



# ITF South and Southwest Asia Transport Outlook



Case-Specific Policy Analysis

# ITF South and Southwest Asia Transport Outlook



Case-Specific Policy Analysis

# The International Transport Forum

The International Transport Forum is an intergovernmental organisation with 64 member countries. It acts as a think tank for transport policy and organises the Annual Summit of transport ministers. ITF is the only global body that covers all transport modes. The ITF is politically autonomous and administratively integrated with the OECD.

The ITF works for transport policies that improve people's lives. Our mission is to foster a deeper understanding of the role of transport in economic growth, environmental sustainability and social inclusion and to raise the public profile of transport policy.

The ITF organises global dialogue for better transport. We act as a platform for discussion and pre-negotiation of policy issues across all transport modes. We analyse trends, share knowledge and promote exchange among transport decision-makers and civil society. The ITF's Annual Summit is the world's largest gathering of transport ministers and the leading global platform for dialogue on transport policy.

The Members of the Forum are: Albania, Armenia, Argentina, Australia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Cambodia, Canada, Chile, China (People's Republic of), Colombia, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Kazakhstan, Korea, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Mexico, Republic of Moldova, Mongolia, Montenegro, Morocco, the Netherlands, New Zealand, North Macedonia, Norway, Poland, Portugal, Romania, Russian Federation, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Tunisia, Turkey, Ukraine, the United Arab Emirates, the United Kingdom, the United States and Uzbekistan.

International Transport Forum  
2 rue André Pascal  
F-75775 Paris Cedex 16  
[contact@itf-oecd.org](mailto:contact@itf-oecd.org)  
[www.itf-oecd.org](http://www.itf-oecd.org)

## Case-Specific Policy Analysis Reports

The ITF's Case-Specific Policy Analysis series presents topical studies on specific issues carried out by the ITF in agreement with local institutions. Any findings, interpretations and conclusions expressed herein are those of the authors and do not necessarily reflect the views of the International Transport Forum or the OECD. Neither the OECD, ITF nor the authors guarantee the accuracy of any data or other information contained in this publication and accept no responsibility whatsoever for any consequence of their use. This work is published under the responsibility of the Secretary-General of the ITF. This document, as well as any data and map included herein, are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Cite this work as: ITF (2022), "ITF South and Southwest Asia Transport Outlook", *International Transport Forum Policy Papers*, No. 104, OECD Publishing, Paris.

## Acknowledgements

This report was written by Vatsalya Sohu, with contributions from Luis Martinez, Orla McCarthy and John Pritchard of the International Transport Forum (ITF) and Azhar Jaimurzina Ducrest, Sandeep Jain and Kuancheng Huang from the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). Comments from Dr. Rajan Sudesh Ratna and Joseph George from ESCAP South and Southwest Asia Office are gratefully acknowledged. The project was co-ordinated by Wei-Shiuen Ng (ITF), who, along with Mario Barreto (ITF), also contributed to the development and the finalisation of the draft. Jari Kauppila and Elisabeth Windisch, both of the ITF, reviewed the document.

The report was drafted as a part of the “ITF Transport Outlook – Special Issues for Asia: Policy Analysis and Implementation” project, which was funded by the United Nations ESCAP as part of the United Nations Development Account projects on “Transport and trade connectivity in the age of pandemics: Contactless, seamless and collaborative UN solutions” and “Promoting a shift towards sustainable freight transport in the Asia-Pacific region”. This report is one of three special editions of the ITF Transport Outlook for three sub-regions in Asia, Southeast Asia, South and Southwest Asia, and North and Central Asia.

Each report draws upon the modelling framework and outputs from the ITF Transport Outlook 2021, desk research and insights from the [ITF-UNESCAP joint capacity building workshop](#) held virtually in October 2021, relevant ESCAP reports and the Special event on “Transport Connectivity and COVID-19 Pandemic: Pathways for Greater Resilience and Sustainability”, organised during the Fourth Ministerial Conference on Transport held in Bangkok and via videoconference from 14 to 17 December 2021.

## Foreword

The project *ITF Transport Outlook – Special Issues for Asia: Policy Analysis and Implementation* was developed jointly by the International Transport Forum and the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). Both organisations have long collaborated closely and grant each other reciprocal observer status. Funded by ESCAP and carried out by the ITF, this project marks a new high point in this productive partnership.

The reports of this joint project will help member countries of both organisations to understand Asia's transport future better. How will demand for passenger mobility and freight transport evolve in the coming decades? What does this mean for transport-related emissions? And what impact could potential disruptions have? The Covid-19 pandemic has underlined the case for much more resilient transport systems, which require new and different transport policies.

Enhancing governments' capacity to identify critical differences in demand projections for passenger and freight transport between countries in different sub-regions in Asia and the rest of the world will help create a sound basis for necessary policy shifts.

The sub-regions covered by the project are experiencing rapid changes in transport demand, the evolution of mobility services and the provision of transport infrastructure. A primary objective of the work is to provide policy insights that help address the specific challenges in each sub-region and notably improve the sustainability of transport systems.

To support the implementation of sustainable transport pathways, the project included capacity-building and training sessions for each sub-region. The analyses also serve as input to priority actions on connectivity in the next phase of the ESCAP Asia-Pacific Regional Action Programme on Sustainable Transport Connectivity.

I look forward to building further on this excellent example of results-oriented collaboration between two leading intergovernmental organisations in the service of their members.



