for the youth who are the most affected by this crisis. The Ministerial Conference culminated in the forward-looking "Stockholm Declaration," which calls for a new global target to reduce road traffic deaths and injuries by 50 percent by 2030. The UN General Assembly adopted resolution A/RES/74/299 "Improving global road safety" in September 2020 proclaiming the Decade of Action for Road Safety 2021–2030,3 with the ambitious target of preventing at least 50 percent of road traffic deaths and injuries by 2030. This was followed by the development of a "Global Plan for the Decade of Action,"[7] which rejects business as usual and calls on governments and stakeholders to take a new path. That path prioritizes and implements an integrated "Safe System" approach that squarely positions road safety as a key driver of sustainable development (box 4.1).

Estimates for global infrastructure investment needs in developing countries range as high as one trillion US dollars per year

As with other health and development problems, improving road safety requires a sustained and comprehensive approach. Though sustainable transport is integral to achieving the 17 SDGs, a mismatch exists between this promise and the reality of transport planning and practice. The existing transport systems need to be aligned with principles of sustainable living and optimized to deliver sustainability not only in this sector but also to other sectors of society. Existing transport planning resources must be used more effectively to improve the system's performance and reduce its negative consequences. At this level, road safety is no longer an independent public health and safety initiative, but an integral part of a broad range of societal endeavors from commercial enterprise to humanitarian initiatives (AEG 2020). Ensuring coherence between economic development strategies, sustainable development plans, and road safety strategies will be essential to ensure mobility systems are safe and that they contribute to improving health and development outcomes.

In addition, the transport sector contributes significantly to economic output and is a key component of national development (SuM4All 2017). Investment in the transport sector and infrastructure development is a key opportunity to build in safety considerations. Estimates for global infrastructure investment needs in developing countries range as high as one trillion US dollars per year, more than five percent of GDP in some countries (SuM4All 2019). Funding is available for road safety initiatives, provided the appropriate institutional arrangements are in place to mobilize this funding and allocate it effectively, efficiently, and equitably. For instance, the Global Road Safety Facility (GRSF) — a global multi-donor fund hosted by the World Bank plays a very important role in catalyzing further road safety investment from this steady stream of road infrastructure financing. During the first Decade of Action for Road Safety, the GRSF catalyzed US$2.35 billion of road safety financing under the World Bank transport lending. Investment in road safety is an urgent priority but the underlying institutional weaknesses at the country level must be first addressed.

4.2.2 Rail Transport

Although railways are one of the safest modes of transport, accidents happen. The development of railways is dependent on this high safety level (WEF 2010). While safety is one of the railways' main assets compared to other transport modes, control of risk is vitally important to the rail sector. Data analysis suggests that injury to a third party is four times more likely than to a passenger traveling in a train. The International Union of Railways (UIC) Safety Platform[8] was established to help identify all types of measures or activities of system safety within the rail sector likely to enable the safety international railway solution to be maintained or enhanced. The platform promotes overall coherence of the system safety of the railway sector by cooperating with the UIC forum and other platforms while not interfering with their projects. In particular, it is available to these forums, platforms, and their working groups provides, on request, advice on the potential impact of their project proposals on overall levels of system safety.

4.2.3 Air Transport

Safety is one of the key elements of maintaining the vitality of air transport at the global, regional, and national levels. Several initiatives have been developed to help coordinate and guide safety policies and initiatives to reduce accident risk in global commercial aviation.

The International Civil Aviation Organization (ICAO), a specialized agency of the United Nations, developed the global aviation safety plan (GASP),[9] which is a strategy that supports the prioritization and continuous improvement of aviation safety. GASP, along with the global air navigation plan (GANP)[10] provides the framework in which regional and national aviation safety plans will be developed and implemented. This would ensure harmonization and coordination of efforts aimed at improving international civil aviation safety, capacity, and efficiency. GASP's purpose is to reduce fatalities and the risk of fatalities continually by

guiding the development of a harmonized aviation safety strategy, regional aviation safety plans, and national aviation safety plans. GASP contains an aspirational safety goal to achieve and maintain zero fatalities in commercial operations by 2030 and beyond. A series of goals and targets support the aspirational safety goal.

The strategic action plan for future aviation safety was developed jointly by Airports Council International (ACI), Airbus, Boeing, Civil Air Navigation Services Organization (CANSO), Flight Safety Foundation (FSF), IATA, and IFALPA for ICAO. The primary objective of the roadmap is to provide a common frame of reference for all stakeholders including states, regulators, airline operators, airports, aircraft manufacturers, pilot associations, safety organizations, and air traffic service providers. The roadmap[11] recommends: (i) a comprehensive data collection and analysis program be developed for all system stakeholders and (ii) that performance measurement be developed to track the definable reduction in risk expected in the near- and mid-term.

4.2.4 Waterborne Transport

Although global waterborne transport lacks any initiative on safety, the International Maritime Organization (IMO)[12] developed 50 conventions and protocols that take the form of international treaties on shipping, including safety. The subjects covered included tonnage measurement, prevention of collisions, and signaling, among others.

- International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended.
- Convention on the International Regulations for Preventing Collisions at Sea (COLREG), 1972.
- International Convention on Maritime Search and Rescue (SAR), 1979.
- Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation (SUA), 1988, and Protocol for the Suppression of Unlawful Acts Against the Safety of Fixed Platforms located on the Continental Shelf (and the 2005 Protocols).
- International Convention for Safe Containers (CSC), 1972.

Box 4.1: The Safe System Approach

Traditionally, a siloed approach was taken for road safety interventions. Although it is useful to break the road-safety problem into smaller components for analysis and planning purposes, it is critical to view these different elements as interlinked parts of the whole system. The safe system approach to road safety takes as its starting point the position that there is no acceptable level of road deaths or serious injuries (ITF 2022). It acknowledges that while human error on the road is inevitable, death or serious injury resulting from a crash are not (ITF, 2016). It is based on an understanding that effective road-injury prevention is achieved through the interdependence and multiplier effects of various policy measures and a well-balanced set of effective interventions (ITF 2022).

The situation, however, is more complex and requires moving away from a simplified model for road safety action to a safe system approach that necessitates considerable effort directed toward knowing the nature of crashes, transport systems, and the political economy of a country. This effort is rewarded by the larger range of opportunities not only for preventive action and more appropriate design of measures but also for identifying or accessing key levers for change. It would also address important broader issues such as governance. Based on this premise, a safe system approach:

- Seeks a transport system that anticipates and accommodates human errors and prevents consequent death or severe injury.
- Incorporates road and vehicle designs that limit crash forces to levels that are within human tolerance.
- Motivates those who design and maintain the roads, manufacture vehicles, and administer safety programs to share responsibility for safety with road users. When a crash occurs, remedies are sought throughout the system, rather than solely blaming the driver or other road users.
- Pursues a commitment to the proactive improvement of roads and vehicles so that the entire system is made safe rather than just locations or situations where crashes last occurred.
- Adheres to the underlying premise that the transport system should produce zero deaths or serious injuries and that safety should not be compromised for the sake of other factors such as cost or the desire for shorter transportation times.

A safe system approach addresses six pillars: Road-safety management; Safe roads; Safe vehicles; Safe speeds; Safe road-user behaviour; and Post-crash care.

Two interrelated aspects form a safe system. First, are technical solutions that consist of interventions to be implemented in infrastructure design, vehicle safety, and traffic laws. It would also govern enforcement that addresses road user behaviors, post-crash survival and rehabilitation, and the management of modal shifts and speeding, as an underlying causes of death and injury.

The second crucial aspect is robust institutional governance and cooperation between partners in any successful Safe System intervention. Permanent institutions are required to organize government intervention covering research, funding, legislation, regulation, and licensing and to maintain a focus on delivering improved road safety as a matter of national priority. Institutional governance requires mechanisms for coordinating and funding actions. Road-safety strategies must be defined, and plans of action detailed for specific periods. Road-safety action plans require appropriate funding and accountability. Governance arrangements must provide feedback to the partners responsible for concrete interventions through monitoring and ensure remedial measures are taken when needed.

Sources: AEG 2020, Hysing E 2021, ITF 2016, ITF 2022, and Naumann et al 2020.

4.3 Current State of Play

The Partnership identified one principal indicator to proxy progress on road safety—mortality caused by road traffic injury. The target for this indicator is set by the "United Nations Decade of Action for Road Safety 2020–2030". The use of this indicator allows for first-level assessment of road safety issues at the country level and quantifies gaps between actual performance and ambition, and cross-country comparisons (table 4.1).

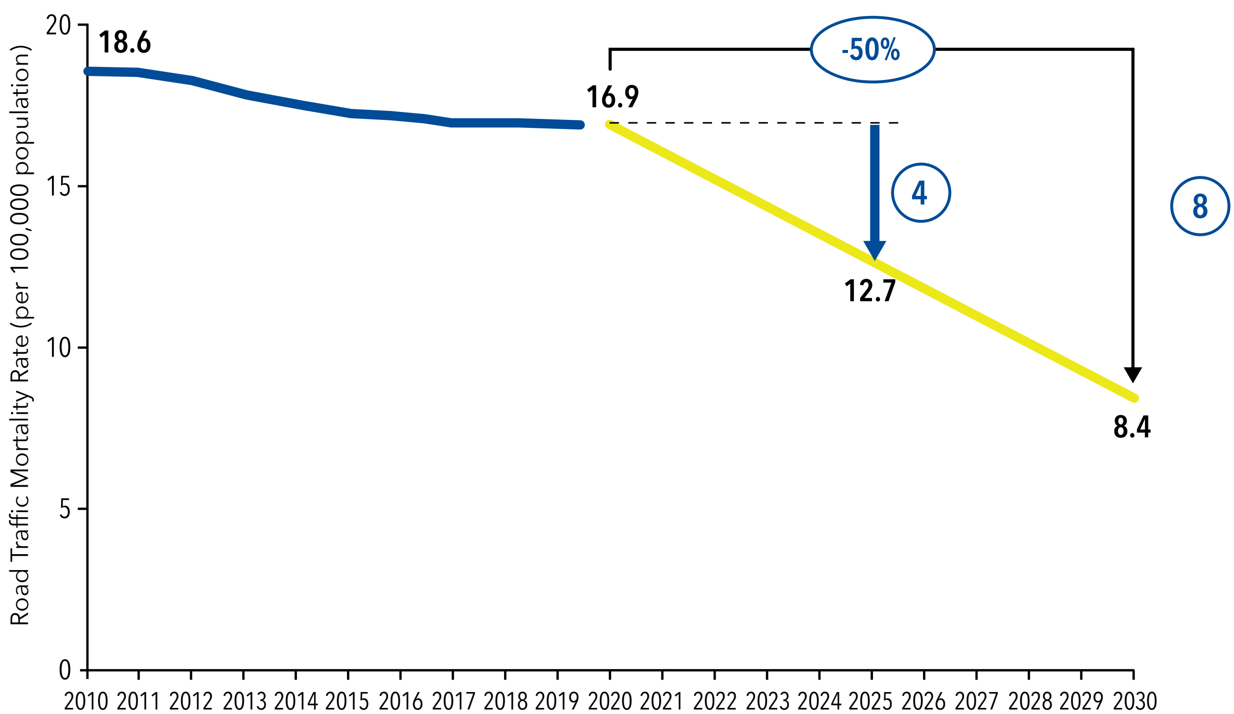
The mortality rate from road traffic injury slightly increased between 2017 and 2019. This is to be compared to a stable trend since 2010 (figure 4.1). However, with this global performance, it is unlikely that the goal of a 50 percent reduction will be met by 2030. A dramatic course correction will be needed to achieve this target. Achieving a 50 percent reduction in mortality from road traffic injury by 2030 will require a reduction in the rate of deaths of approximately 4 per 100,000 population by 2025 and approximately 8 per 100,000 population by 2030.

Table 4.1: Principal indicator on safety targets – average global performance

Indicator	Previous Data	Latest Data	Aspirational Target
Mortality caused by road traffic injury (per 100,000 people)	17.05 (2017)	17.15 (2019 or the latest data available)	Zero ultimately, with a 50 percent reduction by 2030

Source: Authors analysis on data retrieved from World Health Organization, Global Health Observatory Data Repository.

Figure 4.1: Current and projected trend to achieve target of 50 percent reduction in deaths



Source: WHO Data, Delivery, and Impact (DDI) Division.

Globally, the number of road traffic deaths and serious injuries has not decreased since 2010, and in the absence of strong and effective action to reduce this burden, prevailing global trends in road deaths indicate that the coming decade will produce more than 13 million deaths and may also bring some 500 million more injured. In addition to human suffering and grief, road deaths and injuries generate high economic costs through lost income, medical and rehabilitation costs, and judicial and custodial costs (Chen, Simiao et al 2019).

Adopting key safety rules – which have evolved from the seminal conventions of the United Nations (UNECE, 1968) – combined with enforcement presents opportunities to achieve immediate and substantial road safety results. Since 2013, progress has been made across countries to bring laws to align with best practices with 10 additional countries, 45 in total, on addressing drunk driving, five additional countries, 49 in total on motorcycle helmet use, three additional countries, 105 in total, on the use of seatbelts, and three additional countries, 33 in total, on the use of child restraint system. Less progress has been made in adopting best practice speed limits despite speed being a major cause of death and severe injury in road crashes. Despite the progress made in improving legislation across the key risk factors, enforcement remains a major challenge in most countries (WHO 2018). However, it should be noted that without robust general deterrence-based enforcement it is unlikely that legislation alone will produce improved safety results.

Vehicle safety measures continue to make a substantial and efficient contribution to reducing death and serious injuries among car occupants. However, in most rapidly motorizing low- and middle-income countries (LMICs), all new vehicles are not required to pass internationally recognized safety standards. Many meets old designs or are subject to the de-specifying of life-saving technologies in newer models sold elsewhere. Although only 39 countries have implemented seven or eight priority UN vehicle safety standards, signs of progress are present (WHO 2018).

Vehicle safety measures continue to make a substantial and efficient contribution to reducing death and serious injuries among car occupants

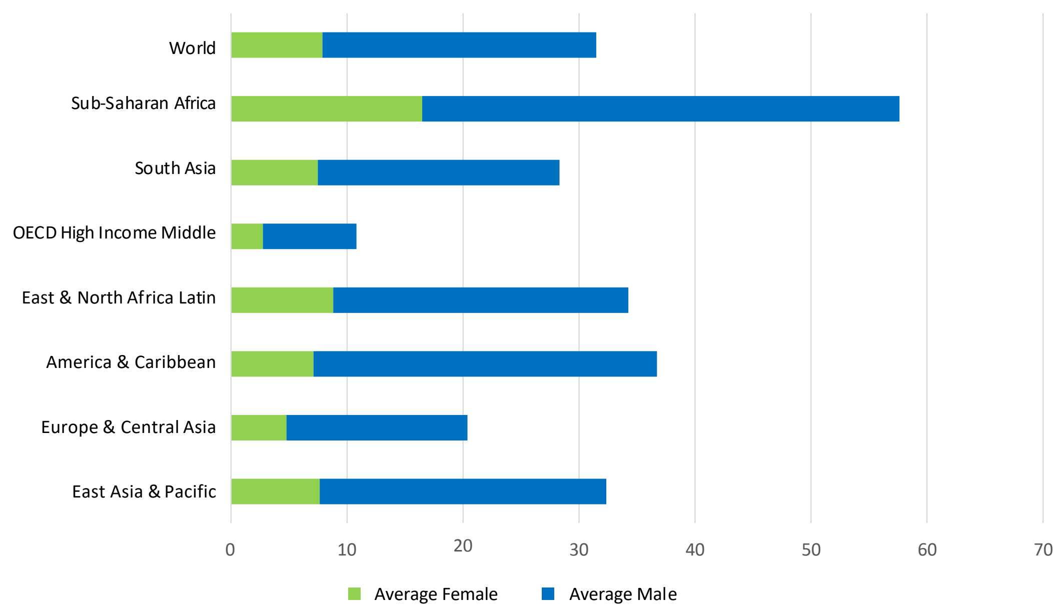
While vehicle safety improvements offer good returns in the longer term, infrastructure safety engineering safety measures offer attractive medium-term gains although they take more time to implement. The design of individual road sections and intersections should agree with their traffic function, prevent serious conflicts, and support safe road-user behavior. Safe road design aims to minimize the risk of crashes and, where crashes continue to occur, to minimize injury outcomes (ITF 2022). Enforcement of infrastructure safety—assuming sufficient police agency capacity—bring quick aggregate returns.

Despite the progress made; it is simply not of sufficient scale to affect the magnitude of change at the global level that is being called for. While the focus on the five pillars of the previous “Decade of Action” drew attention to what outcomes needed to be achieved, challenges experienced in implementing the pillars constituted a critical barrier to achieving targets. Competing priorities, capacity of governments to act, and differences in geographic, geopolitical, and geodemographic situations can present serious challenges to implement changes that initiate or sustain road safety improvements. These challenges have contributed to the lack of reductions in road deaths over the past several years in many countries (Tavakkoli M et al 2022, Hyder, Adnan et al 2016, and Raffo, Veronica & Bliss, Tony. 2012).

4.4.1 Road Traffic Deaths by Road Users

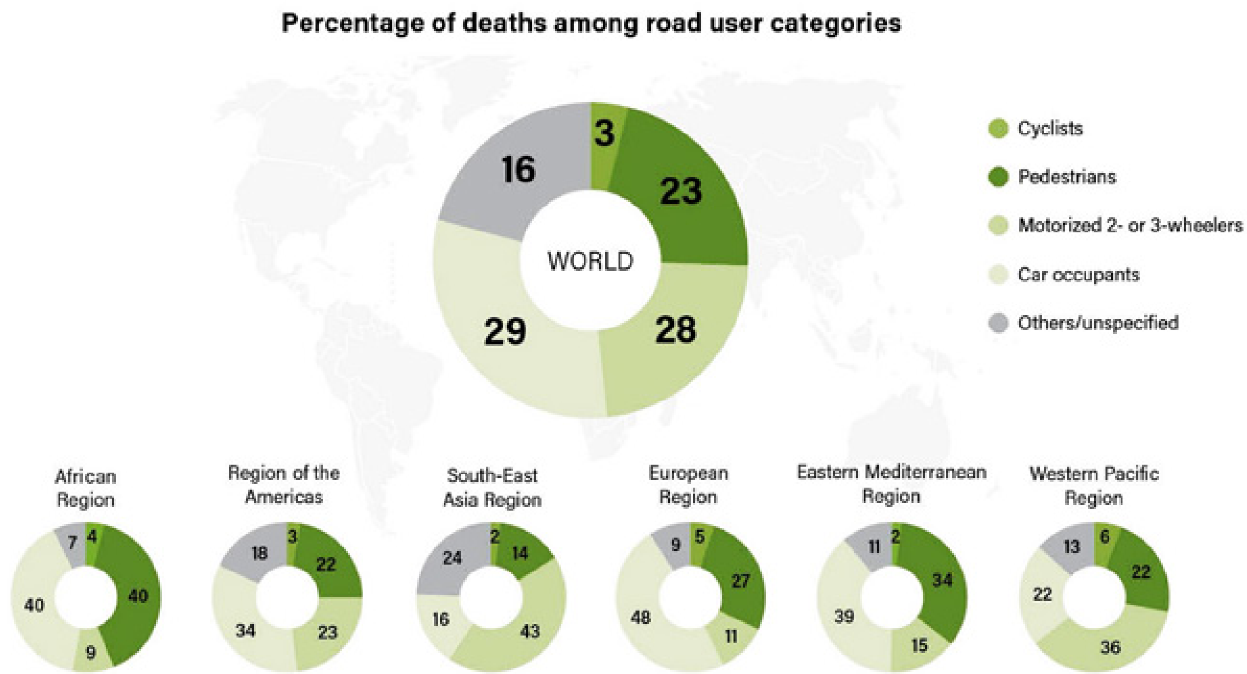
Globally, 1.3 million preventable deaths and an estimated 50 million injuries occur each year while using transport systems. Males are three times more likely than females to be killed in road traffic crashes (figure 4.2); young males are particularly impacted by road crashes, which are the leading cause of death for children and young adults 5–19 years of age (WHO. n.d). Globally, pedestrians and motor vehicle passengers represent the largest share. However, in Southeast Asia and the Western Pacific, the vast majority of those who die are riders of motorized two- and three-wheelers whereas, in Africa, it is pedestrians who are most likely to be killed in a road traffic collision (figure 4.3) (WHO 2018).

Figure 4.2: Mortality caused by road traffic injury (per 100,000 population) (2019)



Source: World Health Organization, Global Health Observatory Data Repository raw data and WB data for regions and authors' analysis.

Figure 4.3: Road traffic deaths by road user type



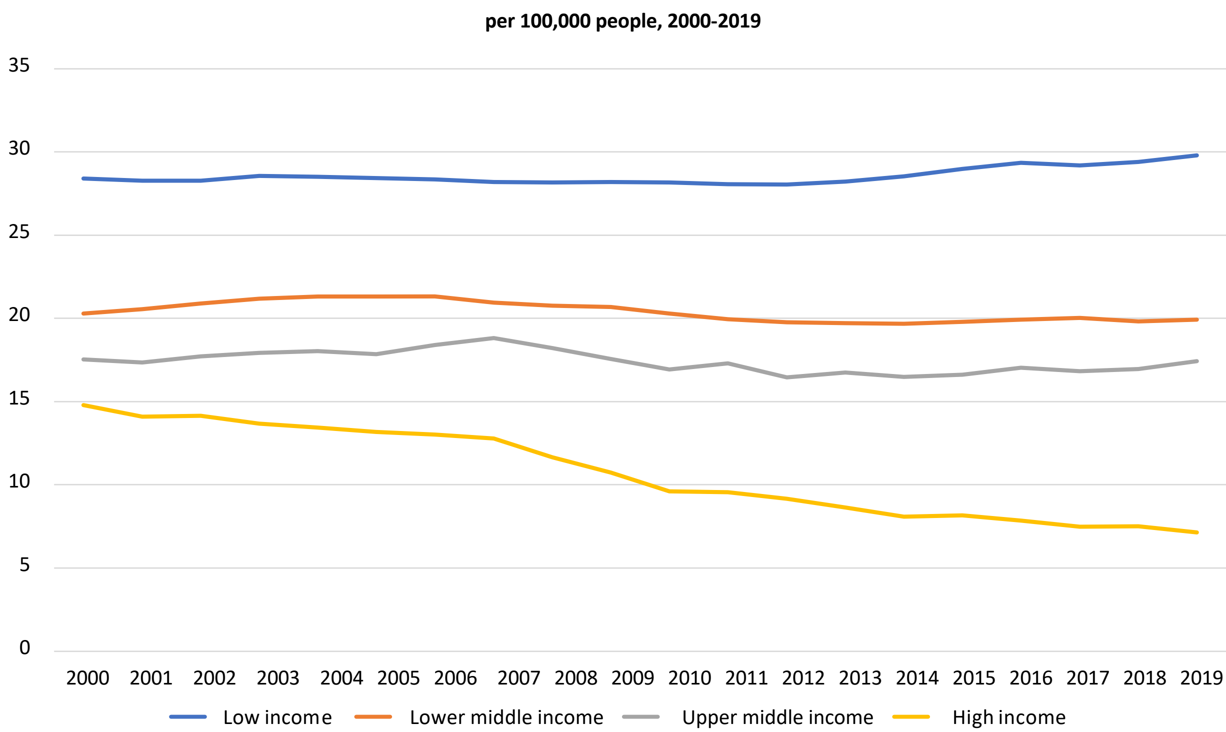
Source: WHO global status report on road safety 2018.

4.4.2 Trends and current state of road traffic deaths

The Global Mobility Report 2017 reported that road transport claims the bulk of transport-related fatalities worldwide: it accounts for 97 percent of the deaths and 93 percent of the associated costs. Based on the latest data, the state of road safety has not significantly improved since 2017. Looking at mortality rates by countries' income groups (figure 4.4), road traffic injury deaths per 100,000 population have consistently been higher in developing countries than in developed countries. This suggests that the lower the country's income, the bigger the safety concern. Moreover, high income countries have reduced their mortality rate caused by traffic injury deaths over time, while low-income countries show a slight increase over time. While the fatality rates per 100,000 population are highest for low-income countries, middle income countries merit close attention, if the problem is to be seriously addressed since the bulk of the fatalities happen in these countries.

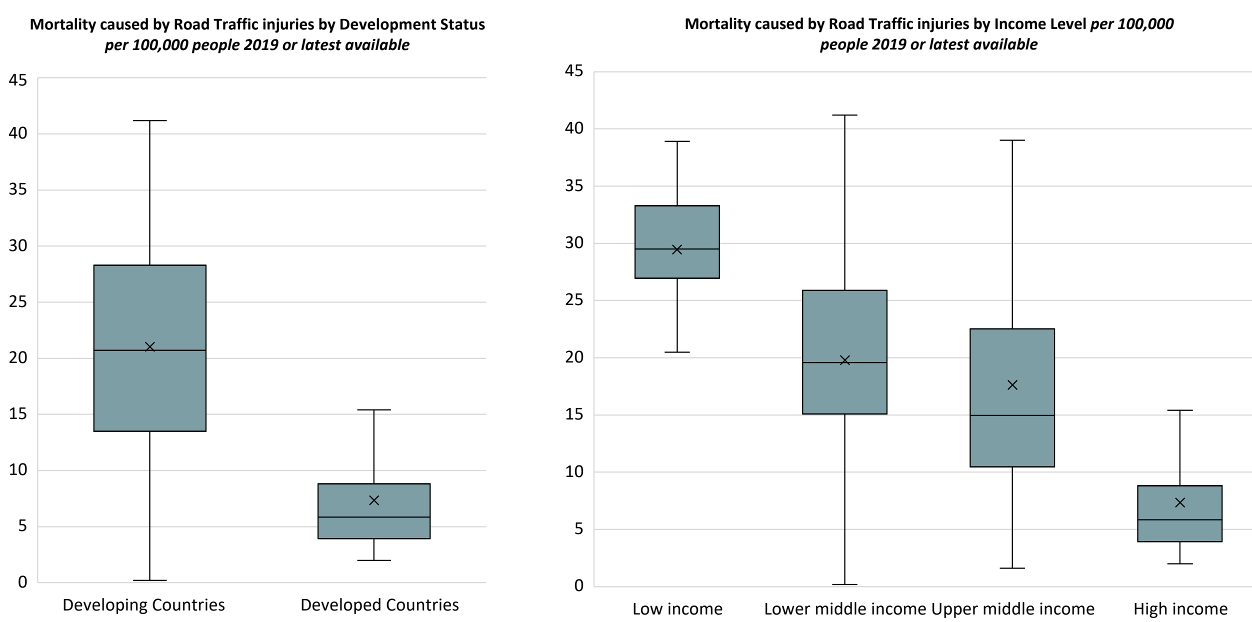
The latest data confirms the significant disparity in the road safety problem between developed and developing countries (figure 4.5). With an average number of road traffic deaths per 100,000 population of 7.1, developed countries face half of the mortality rate of developing countries which stands at 20.9. Disparities among developing countries are also notable, varying between 0.2 in the Federated States of Micronesia and 64.6 in the Dominican Republic.

Figure 4.4: Mortality caused by road traffic injuries by income group classifications



Source: World Health Organization, Global Health Observatory Data Repository raw data and authors' analysis.

Figure 4.5: Performance on safety by level of development and by income level



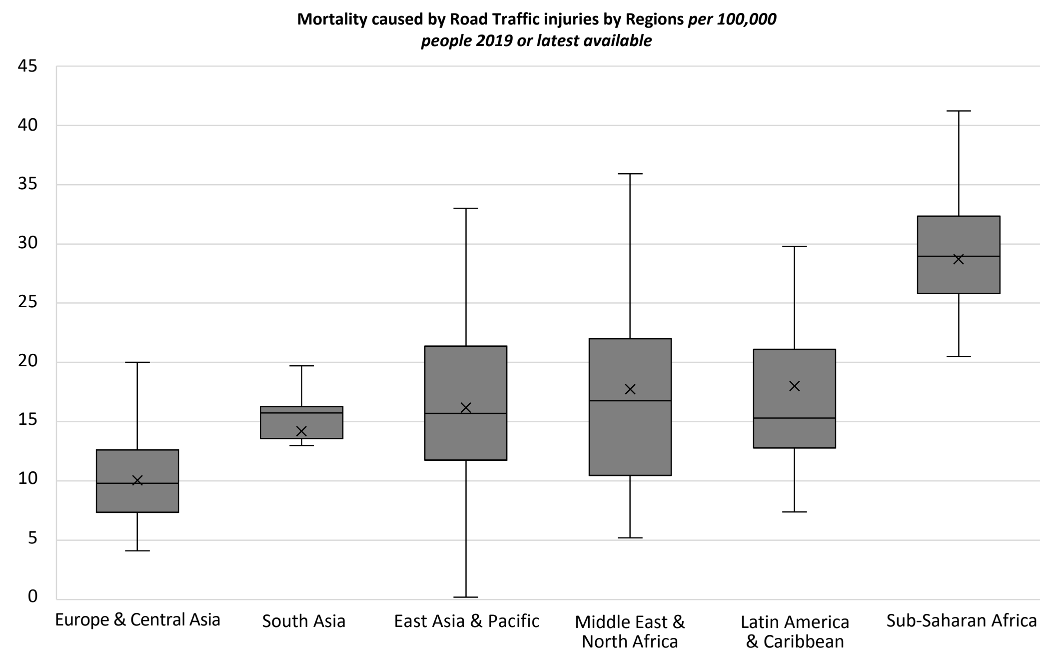
Source: World Health Organization, Global Health Observatory Data Repository raw data and authors' analysis.

Note: The width of the box on either side of the median shows the spread of the observations between the first and third quartiles (i.e., the 25 percent and 75 percent largest values). The whiskers show where the more spread-out observations lie. Individual dots show observations, which are outlying extreme values. X marks the mean value.

Additionally, an analysis of safety performance by regions found that Developing countries in Europe and Central Asia on average have fewer mortalities caused by road traffic injuries. Sub-Saharan Africa has the highest number of mortalities caused by road traffic injuries (figure 4.6).

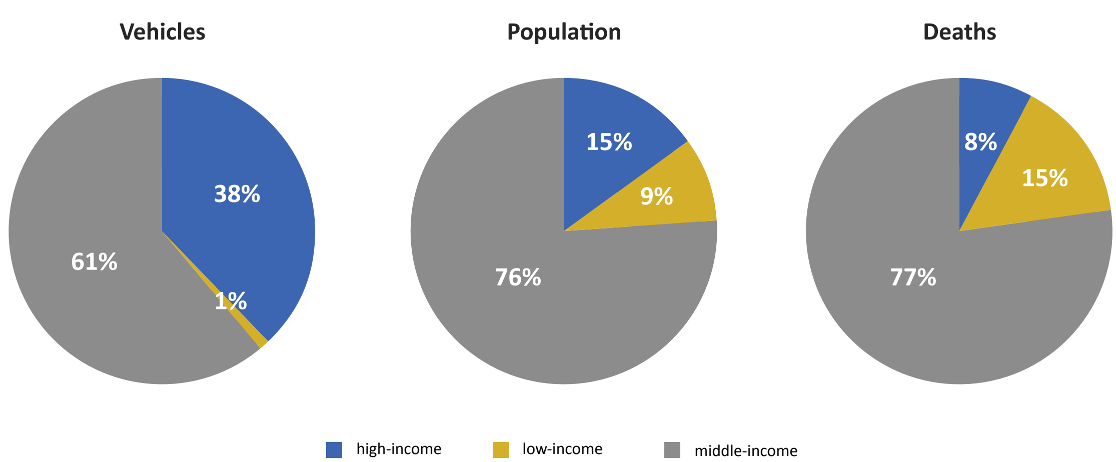
Likewise, road traffic deaths disproportionally affect the middle-income countries. High-income countries are home to 15 percent of the world's population and approximately 38 percent of the world's registered vehicles, yet they account for only eight percent of the global burden of deaths (figure 4.7). Conversely, middle-income countries are home to 85 percent of the world's population and comprise 62 percent of the total number of registered vehicles, yet they account for 92 percent of all deaths (box 4.2).

Figure 4.6: Performance on safety by regions for developing countries



Source: World Health Organization, Global Health Observatory Data Repository raw data and authors' analysis.

Figure 4.7: Comparison of deaths to population and number of registered vehicles



Source: WHO 2019 GHE Estimates.

While the total number of deaths is related to both the population and motorization levels within a country and does not give an assessment of risk, it nonetheless indicates where intervention could help significantly to reduce the total number of road traffic deaths at a global level. On top of the enormous human suffering caused, the economic costs of poor road safety keep hundreds of millions in poverty, with the drain on their productive human resources, and the economic losses estimated at US$1·8 trillion in 2015–30, which is equivalent to an annual tax of 0.12 percent on global Gross Domestic Product (Chen, Simiao et al 2019).

Multiple studies have shown that inequities exist within countries as well as between them. A variety of studies across Europe and, more recently, Latin America, demonstrate that people at lower socio-economic levels or living in more deprived areas face a higher risk of dying—particularly as pedestrians and cyclists who are involved in road crashes in areas other than their residential areas (Aldred R. 2018, Gotsens M et al 2013, Morency P et al 2012, Pirdavani A et al 2017, Sanchez-Gonzalez et al 2020, and Leveau CM 2020).

Several studies using multivariate models attempt to elucidate the role of economic levels versus education levels, with some studies finding a greater detrimental effect on safety in relation to lower education than income. Additional studies have confirmed that improvements in walkability tend to occur in more affluent areas where, paradoxically, less walking occurs (Bartzokas T et al 2020, Ferrari G et al 2021, and Arellana J et al 2021).

Road fatalities and injuries and poverty are closely linked: (i) Poorer citizens often travel greater distances for education and work and do so using unreliable vehicles and infrastructure, thus increasing their likelihood of experiencing a serious crash; (ii)Road traffic injuries affect the working age population most severely; (iii) Road crashes drain the GDP of countries by claiming millions of economically productive young lives (World Bank 2021); (iv) The socio-economic burden of road crashes is disproportionately borne by poor households (World Bank 2021); (v) The ability to cope with financial distress post-crash was better for high income households than low income households (World Bank 2021).

Box 4.2: Trends in performance on safety (globally and by income group classifications or level of development)

Evidence shows at least a ten-fold difference between countries with the lowest and highest rates of road traffic deaths. Most road traffic deaths (92 percent) occur on the roads of rapidly motorizing low and middle-income countries (LMICs). The risk of death in road traffic crashes is more than three times higher for LICs than HICs with risk decreasing as income increases in most regions. Between 2013 and 2016, the number of road traffic deaths did not reduce in any LIC whereas 52 MICs and HICs achieved some reduction. Overall, the number of deaths increased in 111 countries over this period (WHO 2018).

Moreover, LMICs are facing a major challenge in road safety; the upward trend of road crash fatalities and injuries causes human suffering, grief, and loss, and retards economic growth of LMICs. Efforts to implement road safety interventions are fragmented, lack coordination, and are often not data driven or evidence based. A clear understanding of the prevailing road safety situation is a critical step in the reduction of road crash fatalities and injuries through data driven evidence-based interventions. Many vital metrics of road safety performance are not measured effectively in developing countries. This includes the actual number of road crash fatalities and injuries, specific road safety problems (for example, helmet wearing, speed, hazardous road-sides, and pedestrians without footpaths), and the existing capacities of societies and authorities (Tavakkoli M et al 2022 & Milad Haghani et al 2022).

Understanding regional differences is crucial to tailor advice and support to these circumstances. For example, an analysis of WHO Global Status Report data illustrated that the South Asia region had a disproportionately high level of truck and bus safety problems. Regional collaboration and coordination approach may also be useful in addressing broader challenges related to sustainability practices and policies that extend beyond national boundaries. In these situations, regional collaboration can also offer an opportunity to amplify the voice of individual countries. Through establishing regional networks and alliances, countries have more leverage in their multilateral negotiations and negotiations with multiple organizations (Hyder A et al 2016). In some circumstances, there may be a need to weigh whether the value of developing regional platforms outweighs the value of investing in countries. Investing in country data systems should take priority over efforts to invest in regional data systems, which are reliant on progress being made in participating country data systems. Regions are different and have different priorities. The bulk of these differences can be established by broader transport system metrics which provide insights into network, vehicles and road users, and related travel patterns.

The absence of valid, representative data presents profound challenges. One of them is to understand the problem and then develop and implement necessary countermeasures and strategies that address the burden of road crash fatalities and injuries.

Source: Global Road Safety Facility – World Bank

4.4.3 Examples of Country Road Safety Investments

Box 4.3 and Box 4.4 below highlight the examples of road safety programs in India and Bangladesh respectively.

Box 4.3: India State Support Program for Road Safety

The World Bank Group is financing a US$250 million India State-Support Program for Road Safety (ISSPRS or 'PforR Program'). The Program aims to strengthen the capacity for results-based management and improve road safety outcomes in seven Participating States. The State Support Program for Strengthening Road Safety (SSPSRS or 'Government program') of Government of India (GoI)—aimed at strengthening institutional framework and management functions of the government, necessary for achieving the national vision and targets on road safety - is the cornerstone underpinning ISSPRS. Result Areas (RAs) for ISSPRS include: (i) Building Participating States' institutional capacity and systems to reduce road crash fatalities and injuries, (ii) Improving road engineering to enhance the safety performance of state highways and urban roads, (iii) Improving Participating States' vehicles and driver safety systems, (iv) Strengthening Participating States' road policing effectiveness and efficiency, (v) Improving post-crash care by strengthening state emergency medical and rehabilitation services.

Road crash deaths in India, which are the highest in the world, are a burden to its demographic dividend and have a tangible impact on poverty and hard-won economic gains. Official data from GoI suggest that crashes on India's roads claim the lives of about 150,000 people and injure another 450,000 people each year. More than half of the crash victims are pedestrians, cyclists, or motorcyclists (together termed as "Vulnerable Road Users"), often the poorer members of society. Road crashes also affect poor rural families disproportionately, with a greater percentage falling into economic distress after road crashes than other parts of the population.

India is committed to improving road safety outcomes. Through the adoption of the landmark Motor Vehicles Amendment Act (MVAA), 2019, and commitment to the Stockholm Declaration on road safety (2020), the country aims for enhanced governance and accountability of all stakeholders involved in the road safety system and supports the National Road Safety Strategy 2018-2030.

Key Program characteristics are:

1. Evidence-based interventions towards achieving outcomes.
2. Interventions in road engineering, vehicle and driver safety, traffic safety enforcement, and post-crash care to address identified gaps in management and implementation.
3. Targeted capacity building of designated lead agencies and other key stakeholders in states through the Road Safety Capability Building Program (RSCBP) module.
4. Technical assistance for the participating states.
5. Disbursement of Program resources based on the achievement of nine Disbursement-Linked Indicators (DLIs) - chosen to reflect five Results Areas.

Intended project outcomes include development of coordinated, data informed, and results-oriented financing and budget plan for road safety, and reduction in annual road traffic crash fatalities in the Participating States.

Source: Global Road Safety Facility – World Bank

Box 4.4: Bangladesh Road Safety Project

The World Bank Group is financing a US$358 million multisectoral, standalone Bangladesh Road Safety Project. The project aims to support the establishment of a lead road safety agency and achieve a 30 percent reduction in fatal crashes along pilot highway corridors and other roads receiving mass-action treatments. GRSF funded analytical and advisory services helped shape the design of project components. Funding activities included assessments of high-risk pilot corridors, a review of the crash database system, assessment of traffic enforcement agencies, gender gap analysis and economic analysis of the project.

Crashes on the roads of Bangladesh are estimated to kill about 25,000 people and disable another 200,000 people each year. Over the past three decades, the increase in the road traffic fatality rate in Bangladesh has been three times higher than that across the South Asia region. Over half the road crash victims are poor and vulnerable, with pedestrians accounting for almost half of these deaths and injuries.

The Government of Bangladesh (GoB) is committed to sustainably improving the nation's road safety outcomes. Through its landmark Road Transport Act, 2019, the GoB aims to enhance the governance and accountability of all stakeholders in the road safety system, by implementing targeted National Road Safety Strategic Action Plans to halve its road traffic deaths. The Bangladesh Road Safety Project will bring a new impetus to this commitment.
Key project characteristics are:

1. A focus on institution building, governance and public-private partnership opportunities in road safety.
2. Multisectoral road safety pilot initiatives on national highways, and urban and district roads.
3. Priority investments in road infrastructure, vehicle and driver safety, traffic safety enforcement, and crash data management.
4. Post-crash care.
5. Technical assistance for the participating departments.

Intended project outcomes include the launch of a national road safety program and road safety fund, improved inter-agency coordination, faster incident response and crash clearance, and reduced traffic safety risks for all road users in Bangladesh.

Source: Global Road Safety Facility – World Bank

4.4 Outlook

The rate at which transport is becoming motorized is not sustainable; currently exceeding one billion, the world's fleet of motor vehicles is likely to grow to over 2.2 billion in 2050 (EIA, 2021). As such, transport, and land use planning along with mobility policies should be used to shift travel from the private car toward cleaner, safer and affordable modes incorporating higher levels of physical activity such as walking, bicycling, and use of public transit (WHO 2022). In line with the Inland Transport Committee (ITC) recommendations for road safety (UNECE, 2022), policies that promote compact urban design and prioritize safe access by pedestrians, cyclists, and users of safe public transport can reduce the use of personal motorized transport, carbon emissions, traffic congestion, local air pollution, as well as health care costs, while improving health, community well-being, and quality of life.

To bring this vision to life, commitment and coordination are needed from all levels of government, starting right at the very top, to ensure that all ministries and partners are involved in building safe transport systems. A step change in leadership is required, along with approaches and actions from governments around the world. Governments, both national and local, bear the main responsibility to ensure the safety of all citizens.

Governments must set up and maintain the broad and inclusive coordination mechanisms that we need to ensure safe systems. Transport systems intersect with so many other policy areas, including child health, climate action, urban planning, gender equality, and sustainable and equitable development overall, so governments must step up to fulfil their leadership and coordination role (AEG 2020 and WHO & UNECE 2021).

Governments are pivotal in providing strong legal frameworks and funding (Hysing E 2021). Long-term, sustainable investment is needed in safe transport and mobility systems. Significant opportunities to leverage existing investments in wider areas of transport that already exist. This includes transport and network planning, public transport, road construction, and in-traffic operation and maintenance. Safety must be central to all transport-related decision making and in the allocation of all resources.

Safe mobility is a crucial aspect of the universal right to health, a fundamental right of every human being, wherever they are and whatever their circumstances (Vision Zero Network, 2022). Safety is paramount, as the efficient mobility that is desired must not, and need not, come with a tragic cost to human lives.

It is imperative that governments and societies take heed and act, as the tragic toll on our roads continues to rise, and the vast range of transformational benefits that arise from safe mobility systems offer the promise of a safer, healthier, and better future for everyone, everywhere.

The World Health Organization (WHO) is set to release WHO Global Status Report on Road Safety 2023. The report aims to track the implementation of the Global Plan for the Decade of Action for Road Safety 2021-2023 by individual countries as well as global progress toward the target of halving the number of deaths and injuries from road traffic crashes by 2030[13]. With data from 2021, the report will highlight gaps in policy, institutional arrangements, as well as investments in the key areas of multimodal transport and land use planning, safe infrastructure, safe vehicles, road user behaviours, and post-crash response (WHO & UNECE 2021).

Notes

1 A fatality in the context of safety is a person killed in a crash or within 30 days of the crash due to injuries sustained in the crash. A serious injury in the context of safety is a non-fatal casualty who stayed more than 24 hours in a hospital. A slight injury in the context of safety is a non-fatal casualty admitted to the hospital for less than 24 hours. Source: https://www.itf-oecd.org/sites/default/files/argentina-road-safety.pdf and https://www.itf-oecd.org/sites/default/files/argentina-road-safety.pdf.

2 SDG target 3.6: By 2020, halve the number of global deaths and injuries from road traffic accidents. Source: https://sdgs.un.org/goals.

3 More information on the Decade of Action for Road Safety 2021-2030 is available at: https://www.who.int/teams/social-determinants-of-health/safety-and-mobility/decade-of-action-for-road-safety-2021-2030.

4 Developing global targets for road safety risk factors and service delivery mechanisms. https://www.who.int/activities/developing-global-targets-for-road-safety-risk-factors-and-service-delivery-mechanisms.

5 Resolution A/RES/74/299 "Improving global road safety", proclaiming the Decade of Action for Road Safety 2021-2030 is available at https://documents-dds-ny.un.org/doc/UNDOC/GEN/N20/226/30/PDF/N2022630.pdf? OpenElement.

6 More information on the Third Global Ministerial Conference for Road Safety is available at: https://unece.org/3rd-ministerial-conference-road-safety-special-envoy-calls-safety-be-non-negotiable-road-0.

7 The Global Plan for the Decade of Action for Road Safety 2021-2030 is available at: https://www.who.int/publications/m/item/global-plan-for-the-decade-of-action-for-road-safety-2021-2030.

8 More information on the UIC Safety Platform is available via the link: https://uic.org/safety/article/uic-safety-platform.

9 More information on the Global Aviation Safety Plan (GASP) is available at https://www.icao.int/safety/GASP/Pages/Home.aspx.

10 GANP Doc series 9750. https://www.icao.int/publications/Documents/9750_2ed_en.pdf.

11 The Global Aviation Safety Roadmap is available via: https://flightsafety.org/wp-content/uploads/2016/09/roadmap1.pdf.

12 The International Maritime Organization (IMO) is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships. IMO's work supports the UN sustainable development goals. More information about IMO and the conventions is available via: https://www.imo.org/.

13 More information: https://www.who.int/news/item/19-04-2022-new-global-advisory-panel-convenes-for-upcoming-road-safety-report.

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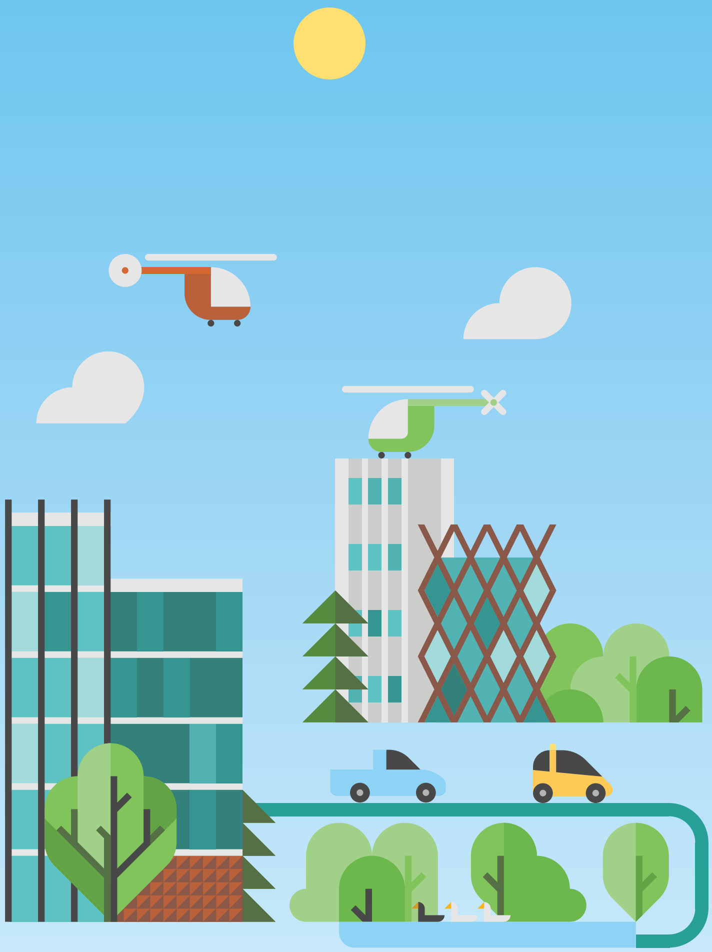
CHAPTER 5: EFFICIENCY



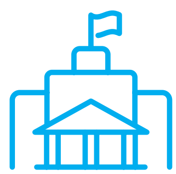
5.1 Goal Definition

The efficiency goal seeks to optimize the predictability, reliability, and cost-effectiveness of the transport system in the use of scarce resources—energy, technology, space, institutions, and regulations. Efficiency aspires to avoid travel time losses owing to congestion or poor organization of traffic flows (SuM4All 2017; 2019). This goal seeks to ensure that transport demand is met at the least possible cost for providers and users. An efficient transport system has transportation modes seamlessly integrated, and optimal traffic volumes, which reduces congestion and cross-border delays and makes the minimum use of energy resources per unit of transport, among other characteristics. In turn, an inefficient transport system has extensive delays and excessive costs that are detrimental to competitiveness, economic growth, and development in general (SuM4All 2017). Integrating high performance digital infrastructure into the transport system will help to manage transport fleets efficiently and improve the transportation of people and freight.

An efficient transport system mandates that governments create conditions in which private and public enterprises can develop services that in the medium to long term would lead to improved efficiency. Governments should implement regulations and standards that create a stable environment for business activities and underpin seamless communication between transport sector entities. These regulations help establish decent working conditions for employees of the sector. They ensure that transport is not developing at the expense of the environment and society. Hence, the regulations aimed at improving efficiency need to be embedded in a broader policy and regulatory framework for sustainable development of the transport sector.

Moreover, an efficient transport system requires that governments promote the development of knowledge and skills through workforce training and re-training. Advanced specialization and technological innovation in transport emphasize necessary skills even more profoundly. In turn, incorrect skill sets or an untrained workforce would not be able to lead the transport sector toward becoming an efficient one.

Finally, efficiency in the transport sector cannot be achieved without governments ensuring that necessary infrastructure is put in place which enables a seamless shift between modes and is connected internationally, in a way that would minimize disruption for example through transshipment.



Efficiency in the transport sector cannot be achieved without governments ensuring that necessary infrastructure is put in place

5.2 Global Commitments and Targets

The concept of efficiency is embedded in the Agenda 2030 for Sustainable Development and its SDGs framework. For example:

- **SDG 9.4:** By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource–use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries acting in accordance with their respective capabilities;

- **SDG 12.3:** By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses; and

- **SDG 12.c:** Rationalize inefficient fossil fuel subsidies that encourage wasteful consumption by removing market distortions. This is established in accordance with national circumstances, by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts. It considers specific needs and conditions of developing countries and minimizes possible adverse impacts on their development in a manner that protects the poor and the affected communities.

The efficiency goal is at the heart of UN conventions and agreements.[1] Infrastructure agreements, for example, managed by the United Nations Economic Commission for Europe (UNECE)[2] and the United Nations Economic and Social Commission for Asia, and the Pacific (UNESCAP)[3] provide a basis for the long term development of coherent international networks for the various modes of inland transport. Thus, they facilitate international travel for people and freight, and border crossing facilitation conventions help establish effective transit systems for moving freight (UNECE. 2021).

Network coherence and harmonization promoted by infrastructure agreements are expressed through infrastructure and operational parameters, which international roads, railway lines, inland waterways, and related installations such as freight transshipment terminals need to attain. These are especially important for establishing efficient freight transport, and concerns parameters such as: (i) for railways: mass per axle, gauge, loading gauge, gradient, or siding length; (ii) for roads: width of lanes, gradient, overhead clearance, and (iii) for inland waterways: minimum parameters of waterways of international importance, including the bridge clearance and minimum draught, and technical and operational criteria of ports of international importance located on these waterways.

The efficiency goal is also reflected in issues such as the admission of vehicles including road and rail vehicles and drivers to international traffic. These were formulated in UN instruments (table 5.1).

Unification of rules and enhancement of interoperability also strengthen transport efficiency (table 5.2). Importantly, agreements establishing unified legal regimes for regulating contracts of carriage contribute to the efficiency goal. Such efficiencies are also expected with the UNECE unified railway law project.

Table 5.1: Instruments for admission of international traffic

	Organization	Regulation or Convention
1	UNECE	1968 Convention on Road Traffic for road vehicles and their drivers
2	UIC	Agreement on Freight Train Transfer Inspection
3	The International Rail Transport Committee	General Contract of Use for Wagons within the scope of Convention concerning International Carriage by Rail (COTIF)
4	The International Rail Transport Committee	COTIF principles of uniform rules concerning the validation of technical standards, and the adoption of uniform technical prescriptions applicable to railway material intended to be used in international traffic (APTU)
5	The International Rail Transport Committee	Uniform rules concerning the technical admission of railway material used in international traffic (ATMF)
6	Organisation For Co-Operation Between Railways (OSJD)	Convention on international direct railway traffic, for rail

Source: Table original to authors.

Table 5.2: Unification of rules for interoperability

	Mode of transport	Regulation or Convention
1	Road	1958 agreement concerning the adoption of harmonized technical United Nations regulations for wheeled vehicles, equipment and parts which can be fitted or be used on wheeled vehicles and the conditions for reciprocal recognition of approvals granted based on these United Nations prescriptions
2	Road	1998 agreement concerning the establishing of global technical regulations for wheeled vehicles, equipment, and parts which can be fitted or be used on wheeled vehicles
3	Road	1997 Agreement concerning the adoption of uniform conditions for periodical technical inspections of wheeled vehicles and the reciprocal recognition of such inspections
4	Road	UN Convention on the contract for the international carriage of goods by road
5	Water	Convention on the carriage of goods by sea
6	Rail	OSJD agreement on the international goods transport by rail
7	Water	The Budapest convention on the contract for the carriage of goods by inland waterway (CMNI)

Source: Table original to authors.

Facilitation of transport and its enhancement to the efficiency goal are also reflected in conventions such as the Convention on Facilitation of International Maritime Traffic and the Convention on International Civil Aviation.

Fundamental to efficiency, especially following the COVID-19 pandemic crisis, is digitalization of transport information or documents. The efficiencies achieved through border crossing facilitation agreements such as Transports Internationaux Routiers (TIR) or agreements for contract of carriage can be furthered by their digital equivalents. The new legal framework for full digitalization of the TIR system, the so-called eTIR, entered into force in May 2021, opening eTIR to 77 countries across five continents. This landmark change allows for completely paperless crossborder transit of goods, under the customs guarantee of the TIR system. The eTIR international system, customs to customs, ensures the secure exchange of data on international transit of goods, vehicles, or containers according to the provisions of the TIR Convention between national customs systems and allows customs to manage the data on guarantees, issued by guaranteed chain to holders authorized to use the TIR system.[4]

At a regional level as in the EU, Regulation (EU) 2020/1056 on electronic freight transport information aims to enhance efficiencies in transport by allowing economic entities to share, with enforcement authorities, information in an electronic format concerning the transport of goods by road, rail, inland waterways, and air in the EU.

On European inland waterways, traffic and transport management, including, wherever technically feasible, interfaces with other transport modes are supported by river information services (RIS). Its application helps improve safety, efficiency, and environmental performance of inland navigation.

Systems such as those above are part of intelligent transport systems (ITS). UNECE, for example, is leading discussions on ITS in transport since 2004 (see Box 5.1). Many countries are making an effort with advanced transport systems to invest in research on ITS to produce better solutions and to allow increased uptake of relevant ITS applications by small and medium-size enterprises. The latter is important to reap the full benefits of ITS. Research on ITS spans: (i) simulations on rail slot adjustments to explore possible slotting gains, (ii) ex-ante simulations to assess possible benefits from segregation of passenger from freight traffic for both road and rail, (iii) piloted RIS Enabled Corridor Management as the next step to deploy RIS that supports inland navigation as a transport mode in the international multimodal logistics chain, (iv) systems developed to provide information on the loading conditions and automatically identify wagons and containers, and (v) online collaboration platforms.[5]

The efficiency objective is also reflected in the Vienna Programme of Action for Landlocked Developing Countries 2014–2024 (VPoA),[6] which is an international agreement focusing on transport corridors and trade for land-locked developing countries. Likewise, the WTO's Trade Facilitation Agreement (TFA)[7] aims to reduce the time and costs taken when moving goods across borders.

Since efficient transport systems need to consider the creation of worthwhile jobs in the transport sector, conditions for the creation of such jobs are at the heart of the International Labour Organization (ILO) legal framework of fundamental principles and rights at work. ILO has adopted several sectoral conventions or instruments for setting up favorable work conditions for ports, shipping, inland waterways, and road transport.

Box 5.1 United Nations efforts on enhancing efficiency in transport

The United Nations Economic Commission for Europe (UNECE) has established a group of experts on international railway passenger hubs to facilitate rail passenger transport and encourage a modal shift to more efficient journeys. This measure defines a network of key passenger railway hubs and a harmonized set of technical characteristics and parameters. These hubs will have a common feel in the same way as airports do today to facilitate the use of railways for international travel.

UNECE has also completed work on the definition of "Model Rules for the Permanent Identification of Railway Rolling Stock" as part of the Luxembourg Protocol to the Cape Town Convention on International Interests in Mobile Equipment. This aims to make the financing of railway rolling stock more efficient and less costly by creating certainty for investors in the sector.

UNECE established a group of experts in cycling infrastructure module in 2022 to improve efficiency in cycling. Among its key tasks, this group is working on defining major types of cycling infrastructure and their parameters as well as cycles so that cycling would not only be made safer across borders but also the cycling systems will be more efficient.

Source: UNECE.

Efficiencies in passenger transport are supported through advancing work on concepts such as mobility as a service (MaaS). The value proposition of this concept concerns integration of mobility services, which is realized by providing trip planning and one-stop fare purchase. Unfortunately, costs and risks of implementation and revenue sharing challenges need to be further addressed for this concept to reap full benefits.

Work on transport system resilience to climate change hazards needs to be at the heart of the efficiency goal. If transport systems are not adapted to the evolving conditions caused by climate change, transport operations risk being disrupted in the future. Such disruptions would turn the transport system toward inefficiency. Therefore, UNECE established a group of experts on assessment of climate change impacts and adaptation for inland transport. The group works on issues such as: (i) projections and analysis for climate change hazards linked with very hot weather or precipitations exceeding specific threshold values, (ii) collection of costs of disruption to transport operations caused by extreme weather events, (iii) methodologies for stress testing transport assets to climate change hazard, or (iv) methodologies for adaptation pathways for transport.

The ILO-IMO-UNECE "Code of Practice for Packing of Cargo Transport Units", which provides best practices for packing containers and other cargo transport units in intermodal chains helps ensure that freight transport is not only safe but efficient. Safe packing, on the one hand, allows for avoiding even small-scale incidents that otherwise would result in delays in loading containers on vessels, trains, or trucks. Containers packed for intermodal routes can be then moved from one mode to the other without re-packing freight.

Governments should set up development targets in any of these areas to improve transport efficiency, and with the understanding of regulatory, workforce, or infrastructure developments or constraints. These targets should especially tackle the areas with identified constraints. Countries which consider their transport systems in an initial stage of development would be interested in setting up a separate set of targets than countries that have already reached a more advanced development stage.[8]

5.3 Current State of Play

The most challenging aspect of efficiency is obtaining the right metrics and the data to measure it.[9] Some of the key aspects of efficiency in the movement of people and goods to date remain unmeasured.[10] The Partnership identified the logistic performance index (LPI) as the best available principal indicator with global data coverage to proxy countries' transport system efficiency. The LPI score reflects perceptions of a country's logistics based on: (i) efficiency of customs clearance process, (ii) quality of trade and transport-related infrastructure, (iii) ease of arranging competitively priced shipments, (iv) quality of logistics services, (v) ability to track and trace consignments, and (vi) frequency with which shipments reach the consignee within the scheduled time.[11] The LPI value varies between one (low) and five (high) as the aspirational target. This indicator allows for measuring the distance that remains between actual transport system performance and the target and comparing year-to-year progress to conclude on the direction in which the global transport system is evolving in efficiency (table 5.3).

Table 5.3: Principal indicator on efficiency target – average global performance

Indicator	Previous Data	Latest Data	Aspirational Target
Logistics performance index - overall [value: 1 = low to 5 = high]	2.87 (2016)	2.85 (2018 or the latest data available)	5

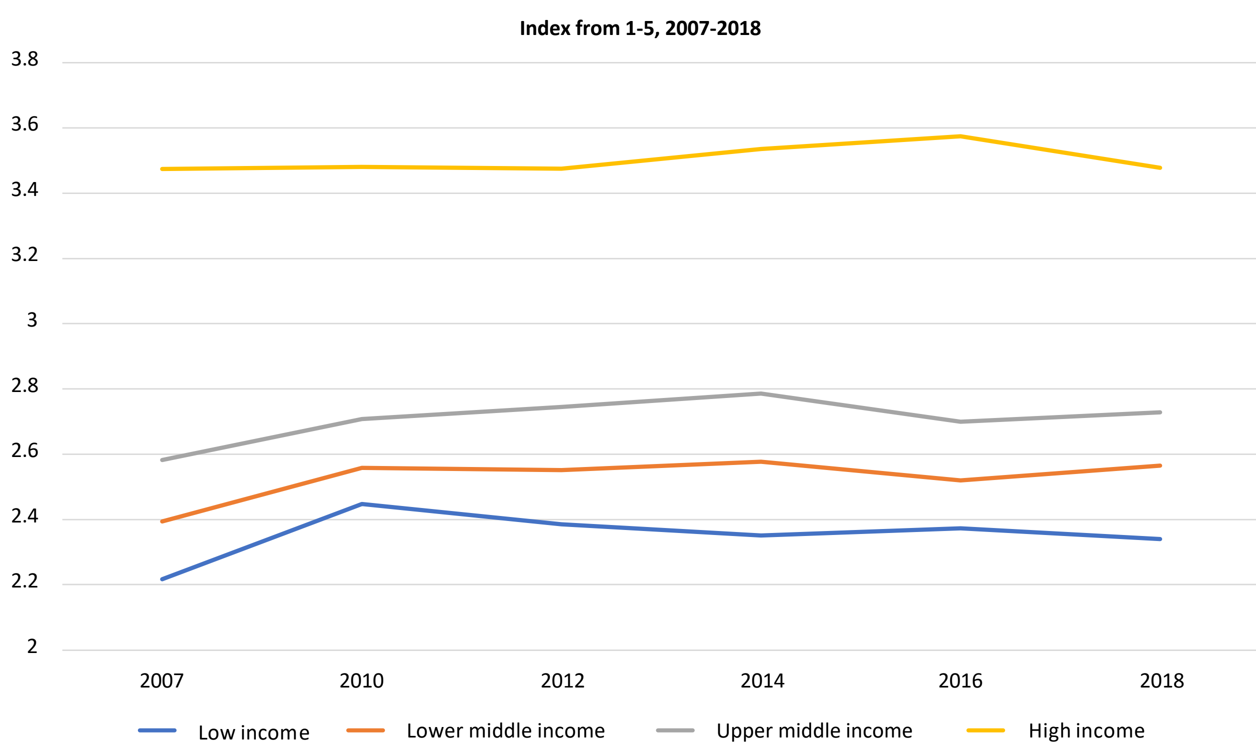
Source: Authors' analysis of World Bank data. Raw data on logistic performance index (LPI) Surveys are available online at: lpi.worldbank.org

At the aggregate level, the data do not show any visible improvements in the global transport system's efficiency. At the same time, transport systems are continuously subject to shocks, such as pandemics and extreme weather events, which need to be effectively managed now and in the future. The COVID-19 pandemic in 2020 disrupted supply networks and laid bare previously unanticipated vulnerability of transport systems. For example, highly efficient and tightly synchronized freight transport operations and logistics systems created disruptions that had a ripple effect on global commerce—exposing the fragility of the entire global supply chain. This led to shortages in the availability of medical supplies, raw materials, sub-assemblies, and finished goods as well as logistical issues and inventory build-up (Vandycke, Viegas, and Sarriera 2020). As a result, a critical lesson was learned—that efficiency is not everything. Specifically, while fully optimized production and transport systems under typical conditions in the quest for efficiency generate significant global and trade benefits, they are highly vulnerable to risks. Therefore, building redundancy—at the cost of system efficiency losses—could be the price to pay to minimize risk to the global supply chains in the future (Vandycke and Viegas 2020).

Looking at transport system efficiency through the lens of income groups shows a significant gap between high income countries and low income countries (figure 5.2). By all standards, the first group outperforms the second group—LPI = 3.5 in developed countries against 2.5 in developing countries. The higher the country's income, the more efficient the international supply chains, and the organization of the movement of goods through a network of activities and services in the country. Disparities are also apparent within income levels. For example, upper middle income group has some of the top performers and some of the bottom performers in transport efficiency globally—the top performer has 3.6 out of 5 while the bottom performer has 2.1.

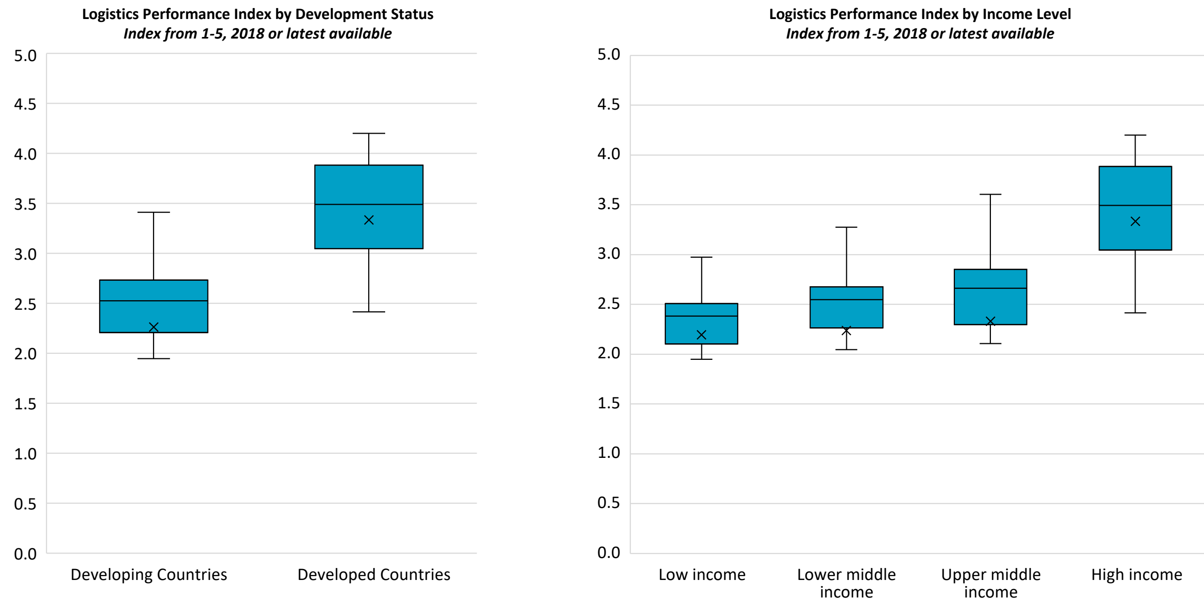
Over time, the efficiency of transport systems in high income countries has stagnated, while performance has marginally improved in low and middle-income countries (LMICs) (figure 5.1) A plausible explanation is that middle-income countries usually have well-functioning infrastructure and border control. They see the biggest gains from marginal improvements in logistics services, particularly outsourcing specialized functions, such as transportation, freight-forwarding, and warehousing. Similarly, in low income countries, the biggest gains typically come from improvements to infrastructure and basic border management, which might mean reforming a customs agency, but, increasingly, it means simple improvements in efficiency in other agencies present at the border. On the other hand, marginal improvements high income countries may be lower due to larger time lags before results are achieved. In high income countries, awareness and demand are growing for green logistics or logistics services that are environmentally friendly, which take time to design, scale up and implement.

Figure 5.1: Logistics performance index by income level



Source: World Bank raw data and authors' analysis.

Figure 5.2: Performance on efficiency by the level of development and by income level



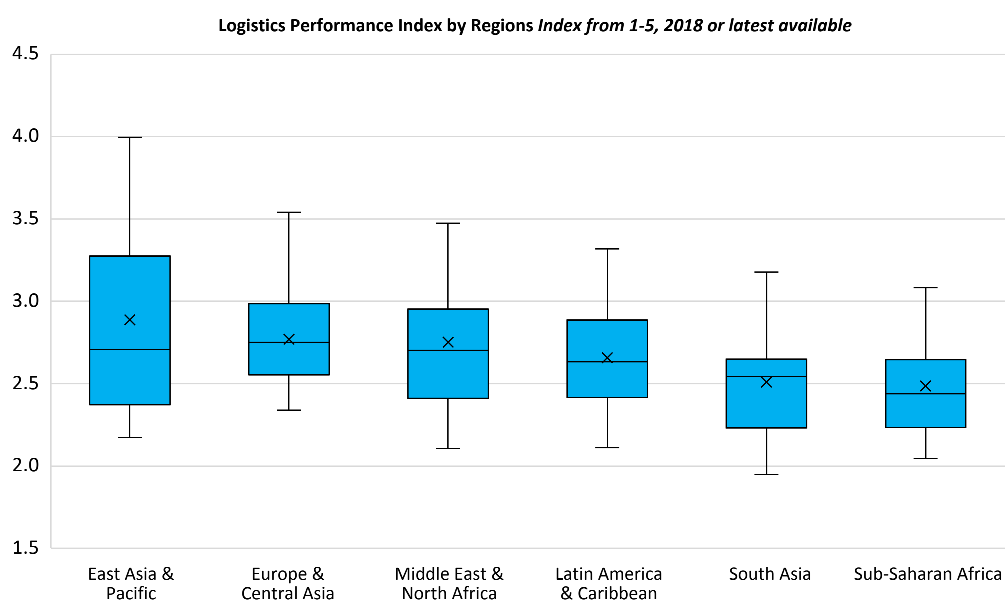
Source: World Bank raw data and authors' analysis.

Note: The height of the box on either side of the median shows the spread of the observations between the first and third quartiles (i.e., the 25 percent and 75 percent largest values). The whiskers show where the more spread-out observations lie, while X marks the mean value.

Moreover, analysis of efficiency performance by regions found that developing countries in East Asia &Pacific on average perform better in efficiency while countries in Sub-Saharan Africa faired the lowest (Figure 5.3).

To complement this high level analysis from the lens of developing countries in Africa, Box 5.2 below takes a deep dive on the state of play in efficiency for African counties using a recent study to explore the spatial distribution of road infrastructure in the region.

Figure 5.3: Performance on efficiency by regions for developing countries



Source: World Bank raw data and authors' analysis.

Box 5.2: Efficiency of Road Transport in Africa – Africa's spatial distribution of road infrastructure

One of the pressing obstacles on Africa's economic growth is its limited infrastructure. In the 2019 working paper from the National Bureau of Economic Research, Tilman Graff examines the spatial inefficiencies of Africa's transportation industry and its impact on trade. The paper does not focus on Africa's lack of infrastructure (Africa has approximately 31 kilometers of paved road per 100 square kilometers of land in comparison to 134 kilometers of paved road in other low-income countries). Instead, the author delves into efficiency issues by assessing the extent to which the region's existing infrastructure is in the right place. Key findings are:

- Nigeria, for example, has relatively efficient road infrastructure, and very few optimal routes require walking.
- In contrast, Mali, with the Sahara Desert dominating the country's northern region, exhibits large, concentrated swaths where walking is the optimal method of transportation.
- Ethiopia's optimal routes, on the other hand, vary according to subregion. Notably, according to the author, Ethiopia's transportation infrastructure is predominately structured north-to-south and has few trails that facilitate travel from east to west.
- In stark contrast to the previous three examples, the relatively small country of Rwanda lacks road density and location nodes, and its geography, based on the author's analysis, is more conducive to driving as the most efficient mode of transportation.
- Overall, says the author, his research suggests that the distribution of Africa's transportation infrastructure is inefficiently and unequally allocated spatially, as some regions are over overequipped and others underdeveloped.

The author explores several hypotheses to explain why Africa's roads are inefficiently placed. One hypothesis concerns railway lines: He suggests that regions with railway lines constructed by colonial powers tend to have surplus road infrastructure. According to the hypothesis, colonial rail infrastructure enticed further transportation infrastructure at the same locations due to the "spatial organization of economic activity" and urbanization clustered around those rail networks.

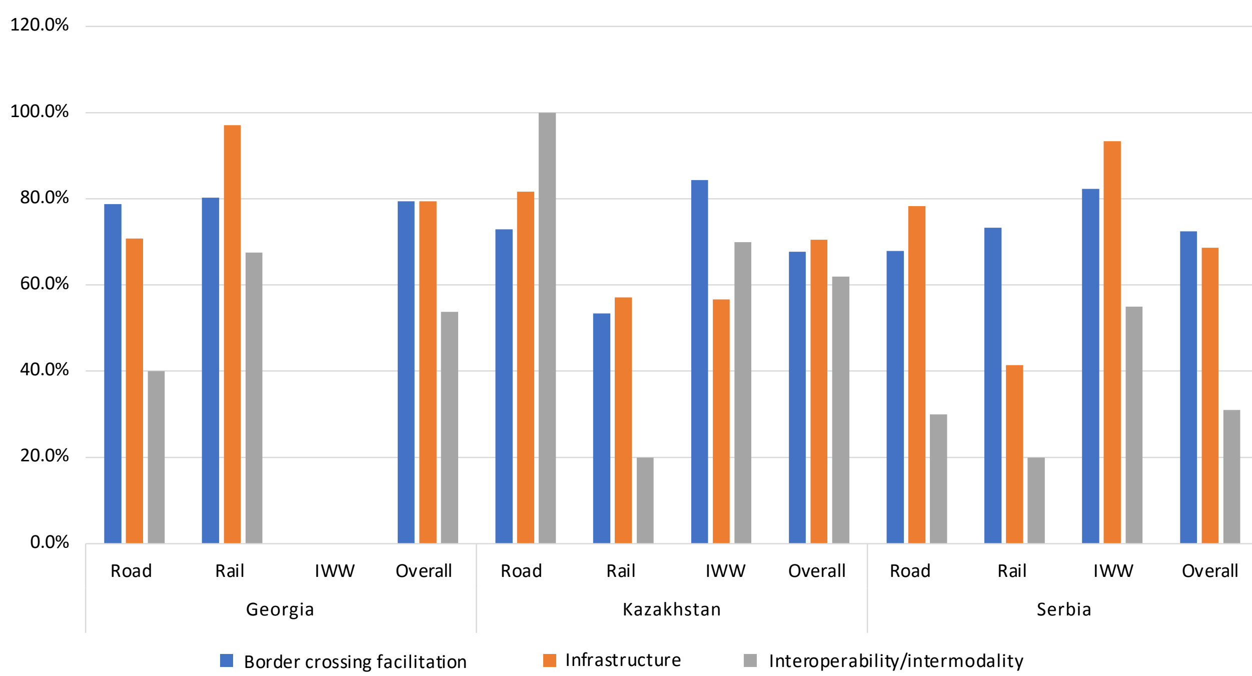
In this way, the author argues that areas with colonial rail infrastructure tend to have an inefficiently high density of roads relative to other regions. While contemporary economic activity still clusters around these former railway lines, the author argues that their historical purpose no longer provides an efficient trade network today. Notably, some planned railways were never built, and the author finds that it is exclusively the built, rather than the planned, railways that are associated with inefficiency with trade networks.

Source: Graff (2019); Holtz and Heitzig (2021).

Next, we take a deep dive on measuring efficiency beyond the LPI indicator. While the LPI is a valuable indicator to assess the level of efficiency achieved in the freight transport sector by its users—shippers and freight forwarders—other indicators are available to refine the analysis, for example, the sustainable inland transport connectivity indicators (SITCIN) provides a comprehensive set of indicators to measure the economic, environmental, and social sustainability of inland transport systems, including road, rail, and inland waterways. The indicators offer a set of measurable criteria for governments, allowing them to evaluate the extent to which they implement the relevant UN legal instruments in the field of transport and the degree to which their inland transport systems are interoperable with those in neighboring countries. SITCIN enables countries to measure their degree of inland transport connectivity, assess economic sustainability, and provide insight into how efficient road, rail, and inland waterway transport systems and their operation are.[12]

SITCIN was piloted in five countries (figure 5.4). The self-assessments by the transport ministries present a satisfactory performance for Georgia (box 5.3), Kazakhstan, and Serbia in border crossing facilitation and infrastructure. Performance shortcomings were noted in providing seamless intermodal solutions.

Figure 5.4: SITCIN assessment across modes of transport in Georgia, Kazakhstan, and Serbia



Source: UNECE data and authors' analysis.

Box 5.3: Summary of SITCIN pilot project in Georgia

Transport connectivity of Georgia performs well in facilitating crossborder transport through the application of electronic data exchange, free-of-charge customs clearance service for export and transit containers, and visa-free access for drivers from main trade partner countries, for instance. The key challenge is to ensure the same service quality and simplified border-crossing procedures established by the relevant authorities in adjoining countries. Coordination and delegation of authority on controls with Azerbaijan and Armenia need to be improved. Road infrastructure scores well on many of the indicators such as the ratio of international roads, length of dual carriageway, and IRI rating. Room for improvement can be seen in the number of international roads with design speeds of at least 100 km/h, the provision of service facilities along international roads, and tunnel management systems. Georgia's rail transport infrastructure mostly satisfies the international standards mainly because the country participates in various international corridors. However, challenges remain in aged rolling stocks, low commercial speed, and unsecured siding at rail BCPs, and international rail lines. Even though Georgian law adheres to global intermodal transport agreement, the share of multimodal, intermodal, and combined cargo transported by road transport remains low, at approximately 21 percent. Containerized cargo transportation also sees a low share. Among all the assessment aspects, the lowest performance is shown in environment and energy due to the high age of vehicles, low stringency level of national vehicle emission legislation, and the small number of alternative fuel road vehicles.

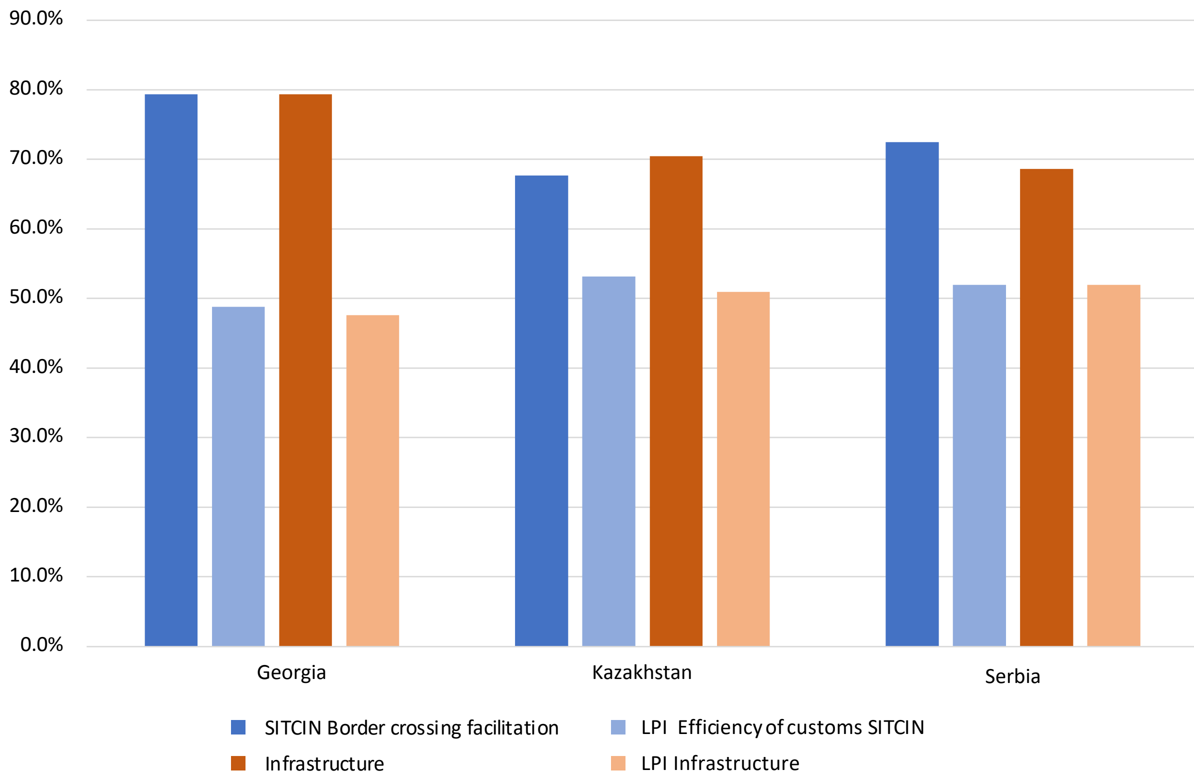
The SITCIN pilot projects have proven that SITCIN can be used as such a tool. SITCIN self-assessments allowed the pilot project countries to identify the underperformance of transport systems and plan for activities to start relevant processes to address this underperformance in the short to medium term. It is worth stressing again that many of the underperformance issues identified are ready solutions that exist often reflected in the international transport rules and regulations. Eliminating system gaps can be achieved by adequate transposition and implementation of rules and regulations from international agreements and conventions.

Source: UNECE analysis.

It is important to note that SITCIN self-assessments may diverge from the perception of the sector performance expressed by the LPI survey results and the views shared by the shippers, freight forwarders, and other users of the transport systems. Figure 5.5 shows the comparison between SITCIN self-assessment components of border crossing facilitation and infrastructure versus the LPI components of border efficiencies and infrastructure for three SITCIN pilot-project countries. The performance self-assessment scores better than the perception of performance assessed by the system's users.

Some of the divergences come from the fact that SITCIN assesses only inland transport systems. Specific achievements in one country do not necessarily ease operations for the shippers if the adjoining countries have not been able to offer similar service levels. For instance, simplified border-crossing procedures would only bring benefits to users if harmonized by two adjoining countries.

Figure 5.5: SITCIN and LPI comparison of components for Georgia, Kazakhstan, and Serbia



Source: UNECE and World Bank data and UNECE authors' analysis.

5.4 Outlook

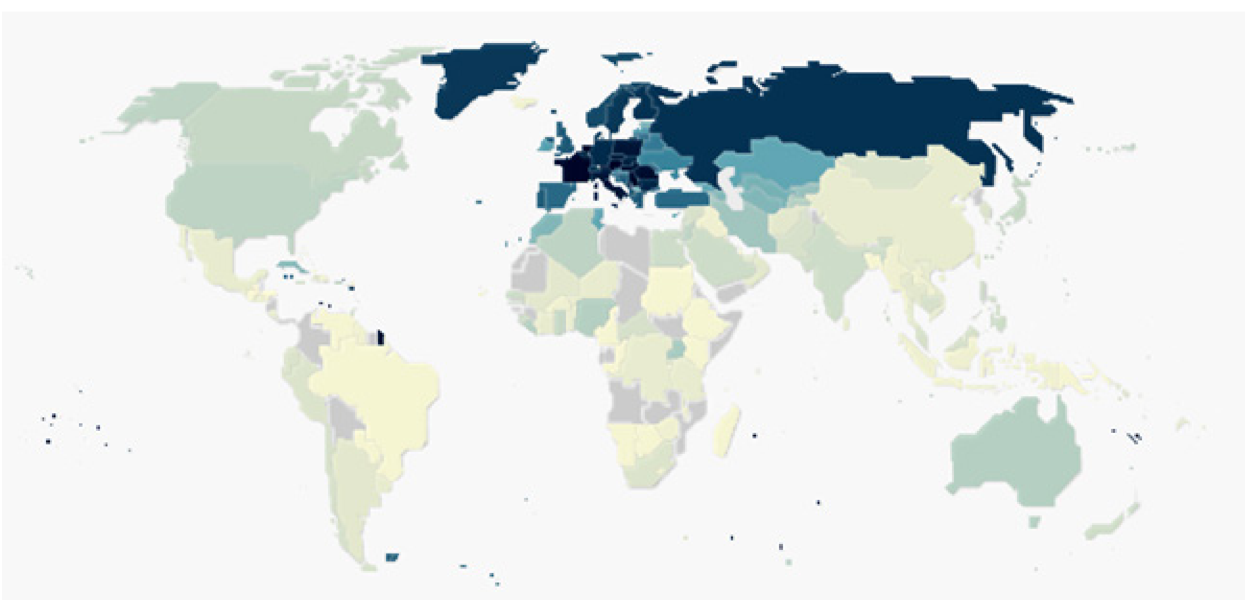
Achieving further progress in transport efficiency requires provision of a stable policy and regulatory environment for public and private transport entities to carry out their operations. Such stability is often achieved by transposing and implementing United Nations and other transport legal instruments described in the preceding sections.

No formal process exists to assess how various legal instruments are implemented. Hence the United Nations does not collect data from countries on the level of implementation. Map 5.1 depicts the accession to the various legal instruments around the world, with darker colors representing a higher number of accessions. It should however be noted that accession does not need to equal implementation.

As monitoring of implementation on a global level remains elusive due to scale challenges, countries—especially in the developing regions—should be encouraged to accede to more of the UN instruments and strengthen their capacity to self-monitor the implementation of the agreed rules, regulations, and plans. This would result in increased global social benefits. International transport corridors offer seamless connectivity only when the available infrastructure is constructed, maintained, and operated in accordance with the agreed construction and operational parameters.

Whether or not and how quickly the transport system can improve its efficiency depends on where the system constraints or inefficiencies are. Further development of the instruments to manage digitalization effectively and automation globally would also assist in strengthening efficiencies. At the same time, as it is the responsibility of the governments to establish effective, or sustainable transport systems, it is important for the governments of developing countries, to have at hand tools, which would help them assess the system, identify gaps, and address them (box 5.4).

Map 5.1: Number of accessions to UN inland transport legal instruments



Source: https://unece.org/transport/contracting-parties.
Note: The darker the color, the higher the number of legal instruments acceded (in force or not).

Box 5.4: Good practice examples of tools that help with monitoring the implementation of instruments to enhance efficiency in transport

The TEN-T network

The European Union collects and publishes information on the compliance indicators for the TEN-T network.[a] Achieving compliance on the core network by 2030 and on the comprehensive network by 2050 is expected to lead to improved transport efficiencies along the TEN-T corridors.

The UNECE Blue Book

UNECE collects information on the compliance of inland networks with the agreed construction parameters. UNECE Blue Book provides an inventory of existing and envisaged standards and parameters of waterways and ports in Europe. It shows, on an internationally comparable basis, the available inland navigation infrastructure parameters in Europe as compared to the minimum standards and parameters prescribed in the AGN Agreement.[b] Inventories presenting information on the achieved parameters for rail networks are developed by UNECE for the AGC and AGTC Agreements in the GIS environment.

International Transport Infrastructure Observatory

UNECE has also developed the International Transport Infrastructure Observatory (ITIO) in collaboration with the United Nations Economic and Social Commission for Western Asia (ESCWA), the Economic Cooperation Organization secretariat, and the Centre for Transportation Studies for the Western Mediterranean (CETMO). ITIO which has been funded through the Islamic Development Bank (IsDB) is available at https://ITIO-GIS.org. It provides a GIS platform hosting data on transport infrastructure networks and nodes across different modes including road, rail, inland waterways, ports, airports, intermodal terminals, logistics centers, and border crossing points from across Europe, Asia, the Middle East, Western Mediterranean, and North Africa regions and their parameters, as far as available. It also shows maps overlaying the networks with various projections for varying conditions owing to climate change. Availability of network information—their working parameters in one place, what ITIO attempts to do—assists transport operators in the freight sector to better plan freight carriage. The upcoming inventory of AGC and AGTC networks will provide information on these rail networks in the UNECE region on one GIS platform. It will also allow for better planning of rail transport operations through this platform. This should help increase further efficiency in transport in short term. The efforts invested in transport document digitalization, like eTIR or eCMR and others, and their wide application are expected to lead to much more efficient information sharing between relevant entities involved in transport operations. These efficiencies are expected to be achieved before 2030. The work done at ITS in countries and internationally as led by UNECE is expected to help achieve further efficiencies in the transport sector.

Source: UNECE.

Notes:

a. To learn more about TEN-T see: https://transport.ec.europa.eu/transport-themes/infrastructure-and-investment/trans-european-transport-network-ten-t_en; for information regarding compliance indicators, see https://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/map/maps.html

b. To learn more about UNECE Blue Book see Blue Book | UNECE. www.unece.org/trans/main/sc3/bluebook_database.html.

Notes

1 The SuM4All paper '*A review of international agreements, conventions, and other instruments to achieve sustainable mobility*' provides an overview of the existing instruments—legally binding and nonbinding—that can be mapped into each global goal of sustainable mobility. Source: https://www.sum4all.org/data/files/1_a_review_of_international_agreements_and_other_instruments_to_achieve_sustainable_mobility.pdf

2 List of Conventions managed by UNECE: a) The European Agreement on Main International Traffic Arteries (AGR), b)The European Agreement on Main International Railway Lines (AGC), c) The European Agreement on Important International Combined Transport Lines and Related Installations (AGTC), d) The European Agreement on Main Inland Waterways of International Importance (AGN), e) Convention on the Contract for the International Carriage of Goods by Road (CMR), f) Additional Protocol to the CMR Concerning the Electronic Consignment Note (e-CMR), g) Customs Convention on the International Transport of Goods under Cover of TIR Carnets (TIR Convention), h) International Convention on the Harmonization of Frontier Controls of Goods, i) Customs Convention on Containers, j) European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), and k) Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for such Carriage (ATP).

3 List of Conventions managed by UNESCAP: a) Intergovernmental Agreement on the Asian Highway Network, b) Intergovernmental Agreement on the Trans-Asian Railway Network, and c) Intergovernmental Agreement on Dry Ports.

4 The TIR system counts more than 30,000 authorized operators and is accepted at more than 3,500 customs offices worldwide. Additionally, the electronic Convention on the Contract for the International Carriage of Goods by Road (eCMR) once operational enables the fully electronic exchange of data between different stakeholders involved in road transport. UNECE today brings together all relevant stakeholders such as governments including customs authorities and the private sector in order to operationalize the eCMR by identifying and implementing a solution for the future eCMR system that is efficient and covers the needs and requirements of all regions and stakeholders.

5 UN/CEFACT and its transport reference data model offers an important input to document digitalization and should be explored further.

6 To learn more about the Vienna Programme of Action, see: https://www.un.org/ohrlls/content/vienna-programme-action

7 To learn more about the WTO's Trade Facilitation Agreement see: https://www.wto.org/english/tratop_e/tradfa_e/tradfa_e.htm#II.

8 An example of choosing a separate set of actions for development and thus formulating different targets can be found in the UNECE work titled "Handbook for National Master Plans for Freight Transport and Logistics" (https://unece.org/sites/default/files/2021-05/2017186_E_web.pdf). In this publication, governments are presented with several different actions which they may be interested in pursuing in the development of the freight transport and logistics sector depending on the performance already reached. This publication differentiates between a set of actions recommended to countries focusing on improving freight transport and logistics sector and separately to countries driving sector developments. While for the first group of countries addressing development gaps needs to be the priority, the other group of countries needs to focus on process optimization, research and development, and pilot-proving new solutions

9 There are multiple challenges in measuring efficiency in transport systems: (i) the absence of a universally agreed upon definition of "efficiency" and boundaries within the overall transport sector, and (ii) the multi-faceted aspect of "efficiency." For the purpose of the GMR and the SuM4All Initiative, "efficiency" will focus on transport systems, which includes aspects of multimodality, border crossing, trade and logistics, high-volume roads, and resource efficiency. From this macro-economic perspective, resources include capital, labor, energy, technology, space, institutions, and regulations.

10 These include integration across transport modes and harmonization of regulatory barriers, for example.

11 Data are from Logistics Performance Index surveys conducted by the World Bank in partnership with academic and international institutions and private companies and individuals engaged in international logistics.

12 Any government wishing to assess the sustainability of its inland transport system may do so at https://sitcin.org/.

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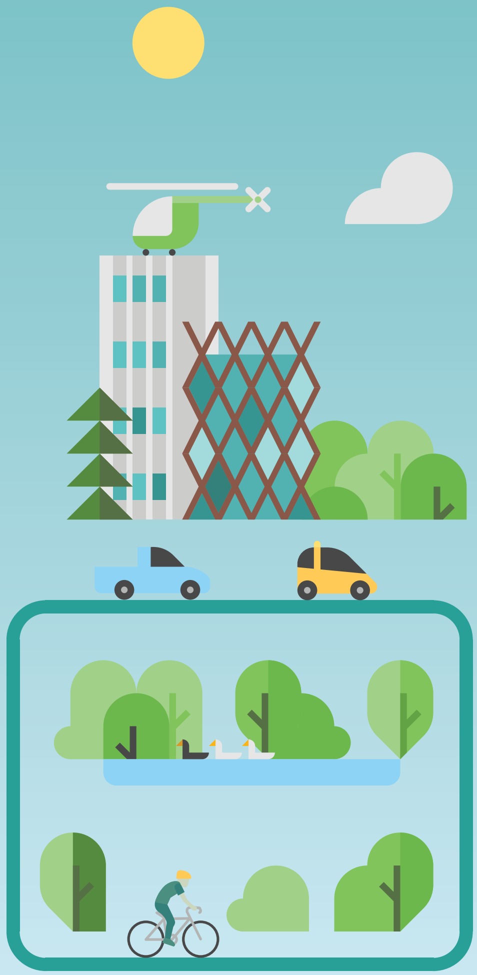
ANNEX 1: GLOBAL TRACKING FRAMEWORK FOR TRANSPORT (GTF)



The Global Tracking Framework for Transport (GTF)[1] is the first-ever global repository of transport indicators with global data coverage. It consists of more than 100 desirable and actual transport-related indicators to measure the performance of countries' transport systems, covering all modes of transportation (road, air, maritime, and rail). The performance is measured by a set of principal indicators and supporting indicators. The elementary Global Tracking Framework for Transport (GTF) was designed in 2016 and launched in the subsequent year by the Partnership as part of the Global Mobility Report 2017 (GMR)[2].

Measuring and monitoring transport systems performance is critical for transparency and accountability. Most sectors, like energy and technology, relied on the Sustainable Development Goal process to clarify goals, identify relevant indicators, and set targets for defining their sector performance metrics. When the SDG framework was established in 2015, the international transport community was not able to agree on transport metrics: it lacked clarity on overarching goals, performance metrics, solid indicators, and a global data system. The GTF was developed as a remedy for this.

A1.1 Evolution of the Global Tracking Framework for Transport

The elementary GTF was introduced in the Global Mobility Report 2017[3]. This version (GTF 1.0) included 29 existing transport-related indicators with global data coverage and outlined over 70 desirable indicators to proxy country-level progress toward sustainable mobility.

The GTF 1.0 was upgraded to 2.0 in January 2020. This upgrade included incorporating up-to-date data for existing indicators and expanding the framework with fifteen new indicators. Additionally, a time series dimension was added along with the development of a composite index for sustainable mobility to enable country ranking. This index was coined as the *Global Sustainable Mobility Index (GSMI)*[4]. All upgrades were reflected in the Data Module[5] of the Policy Decision Making Tool for Sustainable mobility 2.0. In 2021, a routine annual update of data was conducted.

The next major update of the GTF was an upgrade to version 3.0, which was developed in 2022. Salient features of the GTF 3.0 include:

- New Global Sustainable Mobility Index (GSMI) for 183 countries.
- 16 new transport-related indicators were added to the existing 44.
- Income group benchmarking for all indicators, across all countries, based on the current World Bank Country Income Group Classification.
- Updated demographic data (population and GDP per capita).
- Updated country dashboard for 183 countries, allowing tracking overtime and benchmarking, by accessing the Country Mobility Performance Dashboards webpage[6].

A1.2 Metrics to Measure Performance in Sustainable Mobility

A1.2.1 Metrics to Measure Progress in Green Mobility

The GTF measures the countries' performance on the green mobility goal by using the two principal indicators and desired targets followed by a set of supporting indicators (Table A1.1):

Table A1.1: Indicators to Measure Green Mobility in the Global Tracking Framework for Transport

Sub-goal	Principal indicators	Aspirational Target	Source of the Data
GHG emissions	Transport-related GHG emissions per capita (tons of CO_2 per capita)	< 0.3	CAIT
Air Pollution	$PM_{2.5}$ air pollution, mean annual exposure (micrograms per cubic meter)	< 10	Global Burden of Disease Study and UNHABITAT
Noise Pollution	Number of Urban Dwellers Exposed to Excessive Noise Levels	Data not yet available	Data source not yet available
Supporting indicators			**Source of the Data**
Total transport related GHG emissions (million tonnes of CO_2)			IEA
CO_2 emission from transport per capita ($kgCO_2$/capita)			IEA
CO_2 emission from transport (of which road) per capita ($kgCO_2$/capita)			IEA
Energy Transition Index (percent)			World Economic Forum
Fossil Fuel energy consumption (percent of total)			IEA
$PM_{2.5}$ air pollution, population exposed to levels exceeding WHO guideline value (percent of total)			Global Burden of Disease Study
Renewable energy consumption (percent of total final energy consumption)			World Bank
Access to Electricity (percent of the population)			World Bank
Mortality rate attributed to household and ambient air pollution, age-standardized, female (per 100,000 population)			World Bank
Mortality rate attributed to household and ambient air pollution, age-standardized, male (per 100,000 population)			World Bank
Mortality rate attributed to household and ambient air pollution, age-standardized, total (per 100,000 population)			World Bank
Electricity production from oil, gas, and coal sources (percent of total)			World Bank
Desirable Indicators			
Traffic noise index TNI[7]			
GHG emissions from transport per unit of value added (MT CO_2e/unit GDP, calculated from transport UNFCCC/IEA emissions data and World Bank GDP growth data)			
Low emission vehicle share of light-duty 4-wheel and motorized 2-wheel vehicle sales, (percent of total sales, calculated from OICA vehicle sales data and IEA electric vehicle data)			

Desirable Indicators
Share of alternative fuels in transport (by gCO_2e/MJ for each fuel type), (% of total fuels, calculated from IEA biofuels data and electric vehicle data)
Modal share of passenger transport (by private transport, public transport, walking, cycling, air), (percent of total pkm, calculated from UITP Mobility in Cities database)
Modal share of freight transport (by rail, water, air, road), (percent of total tkm, calculated from World Bank freight data
Average trip length per country (by passenger transport and freight transport mode), (km)*
Incidents/climate change-related disasters/losses/damages/disruptions to transport service (number of total incidents, data sources TBD)
Time and GDP loss due to climate-related disruptions to service (minutes and $/year, data sources TBD)
Investment in retrofitting existing transport infrastructure investments to withstand extreme climate conditions or climate disasters ($, calculated from MDB/IFI transport investment data)
Investment in retrofitting existing transport infrastructure investments to withstand extreme climate conditions or climate disasters ($, calculated from MDB/IFI transport investment data)
Percentage of new transport infrastructure investments designed to withstand extreme climate conditions or climate disasters (% total infrastructure, calculated from MDB/IFI transport investment data
Percentage of countries or transport companies that have adopted adaptation plans that cover transport infrastructure (% total countries/companies, calculated from UNFCCC NAPs/NAPAs, available private sector data sources)
Percentage of countries, sub-national regions, and cities with structured vulnerability assessments incorporated into the road and transport management systems (% total countries/sub-national regions/cities, calculated from available data from national, sub-national, and corporate networks)
Emissions of PM_{10}, $PM_{2.5}$, black carbon, NOx, SOx, and VOCs from passenger and freight vehicles (tonnes/year, calculated from WHO/World Bank data)*
Percentage of cities with air quality levels in compliance with WHO guideline values disaggregated by type (PM_{10} and $PM_{2.5}$) and income (HIC, MIC, and LIC)
Share of countries with Euro 6 equivalent vehicle emission standards in place for light-duty and heavy-duty vehicles, disaggregated by income (HIC, MIC, and LIC) (% of all countries, calculated from UNEP/Partnership for Clean Fuels and Vehicles data)
Share of countries with low-sulfur (max 50 ppm) and ultra-low-sulfur (max 10 ppm) standards for gasoline and diesel, disaggregated by mode (land, maritime transport) income (HIC, MIC, and LIC)
Average minutes per day walked or cycled by adults for transport (minutes/day)
Percentage of adolescents walking or cycling for transport to school
Average minutes per day walked or cycled by adolescent for transport to school (minutes/day)
Percent change in average noise level for cars/vans (% dB, from WHO/EEA and other available time series data
Percent change in average noise level for lorries/buses(% dB, from WHO/EEA and other available time series data)*
Percent change in average vehicle noise (axel, engine, exhaust, tires) inside agglomerations (% dB, from WHO/EEA and other available time series data)
Percent change in average tire noise outside agglomerations (% dB, from WHO/EEA and other available time series data)
Reduction in average vehicle noise (axel, engine, exhaust, tires) inside agglomerations (dB)*
Highest vehicle noise level under any operating conditions (dB, calculated from OICA and other available data)*

A1.2.2 Metrics to Measure Progress in Universal Access

The GTF measures the countries' performance on the universal access goal by using the three principal indicators and desired targets followed by a set of supporting indicators (Table A1.2):

Table A1.2: Indicators to Measure Universal Access in the Global Tracking Framework for Transport

Sub-goal	Principal indicators	Aspirational Target	Source of the Data
Rural	Rural access index – Geospatial methodology (percentage)	100	RECAP
Urban	Rapid transit to the resident ratio (km/million)	> 40	ITDP
Gender	Female workers in transport (percentage)	50	ILO
Supporting indicators			**Source of the Data**
Air transport, passengers carried (thousands)			ICAO
Air Transport, freight (million tons)			ICAO
Air Transport, registered carrier departures worldwide			ICAO
Airport Connectivity (Score)			World Economic Forum
Number of Registered Vehicles			WHO
Quality of air transport infrastructure [value: 1 = worst to 7 = best]			World Economic Forum
Quality of port infrastructure [value: 1 = worst to 7 = best]			World Economic Forum
Quality of railroad infrastructure [value: 1 = worst to 7 = best]			World Economic Forum
Quality of roads [value: 1 = worst to 7 = best]			World Economic Forum
Rail lines (total route – km)			UIC
Railroad Density (km of railroads per sq. km)			World Economic Forum
Railways, goods transported (million ton-km)			UIC
Railways, passengers carried (million passenger-km)			UIC
Road Connectivity Index (0-100)			World Economic Forum
Rural Access Index – Household Survey Methodology (Percentage)			World Bank
Port call and performance statistics: number of port calls, annual – (All ships)			UNCTAD
Desirable Indicators			
Percentage of the population within 500 m of a frequent public transport stop/station (National Level)			
The Affordability Index: public transport fare for a 10km-commute relative to per capita income			
Percentage of Households within a 10-minute bike ride or walk from frequent transit (disaggregated by income level)[8]			
Percentage of Households within a 10-minute bike ride or walk from Rapid Transit disaggregated by income level[9]			
Reduction in the percentage of women who are deterred by fear of crime from getting to and from public transport			
Proportion of rural roads in "good and fair condition" (as developed by new RAI)			

Desirable Indicators
Percentage of markets accessible by an all-season road
Percentage of national government budget spent on low volume rural transport infrastructure
Percentage of the rural population with access to affordable and reliable passenger transport services
Ratio of national to local passenger transport fares (collection of data on rural passenger transport US$ per km for short distance and long distance trips which would be disaggregated by most common modes e.g. bus, motorbike, other IMT
Percentage of household monthly expenditure spent on transport
Percentage of rural population with at least daily transport service – from Living Standards Surveys (LSS)*
Percentage of households that make one motorized trip per month
Length of public transport lines (particularly high capacity but also informal public transport if possible) per area, dedicated bicycle lane, and sidewalk coverage (this parameter will also help to determine urban density i.e. people / sq km)*
Vehicle fleets per motorized transport mode (public transport and all other modes,such as, taxis and shared taxis
informal / paratransit (if possible) and motor cars, motorized two-wheelers (annual update)*
Number of public transport journeys by mode of transport (annual update)
Vehicle km offered per public transport mode (annual update)*
Number of public transport stops per area (annual update)*
Average income (percent) per resident spent on transport (affordability)*
Modal share of different passenger modes in the city (public transport, walking, cycling, private vehicles, motorcycles, and taxis, including informal / paratransit if possible). The aim should be to increase use of sustainable transport modes. Consideration should also be given to applying this to freight transport. (inter-modality
Passenger km travelled by public transport by mode of transport (annual update) – using this indicator the average length of public transport journeys (Tier 1) can also be assessed. (inter-modality)*
Goods VKM traveled in the city per capita (freight)*
Percentage of jobs and urban services accessible within 60 minutes by each transport mode in the city
Accessibility of the public transport network to persons with disabilities / vulnerable situations (percent of vehicles allowing wheel-chair access, percent of stations/network with step free access, etc.) (usability)
Reduction in the percentage of women who are deterred by fear of crime from getting to and from public transport. (usability)*

A1.2.3 Metrics to Measure Progress in Safety

The GTF measures the countries' performance on the safety goal using one principal indicator with the desired target followed by a set of supporting indicators (Table A1.3):

Table A1.3: Indicators to Measure Universal Access in the Global Tracking Framework for Transport

Principal indicators	Aspirational Target	Source of the Data
Mortality caused by road traffic injury (per 100,000 people)	0	WHO
Supporting indicators		**Source of the Data**
Deaths by road user category - pedestrian (percent)		WHO
Deaths by road user category - cyclist (percent)		WHO
Deaths by road user category - 2 or 3-wheeler (percent)		WHO
Deaths by road user category - 4-wheeler (percent)		WHO
Deaths by road user category - others (percent)		WHO
Attribution of road traffic deaths to alcohol (percent)		WHO
Reported percentage of seriously injured patients transported by ambulance (percent)		WHO
Mortality caused by road traffic injury, female (per 100,000 female population)		WHO
Mortality caused by road traffic injury, male (per 100,000 male population)		WHO
Desirable Indicators		
Mortality caused by road traffic injury in relation to the number of vehicle-kilometers driven[10].		
Mortality caused by road traffic injury in relation to the number of registered vehicles[11].		
Increase in the modal shift for safer and efficient modes of transport in urban areas (safer modes: mass transit, rail transport, metro, BRT) and increase walking and biking providing safe facilities for them as they are the most efficient and equitable modes of transportation		
Decrease in the number of fatalities and serious injuries among pedestrians and cyclists, while increasing their mode share in urban areas		
Percentage of existing roads that have safety ratings or high-risk spots or sections identified and improved in each country		
Progress with 5 Pillars of Road Safety as defined in the Global Plan and WHO´s document on road safety targets and indicators		
Countries that have compulsory road safety audits and inspections or minimum star rating standards for new roads		
Countries that have speed limits consistent with safe system principles		
Number of cities (more than 500.000 inhabitants) that have road safety plans consistent with safe systems and focus in particular on vulnerable users		
Number of national Road Safety lead agencies		
Effective legislation and enforcement of key road safety legislation		
Countries acceding to each core UN convention on road safety		

Desirable Indicators
Countries with road safety crash mitigation protocols
Countries with licensing processes for all drivers that include written and practical examination (cars, trucks, motorized two-wheelers, professional drivers)
Number of countries with a sound crash database
Number of fatalities in scheduled commercial air transport
Countries that have implemented an effective safety oversight system
Countries that have implemented an effective State Safety Program
Number of countries that have a specific safety railroad department or administration
Number of railways that have a Safety Management System (SMS) in place
Number of countries that have an effective safety protocol or regional rail safety agreements
Number of train and passenger train operators with guidelines for emergency response/preparedness
Number of countries that have active programs to promote safety in the road/rail level crossing
Number of countries that have active programs to prevent trespasser crashes
Maritime casualties

A1.2.4 Metrics to Measure Progress in Efficiency

The GTF measures the countries' performance on the efficiency goal using one principal indicator with the desired target followed by a set of supporting indicators. (Table A1.4):

Table A1.4: Indicators to Measure Efficiency in the Global Tracking Framework for Transport

Principal indicators	Aspirational Target	Source of the Data
Logistics performance index - overall [value: 1 = low to 5 = high]	5	World Bank
Supporting indicators		**Source of the Data**
Logistics performance index - customs [value: 1 = low to 5 = high]		World Bank
Liner Shipping Connectivity Index, quarterly		UNCTAD
Good governance index - Undue influence [value: 1 = worst to 7 = best]		World Economic Forum
Energy consumption of transport relative to GDP (PPP) (GOE per dollar)		IEA
Container port throughput (TEU: 20-foot equivalent units, thousands)		UNCTAD
Digital Adoption Index (0-100)		World Bank
Efficiency of air transport services [value: 1 = worst to 5 = best]		World Economic Forum
Efficiency of train services [value: 1 = worst to 5 = best]		World Economic Forum
Efficiency of seaport services [value: 1 = worst to 5 = best]		World Economic Forum
PPP investment in Transport (current million US$)		World Bank
Control of Corruption (Score 0 – 100)		World Bank
Median time in port (days) – All ships		UNCTAD
Average age of vessels – All ships		UNCTAD
Average size of vessels – All ships		UNCTAD
Average cargo carrying capacity (dwt) per vessel – All ships		UNCTAD
Average container carrying capacity (TEU) per container ship – All ships		UNCTAD
Exports by main service – Transport (Annual estimates based on quarterly data – US Dollars at current prices in millions)		UNCTAD
Imports by main service – Transport (Annual estimates based on quarterly data – US Dollars at current prices in millions)		UNCTAD
Desirable Indicators		
Freight connectivity		
Percentage of agricultural potential connected to a major port or market by a certain road category within a given time period		
Rail lines		
Average age of vehicle fleet		

Notes

1 The Global Tracking Framework for Transport is available online via the link https://www.sum4all.org/global-tracking-framework.

2 See the Global Mobility Report from: https://www.sum4all.org/publications/global-mobility-report-2017.

3 The Global Tracking Framework for Transport is described in See Annex 1: Elementary Global Tracking Framework for Transport, 95-102. In Sustainable Mobility for All. 2017. Global Mobility Report 2017: Tracking Sector Performance (GMR). Washington DC: Sustainable Mobility for All. ISBN: 978-0-692-95670-0. License: Creative Commons Attribution CC BY 3.0. https://openknowledge.worldbank.org/bitstream/handle/10986/28542/120500.pdf?sequence=6.

4 See more information about the GSMI Index: https://www.sum4all.org/data/files/GRA-Tool/sustainable_mobility_index_score_methodology.pdf.

5 The Data Module of the Policy Decision Making Tool for Sustainable mobility 2.0 is available online via: https://www.sum4all.org/gra-tool/country-performance/global.

6 The Country Mobility Performance Dashboards webpage is available via the link: https://www.sum4all.org/gra-tool/country-performance/snapshot.

7 "Traffic noise index" is not widely used, since it becomes representative only when the traffic is flowing, risking being misinterpreted in a different situation.

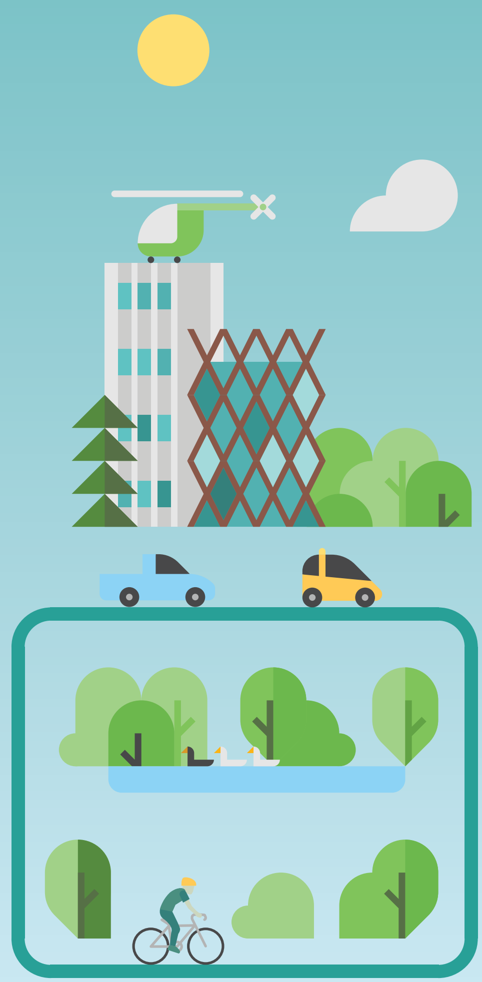
8 Data on the "Percentage of Households within a 10-minute bike ride or walk from frequent transit (disaggregated by income level)" is available only for 20 US cities.

9 Data on the "Percentage of Households within a 10-minute bike ride or walk from Rapid Transit disaggregated by income level" is available only for 20 US cities.

10 The indicator measuring "mortality caused by road traffic injury in relation to the number of vehicle-kilometers driven" would be good for assessing the risk of traveling on the road network in a given country. The current coverage is in some OECD countries with global coverage remaining desirable.

11 The indicator measuring "mortality caused by road traffic injury in relation to the number of registered vehicles" would be useful for comparing road safety across countries with different motorization levels. The current coverage is in some OECD countries with global coverage remaining desirable.

ANNEX 2: SELECTED COUNTRY MOBILITY DASHBOARDS

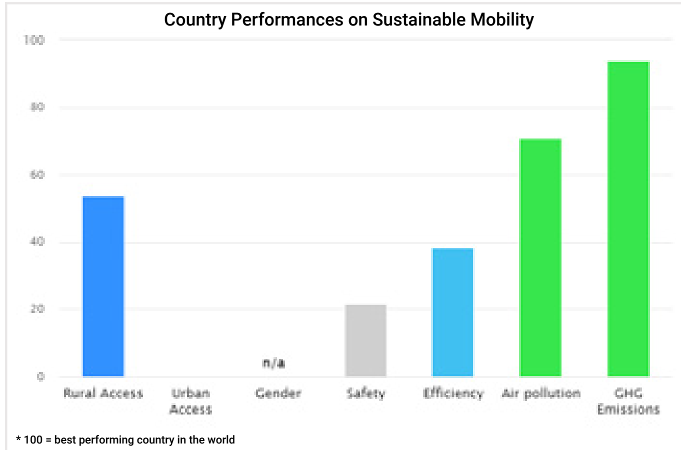


Sustainable Mobility for All Partnership developed country dashboards for 183 countries, with country-level data for transport indicators, and index scores to diagnose, and compare transport system performance across countries.

Below are examples from the "Sustainable Mobility for All. 2022. Mobility Performance at a Glance: Country Dashboards 2022."

KENYA

SUSTAINABLE MOBILITY RANKING (Based on the Global Sustainable Mobility Index, 2022)	#115/183 Countries
SUSTAINABLE MOBILITY INDEX (Based on Country Mobility Performances, 2022 – 0 to 100)	40.1
REGION (World Bank classification based on Income group)	Sub-Saharan Africa
INCOME GROUP (World Bank classification based on Income group)	Lower middle income
GDP PER CAPITA (PPP 2020 - Current Internationa $)	4,577
POPULATION (Thousands)	53,771



UNIVERSAL ACCESS

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal (Rural): Rural Access Index - Geospatial Methodology (%)	2016	63	n/a	53.3	61.9	ReCAP
Principal (Urban): Rapid Transit to Resident Ratio (km per millions)	2021	0	=	0.4	2.7	ITDP
Principal (Gender): Workers in transport who are female (%)	n/a	n/a	n/a	7	6	ILO
Air transport (registered carrier departures worldwide)	2020	33.2	↓	8.6	40.4	ICAO
Air transport, freight (million ton-km)	2020	113.1	↓	71	77.2	ICAO
Air transport, passengers carried (thousands)	2020	1.9	↓	0.5	4	ICAO
Airport Connectivity Index (score)	2019	44.1	=	23.6	42.1	WEF
Number of Port Calls (all ships, annual)	2021	1,897	↑	1,376.87	9,976.66	UNCTAD
Number of registered vehicles	2015	2979.9	↓	1160.4	1145.7	WHO
Quality of air transport infrastructure [value: 1 = worst to 7 = best]	2017	4.9	↑	3.6	3.7	WEF
Quality of port infrastructure [value: 1 = worst to 7 = best]	2017	4.5	↑	3.4	3.3	WEF
Quality of railroad infrastructure [value: 1 = worst to 7 = best]	2017	3.2	↑	2.3	2.6	WEF
Quality of roads [value: 1 = worst to 7 = best]	2019	4.1	↓	3.3	3.5	WEF
Rail lines (total route-km)	2004	1,917	↓	2,224.45	4,732.87	UIC
Railroad density (km of railroads per sq. km)	2019	6.7	↑	4.6	7.9	WEF
Railways – goods transported (million ton – km)	2004	1,399	↓	5,602.8	29,206.89	UIC
Railways, passengers carried	2007	109.2	↓	785.8	41,878.32	UIC
Road Connectivity Index (0-100)	2019	72.1	↑	66.3	67	WEF
Rural Access Index - Household Survey (%)	2009	56	n/a	43	60	WB

SAFETY

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: Mortality caused by road traffic injury (per 100,000 people)	2019	28.3	↑	28.7	19.8	WHO
Attribution of road traffic deaths to alcohol (%)	n/a	n/a	n/a	17.3	18.5	WHO
Mortality caused by road traffic injury, female (per 100,000 female population)	2019	14.4	↑	16.5	10.3	WHO
Mortality caused by road traffic injury, male (per 100,000 male population)	2019	42.4	↑	41.1	29.4	WHO
Reported percentage of seriously injured patients transported by ambulance (%)	2013	<= 11%	n/a	n/a	n/a	WHO

EFFICIENCY

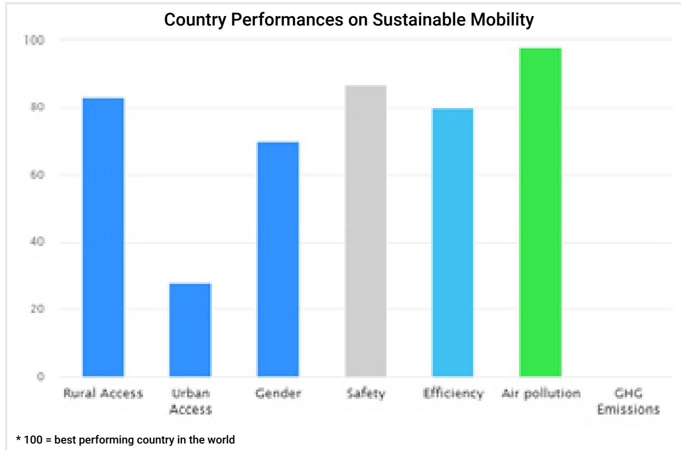
INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: Logistics performance index: Overall (1=low to 5=high)	2018	2.8	↓	2.5	2.6	WB
Average age of vessels (years) – All ships	2021	12	↑	15.9	16.1	UNCTAD
Average cargo carrying capacity (dwt) per vessel – All ships	2021	26,101	↓	26,157.03	24,434.026	UNCTAD
Average container carrying capacity (TEU) per container ship – All ships	2021	3,175	↓	2,969.12	2,556.42	UNCTAD
Average size of vessels (gross tonnage) – All ships	2021	24,186	↓	22,358.55	20,862.976	UNCTAD
Container port throughput (TEU: 20 foot equivalent units)	2020	1,311,000	↓	551,417.3	2,235,932.33	UNCTAD
Control of Corruption (0 – 100)	2020	28.4	↓	37.4	41.6	WB
Digital Adoption Index (0-1)	2016	0.5	↑	0.3	0.4	WB
Efficiency of air transport services [value: 1=worst to 5=best]	2019	5	=	3.7	3.9	WEF
Efficiency of seaport services [value: 1=worst to 5=best]	2019	4.2	↓	3.2	3.4	WEF
Efficiency of train services [value: 1=worst to 5=best]	2019	4	↑	2.4	2.9	WEF
Energy consumption of transport relative to GDP (PPP) (GOE per dollar)	2012	14	n/a	21.2	22.8	IEA
Exports by main service – Transport (Annual estimates based on quarterly data – US Dollars at current prices in millions)	2021	1,477	↑	525.2	1,416.94	UNCTAD
Good governance index - Undue influence [value: 1 = worst to 7 = best]	2015	3	n/a	3.3	3.2	WEF
Imports by main service – Transport (Annual estimates based on quarterly data – US Dollars at current prices in millions)	2021	1,728	↑	1,131.69	3,465.021	UNCTAD
Liner shipping connectivity index, quarterly	2022 Q1	16.5	↓	14.4	22.4	UNCTAD
Logistics performance index - customs [value: 1 = low to 5 = high]	2018	2.7	↓	2.3	2.4	WB
Median time in port (days) – All ships	2021	2.5	↓	2.1	1.6	UNCTAD
Public Private Partnership investment in transport (current US$)	2018	213.9	↑	258.8	745.2	WB

GREEN MOBILITY

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: PM2.5 air pollution, mean annual exposure (micrograms per cubic meter)	2019	21.5	↓	41.3	34.5	UNHABITAT/ GBDS
Principal: Transport-related GHG emissions per capita (tons of CO_2 per capita)	2019	0.2	=	0.3	0.4	CAIT
Access to Electricity (% of population)	2020	71.4	↑	51.5	82.1	WB
CO_2 emissions from road transport per capita (kgCO_2/capita)	2017	174	↓	290	391.6	IEA
CO_2 emission from transport per capita (kgCO_2/capita)	2017	175	↓	300.7	418.1	IEA
Electricity production from oil, gas and coal sources (% of total)	2015	12.5	↓	52.8	63.5	WB
Energy Transition Index (%)	2021	58.1	=	50.8	52	WEF
Fossil fuel energy consumption (% of total)	2014	17.4	↓	26.9	43.5	IEA
Mortality rate attributed to household and ambient air pollution, age-standardized, female (per 100,000 population)	2016	75	n/a	162	119.7	WB
Mortality rate attributed to household and ambient air pollution, age-standardized, male (per 100,000 population)	2016	81	n/a	179.4	149.1	WB
Mortality rate attributed to household and ambient air pollution, age-standardized, total (per 100,000 population)	2016	78.1	n/a	170	133.1	WB
PM2.5 air pollution, population exposed to levels exceeding WHO guideline value (% of total)	2017	100	=	100	98.7	GBDS
Renewable energy consumption (% of total final energy consumption)	2018	72.3	↑	62.2	39	WB
Total transport-related GHG emissions (million tonnes of CO_2)	2019	9.8	↑	4.8	21	CAIT

AUSTRALIA

SUSTAINABLE MOBILITY RANKING (Based on the Global Sustainable Mobility Index, 2022)	#21/183 Countries
SUSTAINABLE MOBILITY INDEX (Based on Country Mobility Performances, 2022 – 0 to 100)	69
REGION (World Bank classification based on Income group)	OECD High Income
INCOME GROUP (World Bank classification based on Income group)	High income
GDP PER CAPITA (PPP 2020 - Current Internationa $)	53,329
POPULATION *(Thousands)*	25,687



UNIVERSAL ACCESS

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal (Rural): Rural Access Index - Geospatial Methodology (%)	2016	86	n/a	92.8	86.5	ReCAP
Principal (Urban): Rapid Transit to Resident Ratio (km per millions)	2021	11.2	↓	32.2	28.8	ITDP
Principal (Gender): Workers in transport who are female (%)	2017	22	n/a	23	21	ILO
Air transport (registered carrier departures worldwide)	2020	273.4	↓	343	226.8	ICAO
Air transport, freight (million ton-km)	2020	1,200.644	↓	3,001.7	2,453.01	ICAO
Air transport, passengers carried (thousands)	2020	23.6	↓	24.9	17.2	ICAO
Airport Connectivity Index (score)	2019	97.5	=	69.6	63.7	WEF
Number of Port Calls (all ships, annual)	2021	54,859	↓	92,918.53	61,381.68	UNCTAD
Number of registered vehicles	2016	18326.2	↓	230.2	287.5	WHO
Quality of air transport infrastructure [value: 1 = worst to 7 = best]	2017	5.2	↓	5.4	5.3	WEF
Quality of port infrastructure [value: 1 = worst to 7 = best]	2017	4.9	↑	5.1	5	WEF
Quality of railroad infrastructure [value: 1 = worst to 7 = best]	2017	4.1	↑	4.7	4.3	WEF
Quality of roads [value: 1 = worst to 7 = best]	2019	4.9	↑	4.9	4.8	WEF
Rail lines (total route-km)	2011	8,829.314	↑	13,440.52	11,689.05	UIC
Railroad density (km of railroads per sq. km)	2019	1.1	↓	51.1	52.2	WEF
Railways – goods transported (million ton – km)	2016	413,490	↑	116,179.43	99,394.18	UIC
Railways, passengers carried	2018	17,585.947	↑	34,748.63	29,875.75	UIC
Road Connectivity Index (0-100)	2019	94.5	↑	86.7	84.1	WEF
Rural Access Index - Household Survey (%)	n/a	n/a	n/a	93	89	WB

SAFETY

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: Mortality caused by road traffic injury (per 100,000 people)	2019	4.9	↑	5.3	7.3	WHO
Attribution of road traffic deaths to alcohol (%)	2017	17	=	17.9	17.2	WHO
Mortality caused by road traffic injury, female (per 100,000 female population)	2019	2.6	↑	2.8	3.4	WHO
Mortality caused by road traffic injury, male (per 100,000 male population)	2019	7.3	↑	8.1	11	WHO
Reported percentage of seriously injured patients transported by ambulance (%)	2013	-	n/a	n/a	n/a	WHO

EFFICIENCY

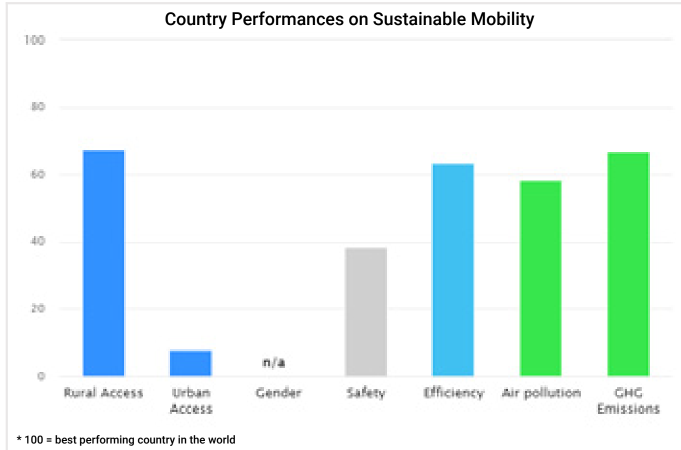
INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: Logistics performance index: Overall (1=low to 5=high)	2018	3.8	↓	3.7	3.5	WB
Average age of vessels (years) – All ships	2021	20	↓	19	18	UNCTAD
Average cargo carrying capacity (dwt) per vessel – All ships	2021	82,439	↑	17,929.7	25,154.681	UNCTAD
Average container carrying capacity (TEU) per container ship – All ships	2021	4,641	↓	2,882.31	3,221.89	UNCTAD
Average size of vessels (gross tonnage) – All ships	2021	27,620	↑	13,817.07	19,635.84	UNCTAD
Container port throughput (TEU: 20 foot equivalent units)	2020	8,656,995	↓	8,242,959.5	6,791,724.59	UNCTAD
Control of Corruption (0 – 100)	2020	95.2	↓	89.3	84.6	WB
Digital Adoption Index (0-1)	2016	0.7	↑	0.8	0.7	WB
Efficiency of air transport services [value: 1=worst to 5=best]	2019	5.5	↑	5.4	5.3	WEF
Efficiency of seaport services [value: 1=worst to 5=best]	2019	4.8	↑	4.6	4.9	WEF
Efficiency of train services [value: 1=worst to 5=best]	2019	4.4	↑	4.7	4.3	WEF
Energy consumption of transport relative to GDP (PPP) (GOE per dollar)	2012	32	n/a	21.9	20.8	IEA
Exports by main service – Transport (Annual estimates based on quarterly data – US Dollars at current prices in millions)	2021	2,826.211	↓	20,289.33	15,988.44	UNCTAD
Good governance index - Undue influence [value: 1 = worst to 7 = best]	2015	5	n/a	4.6	4.5	WEF
Imports by main service – Transport (Annual estimates based on quarterly data – US Dollars at current prices in millions)	2021	13,629.983	↑	20,891.99	16,544.195	UNCTAD
Liner shipping connectivity index, quarterly	2022 Q1	35.8	↑	52.8	46.6	UNCTAD
Logistics performance index - customs [value: 1 = low to 5 = high]	2018	3.9	↑	3.5	3.3	WB
Median time in port (days) – All ships	2021	1.6	↑	1	1.1	UNCTAD
Public Private Partnership investment in transport (current US$)	n/a	n/a	n/a	n/a	50.4	WB

GREEN MOBILITY

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: PM2.5 air pollution, mean annual exposure (micrograms per cubic meter)	2019	6.7	=	11.5	18.2	UNHABITAT/ GBDS
Principal: Transport-related GHG emissions per capita (tons of CO_2 per capita)	2019	4	↓	2.6	2.4	CAIT
Access to Electricity (% of population)	2020	100	=	100	99.9	WB
CO_2 emissions from road transport per capita (kgCO_2/capita)	2017	3,331	↑	2,315.78	2,300.27	IEA
CO_2 emission from transport per capita (kgCO_2/capita)	2017	3,970	↑	2,498.97	2,438.65	IEA
Electricity production from oil, gas and coal sources (% of total)	2015	86.4	↑	42.4	54.7	WB
Energy Transition Index (%)	2021	65	↑	68.7	65.4	WEF
Fossil fuel energy consumption (% of total)	2015	89.6	↓	67.4	70.2	IEA
Mortality rate attributed to household and ambient air pollution, age-standardized, female (per 100,000 population)	2016	7	n/a	12.2	19.5	WB
Mortality rate attributed to household and ambient air pollution, age-standardized, male (per 100,000 population)	2016	10	n/a	22.4	32.7	WB
Mortality rate attributed to household and ambient air pollution, age-standardized, total (per 100,000 population)	2016	8.4	n/a	16.7	25.7	WB
PM2.5 air pollution, population exposed to levels exceeding WHO guideline value (% of total)	2017	24.9	↓	57.6	69.9	GBDS
Renewable energy consumption (% of total final energy consumption)	2018	9.7	↓	23.4	18.4	WB
Total transport-related GHG emissions (million tonnes of CO_2)	2019	102	↑	104.6	71.4	CAIT

SOUTH AFRICA

SUSTAINABLE MOBILITY RANKING (Based on the Global Sustainable Mobility Index, 2022)	#81/183 Countries
SUSTAINABLE MOBILITY INDEX (Based on Country Mobility Performances, 2022 – 0 to 100)	47.4
REGION (World Bank classification based on Income group)	Sub-Saharan Africa
INCOME GROUP (World Bank classification based on Income group)	Upper middle income
GDP PER CAPITA (PPP 2020 - Current Internationa $)	13,360
POPULATION *(Thousands)*	59,309



UNIVERSAL ACCESS

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal (Rural): Rural Access Index - Geospatial Methodology (%)	2016	74	n/a	53.3	68.9	ReCAP
Principal (Urban): Rapid Transit to Resident Ratio (km per millions)	2021	3.1	↓	0.4	8.2	ITDP
Principal (Gender): Workers in transport who are female (%)	n/a	n/a	n/a	7	14	ILO
Air transport (registered carrier departures worldwide)	2020	88.6	↓	8.6	142.8	ICAO
Air transport, freight (million ton-km)	2020	102.4	↓	71	843	ICAO
Air transport, passengers carried (thousands)	2020	8.3	↓	0.5	15.5	ICAO
Airport Connectivity Index (score)	2019	63.5	=	23.6	51.6	WEF
Number of Port Calls (all ships, annual)	2021	7,194	↓	1,376.87	16,798.21	UNCTAD
Number of registered vehicles	2013	9909.9	n/a	1160.4	2079.8	WHO
Quality of air transport infrastructure [value: 1 = worst to 7 = best]	2017	5.6	↓	3.6	4.4	WEF
Quality of port infrastructure [value: 1 = worst to 7 = best]	2017	4.8	↓	3.4	3.9	WEF
Quality of railroad infrastructure [value: 1 = worst to 7 = best]	2017	3.5	↓	2.3	2.7	WEF
Quality of roads [value: 1 = worst to 7 = best]	2019	4.5	↑	3.3	3.8	WEF
Rail lines (total route-km)	2017	20,953	=	2,224.45	9,882.8	UIC
Railroad density (km of railroads per sq. km)	2019	17.3	↑	4.6	13.9	WEF
Railways – goods transported (million ton – km)	2008	113,342	↑	5,602.8	207,991.37	UIC
Railways, passengers carried	2007	13,864.98	↑	785.8	55,905.01	UIC
Road Connectivity Index (0-100)	2019	96.2	↑	66.3	71.2	WEF
Rural Access Index - Household Survey (%)	1993	21	n/a	43	71	WB

SAFETY

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: Mortality caused by road traffic injury (per 100,000 people)	2019	22.2	↓	28.7	17.2	WHO
Attribution of road traffic deaths to alcohol (%)	2017	57.5	=	17.3	14.1	WHO
Mortality caused by road traffic injury, female (per 100,000 female population)	2019	9.9	↓	16.5	7.6	WHO
Mortality caused by road traffic injury, male (per 100,000 male population)	2019	34.9	↓	41.1	27.2	WHO
Reported percentage of seriously injured patients transported by ambulance (%)	2013	50-74%	n/a	n/a	n/a	WHO

EFFICIENCY

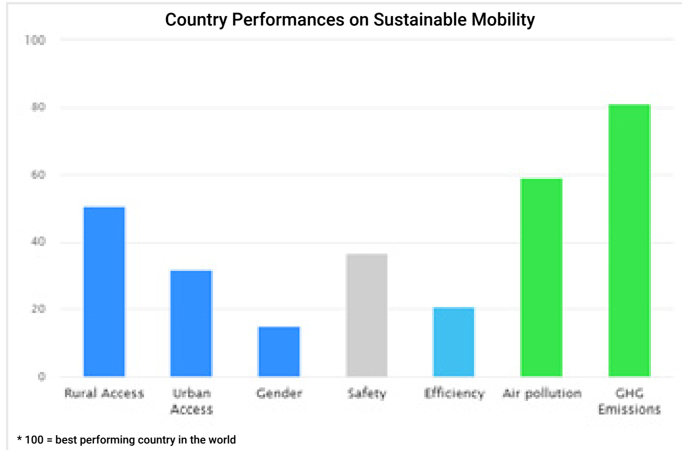
INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: Logistics performance index: Overall (1=low to 5=high)	2018	3.4	↓	2.5	2.7	WB
Average age of vessels (years) – All ships	2021	12	=	15.9	18.7	UNCTAD
Average cargo carrying capacity (dwt) per vessel – All ships	2021	60,254	↑	26,157.03	23,784.07	UNCTAD
Average container carrying capacity (TEU) per container ship – All ships	2021	4,771	↓	2,969.12	2,689.16	UNCTAD
Average size of vessels (gross tonnage) – All ships	2021	41,633	↑	22,358.55	20,848.581	UNCTAD
Container port throughput (TEU: 20 foot equivalent units)	2020	4,029,000	↓	551,417.3	8,542,106.18	UNCTAD
Control of Corruption (0 – 100)	2020	63.5	↓	37.4	51.2	WB
Digital Adoption Index (0-1)	2016	0.6	↑	0.3	0.5	WB
Efficiency of air transport services [value: 1=worst to 5=best]	2019	5.5	↑	3.7	4.6	WEF
Efficiency of seaport services [value: 1=worst to 5=best]	2019	4.5	=	3.2	3.9	WEF
Efficiency of train services [value: 1=worst to 5=best]	2019	3	↓	2.4	3.1	WEF
Energy consumption of transport relative to GDP (PPP) (GOE per dollar)	2012	26	n/a	21.2	23.4	IEA
Exports by main service – Transport (Annual estimates based on quarterly data – US Dollars at current prices in millions)	2021	1,428.778	↑	525.2	5,796.97	UNCTAD
Good governance index - Undue influence [value: 1 = worst to 7 = best]	2015	4	n/a	3.3	3.2	WEF
Imports by main service – Transport (Annual estimates based on quarterly data – US Dollars at current prices in millions)	2021	5,071.712	↑	1,131.69	7,810.97	UNCTAD
Liner shipping connectivity index, quarterly	2022 Q1	39.3	↑	14.4	28.4	UNCTAD
Logistics performance index - customs [value: 1 = low to 5 = high]	2018	3.2	↓	2.3	2.6	WB
Median time in port (days) – All ships	2021	2.5	↑	2.1	1.3	UNCTAD
Public Private Partnership investment in transport (current US$)	2019	13.5	↓	258.8	560	WB

GREEN MOBILITY

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: PM2.5 air pollution, mean annual exposure (micrograms per cubic meter)	2019	28.3	↓	41.3	23.2	UNHABITAT/ GBDS
Principal: Transport-related GHG emissions per capita (tons of CO_2 per capita)	2019	1	↓	0.3	1.1	CAIT
Access to Electricity (% of population)	2020	84.4	↓	51.5	96.2	WB
CO_2 emissions from road transport per capita (kgCO_2/capita)	2017	900	↓	290	918.5	IEA
CO_2 emission from transport per capita (kgCO_2/capita)	2017	947	↓	300.7	1,005.28	IEA
Electricity production from oil, gas and coal sources (% of total)	2015	92.8	↓	52.8	62	WB
Energy Transition Index (%)	2021	48	↓	50.8	58.6	WEF
Fossil fuel energy consumption (% of total)	2014	86.8	↑	26.9	61.8	IEA
Mortality rate attributed to household and ambient air pollution, age-standardized, female (per 100,000 population)	2016	66	n/a	162	52.6	WB
Mortality rate attributed to household and ambient air pollution, age-standardized, male (per 100,000 population)	2016	118	n/a	179.4	80.4	WB
Mortality rate attributed to household and ambient air pollution, age-standardized, total (per 100,000 population)	2016	86.7	n/a	170	65	WB
PM2.5 air pollution, population exposed to levels exceeding WHO guideline value (% of total)	2017	100	=	100	96	GBDS
Renewable energy consumption (% of total final energy consumption)	2018	10.3	↑	62.2	20	WB
Total transport-related GHG emissions (million tonnes of CO_2)	2019	58.5	↑	4.8	43.8	CAIT

GUATEMALA

SUSTAINABLE MOBILITY RANKING (Based on the Global Sustainable Mobility Index, 2022)	#116/183 Countries
SUSTAINABLE MOBILITY INDEX (Based on Country Mobility Performances, 2022 – 0 to 100)	40
REGION (World Bank classification based on Income group)	Latin America & Caribbean
INCOME GROUP (World Bank classification based on Income group)	Upper middle income
GDP PER CAPITA (PPP 2020 - Current Internationa $)	8,853
POPULATION *(Thousands)*	16,858



UNIVERSAL ACCESS

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal (Rural): Rural Access Index - Geospatial Methodology (%)	2016	61	n/a	65.4	68.9	ReCAP
Principal (Urban): Rapid Transit to Resident Ratio (km per millions)	2021	12.8	↓	7.1	8.2	ITDP
Principal (Gender): Workers in transport who are female (%)	2017	5	n/a	11	14	ILO
Air transport (registered carrier departures worldwide)	2020	0.7	↓	48.1	142.8	ICAO
Air transport, freight (million ton-km)	2020	0	↓	194.3	843	ICAO
Air transport, passengers carried (thousands)	2020	0	↓	4.5	15.5	ICAO
Airport Connectivity Index (score)	2019	35.6	=	45	51.6	WEF
Number of Port Calls (all ships, annual)	2021	3,119	↑	4,957.1	16,798.21	UNCTAD
Number of registered vehicles	2016	3250.2	↓	188.8	2079.8	WHO
Quality of air transport infrastructure [value: 1 = worst to 7 = best]	2017	3.4	↓	4.2	4.4	WEF
Quality of port infrastructure [value: 1 = worst to 7 = best]	2017	3.6	↓	3.9	3.9	WEF
Quality of railroad infrastructure [value: 1 = worst to 7 = best]	2013	1.2	↓	2	2.7	WEF
Quality of roads [value: 1 = worst to 7 = best]	2019	2.4	↓	3.7	3.8	WEF
Rail lines (total route-km)	2005	322	↓	5,359.17	9,882.8	UIC
Railroad density (km of railroads per sq. km)	n/a	n/a	n/a	4.2	13.9	WEF
Railways – goods transported (million ton – km)	2000	2,207	↑	11,443.37	207,991.37	UIC
Railways, passengers carried	n/a	n/a	n/a	3,096.84	55,905.01	UIC
Road Connectivity Index (0-100)	2019	38	↑	68.9	71.2	WEF
Rural Access Index - Household Survey (%)	2000	55	n/a	70	71	WB

SAFETY

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: Mortality caused by road traffic injury (per 100,000 people)	2019	22.9	↑	18	17.2	WHO
Attribution of road traffic deaths to alcohol (%)	2013	15	n/a	15.5	14.1	WHO
Mortality caused by road traffic injury, female (per 100,000 female population)	2019	7.5	↑	7.1	7.6	WHO
Mortality caused by road traffic injury, male (per 100,000 male population)	2019	38.8	↑	29.6	27.2	WHO
Reported percentage of seriously injured patients transported by ambulance (%)	2013	>= 75%	n/a	n/a	n/a	WHO

EFFICIENCY

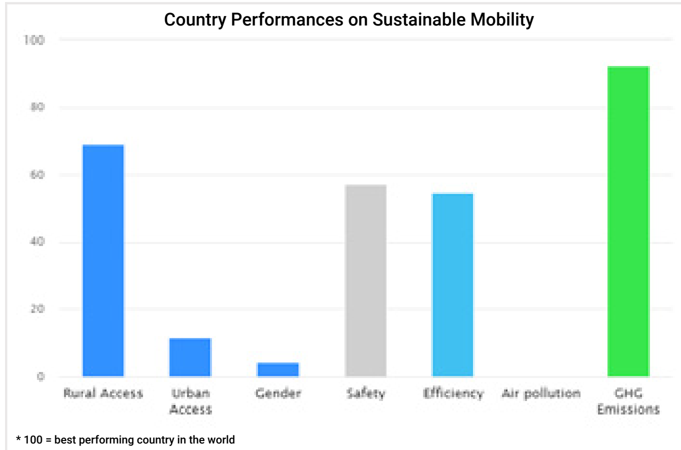
INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: Logistics performance index: Overall (1=low to 5=high)	2018	2.4	↓	2.7	2.7	WB
Average age of vessels (years) – All ships	2021	12	↓	16.4	18.7	UNCTAD
Average cargo carrying capacity (dwt) per vessel – All ships	2021	36,543	↑	25,711.87	23,784.07	UNCTAD
Average container carrying capacity (TEU) per container ship – All ships	2021	2,387	↑	2,833.83	2,689.16	UNCTAD
Average size of vessels (gross tonnage) – All ships	2021	26,612	↑	24,945.2	20,848.581	UNCTAD
Container port throughput (TEU: 20 foot equivalent units)	2020	1,475,779	↓	1,714,669.7	8,542,106.18	UNCTAD
Control of Corruption (0 – 100)	2020	19.2	↓	54	51.2	WB
Digital Adoption Index (0-1)	2016	0.5	↑	0.5	0.5	WB
Efficiency of air transport services [value: 1=worst to 5=best]	2019	4.1	=	4.2	4.6	WEF
Efficiency of seaport services [value: 1=worst to 5=best]	2019	3.9	↑	3.7	3.9	WEF
Efficiency of train services [value: 1=worst to 5=best]	2018	1.1	n/a	2.3	3.1	WEF
Energy consumption of transport relative to GDP (PPP) (GOE per dollar)	2012	18	n/a	23.7	23.4	IEA
Exports by main service – Transport (Annual estimates based on quarterly data – US Dollars at current prices in millions)	2021	495.1	↑	1,076.96	5,796.97	UNCTAD
Good governance index - Undue influence [value: 1 = worst to 7 = best]	2015	3	n/a	2.9	3.2	WEF
Imports by main service – Transport (Annual estimates based on quarterly data – US Dollars at current prices in millions)	2021	2,075.062	↑	2,853.12	7,810.97	UNCTAD
Liner shipping connectivity index, quarterly	2022 Q1	37.4	↑	21.7	28.4	UNCTAD
Logistics performance index - customs [value: 1 = low to 5 = high]	2018	2.2	↓	2.5	2.6	WB
Median time in port (days) – All ships	2021	0.9	↑	1.1	1.3	UNCTAD
Public Private Partnership investment in transport (current US$)	2014	120	↑	499.6	560	WB

GREEN MOBILITY

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: PM2.5 air pollution, mean annual exposure (micrograms per cubic meter)	2019	27.8	↓	19.3	23.2	UNHABITAT/ GBDS
Principal: Transport-related GHG emissions per capita (tons of CO_2 per capita)	2019	0.6	↑	1	1.1	CAIT
Access to Electricity (% of population)	2020	97.1	↑	96.8	96.2	WB
CO_2 emissions from road transport per capita (kgCO_2/capita)	2017	490	↑	826.2	918.5	IEA
CO_2 emission from transport per capita (kgCO_2/capita)	2017	492	↑	885.5	1,005.28	IEA
Electricity production from oil, gas and coal sources (% of total)	2015	39.6	↑	50.7	62	WB
Energy Transition Index (%)	2021	54.7	↓	58.6	58.6	WEF
Fossil fuel energy consumption (% of total)	2014	37.4	↑	50.6	61.8	IEA
Mortality rate attributed to household and ambient air pollution, age-standardized, female (per 100,000 population)	2016	68	n/a	40.7	52.6	WB
Mortality rate attributed to household and ambient air pollution, age-standardized, male (per 100,000 population)	2016	81	n/a	56.8	80.4	WB
Mortality rate attributed to household and ambient air pollution, age-standardized, total (per 100,000 population)	2016	73.8	n/a	48.2	65	WB
PM2.5 air pollution, population exposed to levels exceeding WHO guideline value (% of total)	2017	100	=	94.9	96	GBDS
Renewable energy consumption (% of total final energy consumption)	2018	64.1	↓	25.7	20	WB
Total transport-related GHG emissions (million tonnes of CO_2)	2019	9.6	↑	19.9	43.8	CAIT

INDIA

SUSTAINABLE MOBILITY RANKING (Based on the Global Sustainable Mobility Index, 2022)	#85/183 Countries
SUSTAINABLE MOBILITY INDEX (Based on Country Mobility Performances, 2022 – 0 to 100)	46.5
REGION (World Bank classification based on Income group)	South Asia
INCOME GROUP (World Bank classification based on Income group)	Lower middle income
GDP PER CAPITA (PPP 2020 - Current Internationa $)	6,503
POPULATION (Thousands)	1,380,004



UNIVERSAL ACCESS

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal (Rural): Rural Access Index - Geospatial Methodology (%)	2016	75	n/a	67.9	61.9	ReCAP
Principal (Urban): Rapid Transit to Resident Ratio (km per millions)	2021	4.7	↓	1	2.7	ITDP
Principal (Gender): Workers in transport who are female (%)	2012	1	n/a	4	6	ILO
Air transport (registered carrier departures worldwide)	2020	583.1	↓	90.9	40.4	ICAO
Air transport, freight (million ton-km)	2020	875.1	↓	168.7	77.2	ICAO
Air transport, passengers carried (thousands)	2020	69	↓	10	4	ICAO
Airport Connectivity Index (score)	2019	100	=	62.2	42.1	WEF
Number of Port Calls (all ships, annual)	2021	44,922	↑	11,460.2	9,976.66	UNCTAD
Number of registered vehicles	2015	210023.3	↓	655.4	1145.7	WHO
Quality of air transport infrastructure [value: 1 = worst to 7 = best]	2017	4.6	↑	3.8	3.7	WEF
Quality of port infrastructure [value: 1 = worst to 7 = best]	2017	4.6	↑	3.4	3.3	WEF
Quality of railroad infrastructure [value: 1 = worst to 7 = best]	2017	4.4	↓	3	2.6	WEF
Quality of roads [value: 1 = worst to 7 = best]	2019	4.5	↑	3.8	3.5	WEF
Rail lines (total route-km)	2019	68,155	↓	20,096.18	4,732.87	UIC
Railroad density (km of railroads per sq. km)	2019	22.7	↑	19.9	7.9	WEF
Railways – goods transported (million ton – km)	2017	654,285	↑	165,886.35	29,206.89	UIC
Railways, passengers carried	2017	1,161,333	↑	300,920.85	41,878.32	UIC
Road Connectivity Index (0-100)	2019	75.8	↑	68.6	67	WEF
Rural Access Index - Household Survey (%)	2001	61	n/a	61	60	WB

SAFETY

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: Mortality caused by road traffic injury (per 100,000 people)	2019	15.6	↑	14.2	19.8	WHO
Attribution of road traffic deaths to alcohol (%)	2017	4.1	=	4.1	18.5	WHO
Mortality caused by road traffic injury, female (per 100,000 female population)	2019	7	=	7.5	10.3	WHO
Mortality caused by road traffic injury, male (per 100,000 male population)	2019	23.4	=	20.8	29.4	WHO
Reported percentage of seriously injured patients transported by ambulance (%)	2013	11-49%	n/a	n/a	n/a	WHO

EFFICIENCY

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: Logistics performance index: Overall (1=low to 5=high)	2018	3.2	↓	2.5	2.6	WB
Average age of vessels (years) – All ships	2021	14	=	16	16.1	UNCTAD
Average cargo carrying capacity (dwt) per vessel – All ships	2021	40,872	↓	29,009.4	24,434.026	UNCTAD
Average container carrying capacity (TEU) per container ship – All ships	2021	4,017	↓	3,779.75	2,556.42	UNCTAD
Average size of vessels (gross tonnage) – All ships	2021	27,861	↓	26,385.8	20,862.976	UNCTAD
Container port throughput (TEU: 20 foot equivalent units)	2020	16,285,806	↓	5,833,994.2	2,235,932.33	UNCTAD
Control of Corruption (0 – 100)	2020	55.3	↑	46.4	41.6	WB
Digital Adoption Index (0-1)	2016	0.5	↑	0.4	0.4	WB
Efficiency of air transport services [value: 1=worst to 5=best]	2019	4.9	↑	4	3.9	WEF
Efficiency of seaport services [value: 1=worst to 5=best]	2019	4.5	↓	3.6	3.4	WEF
Efficiency of train services [value: 1=worst to 5=best]	2019	4.4	↓	3.2	2.9	WEF
Energy consumption of transport relative to GDP (PPP) (GOE per dollar)	2012	12	n/a	12	22.8	IEA
Exports by main service – Transport (Annual estimates based on quarterly data – US Dollars at current prices in millions)	2021	27,888.354	↑	4,364.36	1,416.94	UNCTAD
Good governance index - Undue influence [value: 1 = worst to 7 = best]	2015	4	n/a	3.2	3.2	WEF
Imports by main service – Transport (Annual estimates based on quarterly data – US Dollars at current prices in millions)	2021	80,015.423	↑	13,631.48	3,465.021	UNCTAD
Liner shipping connectivity index, quarterly	2022 Q1	61.5	↑	38.1	22.4	UNCTAD
Logistics performance index - customs [value: 1 = low to 5 = high]	2018	3	↓	2.3	2.4	WB
Median time in port (days) – All ships	2021	1.3	↓	1.8	1.6	UNCTAD
Public Private Partnership investment in transport (current US$)	2019	6469.8	↓	1427.9	745.2	WB

GREEN MOBILITY

INDICATOR	YEAR	VALUE	DELTA	AVERAGE IN REGION	AVERAGE IN INCOME GROUP	SOURCE
Principal: PM2.5 air pollution, mean annual exposure (micrograms per cubic meter)	2019	83.3	↑	52.2	34.5	UNHABITAT/ GBDS
Principal: Transport-related GHG emissions per capita (tons of CO_2 per capita)	2019	0.2	=	0.6	0.4	CAIT
Access to Electricity (% of population)	2020	99	↑	94.8	82.1	WB
CO_2 emissions from road transport per capita ($kgCO_2$/capita)	2017	198	↑	234.8	391.6	IEA
CO_2 emission from transport per capita ($kgCO_2$/capita)	2017	218	↑	246.4	418.1	IEA
Electricity production from oil, gas and coal sources (% of total)	2015	81.9	↑	59.1	63.5	WB
Energy Transition Index (%)	2021	52.8	↓	52.1	52	WEF
Fossil fuel energy consumption (% of total)	2014	73.6	↑	39.3	43.5	IEA
Mortality rate attributed to household and ambient air pollution, age-standardized, female (per 100,000 population)	2016	166	n/a	129.3	119.7	WB
Mortality rate attributed to household and ambient air pollution, age-standardized, male (per 100,000 population)	2016	202	n/a	157	149.1	WB
Mortality rate attributed to household and ambient air pollution, age-standardized, total (per 100,000 population)	2016	184.3	n/a	142.7	133.1	WB
PM2.5 air pollution, population exposed to levels exceeding WHO guideline value (% of total)	2017	100	=	80.7	98.7	GBDS
Renewable energy consumption (% of total final energy consumption)	2018	31.7	↓	41.8	39	WB
Total transport-related GHG emissions (million tonnes of CO_2)	2019	315.9	↑	50.2	21	CAIT

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