Young Tae Kim  
Secretary-General, International Transport Forum

## Table of contents

Executive summary.....	7
Pathways to decarbonise transport in South and Southwest Asia by 2050 .....	9
Reshaping transport in the face of immense population growth and dependence on fossil fuels.....	11
The human dimension: Catering for massive urbanisation .....	11
The economic dimension: Planning for growth.....	14
Selected transport developments in South and Southwest Asia.....	15
Strategic policy priorities at the national level .....	18
The trade dimension: Measuring connectivity gaps.....	25
<b>Freight transport: Managing the tripling of demand.....</b>	<b>30</b>
Non-urban freight transport: Encouraging the sustainable movement of goods .....	31
Urban freight transport: Improving efficiencies and fleets .....	34
<b>Passenger transport: Separating transport demand from economic activity.....</b>	<b>36</b>
Urban passenger transport: Cleaner vehicle fleets crucial for reducing emissions .....	38
Non-urban passenger transport: Increasing low-emission vehicles and fuels .....	43
<b>Conclusions and policy insights.....</b>	<b>47</b>
<b>References.....</b>	<b>51</b>
<b>Annex A. ITF Transport Outlook 2021 modelling scenarios: <i>Recover, Reshape, Reshape+</i>.....</b>	<b>56</b>
<b>Annex B. Freight transport scenario specifications from the <i>ITF Transport Outlook 2021</i>.....</b>	<b>58</b>
<b>Annex C. Urban passenger transport scenario specifications from the <i>ITF Transport Outlook 2021</i> .....</b>	<b>61</b>
<b>Annex D. Non-urban passenger transport scenario specifications from the <i>ITF Transport Outlook 2021</i> .....</b>	<b>64</b>

## Figures

1. Summary of transport policy measures for the three <i>ITF Transport Outlook 2021</i> scenarios ....	10
2. Population projections of South and Southwest Asia countries to 2050 .....	12
3. National population by age (%) in South and Southwest Asia countries, 2020 and 2050.....	12
4. Population living in urban areas in South and Southwest Asia countries, 1950-2050.....	13
5. World Economic Forum transport infrastructure scores for seven South and Southwest Asia countries.....	15
6. The United Nations Conference on Trade and Development Liner Shipping Connectivity Index scores for a selection of countries in South and Southwest Asia, 2011-19 .....	17

7. Impact of distances on reaching global centres of production and consumption for South and Southwest Asia countries.....	26
8. Connectivity gap for South and Southwest Asia countries compared with the Netherlands .....	28
9. Freight activity for surface, domestic air and sea movements to 2050 .....	30
10. Non-urban freight demand by mode and scenario to 2050 .....	31
11. Non-urban freight tank-to-wheel emissions by scenario to 2050.....	32
12. Non-urban freight demand and emissions by modal split to 2050 .....	33
13. Total urban freight tonne-kilometres by scenario to 2050 .....	34
14. Urban freight tank-to-wheel CO <sub>2</sub> emissions by scenario to 2050 .....	35
15. Passenger activity in South and Southwest Asia by scenario to 2050 .....	36
16. Passenger transport emissions by scenario to 2050.....	37
17. Total tank-to-wheel emissions for freight and passenger transport by scenario to 2050 .....	38
18. Urban passenger demand by mode and scenario for South and Southwest Asia to 2050 .....	39
19. Urban passenger emissions by mode and scenario for South and Southwest Asia to 2050.....	41
20. Difference in average travel time across the radius of a city in 2050 under the <i>Reshape+</i> scenario compared to the <i>Recover</i> scenario, by car and public transport .....	43
21. Non-urban passenger demand by mode and scenario to 2050.....	44
22. Non-urban passenger emissions by mode and scenario to 2050.....	45

## Executive summary

### What we did

This report provides recommendations on how to underpin South and Southwest Asia's strategy of economic growth through better connectivity with sustainable transport solutions. The policy insights are based on three scenarios for future transport demand and associated carbon dioxide (CO<sub>2</sub>) emissions in the sub-region to 2050. The baseline scenario (*Recover*) assumes government policies return to business-as-usual after the pandemic. Two other scenarios (*Reshape*, *Reshape+*) assume governments adopt more ambitious policies after the pandemic. Under *Reshape+*, governments additionally leverage the impacts of the Covid-19 pandemic for transport decarbonisation. The scenarios in this study are a regional drill-down of the forward-looking policy for global transport activity used in the ITF Transport Outlook project.

### What we found

Asia's South and Southwest sub-region is responsible for 10% of the CO<sub>2</sub> emissions from the global transport sector. Expected economic growth in the sub-region will translate into increased demand for transport and, given transport's dependence on fossil fuels, a rise in emissions associated with transport activity. Modelling results for all three scenarios show that the freight activity in the sub-region will at least triple between 2015 and 2050. However, ambitious policies that focus on decarbonising transport can lead to a 23% decrease in the demand for freight transport by 2050, compared to the current trajectory. Demand for passenger transport will increase even more significantly. Under the *Recover* scenario, where today's policies remain unchanged, it will quadruple between 2015 and 2050. By contrast, it would be 17% lower in 2050 under the policies assumed in the *Reshape+* scenario than under *Recover* assumptions.

South and Southwest Asia remains one of the world's least-connected regions economically despite efforts to enhance the connectivity in the sub-region. In terms of access to global GDP, countries in South and Southwest Asia have connectivity levels of the half, or less than half, than that of most developed economies. Improving road and rail links and overcoming barriers to intra-regional trade will be critical to enhancing connectivity in the region. Increased trade regionalisation, when combined with the measures under *Reshape+*, can lead to slower growth in freight activity in the region. A combination of policies ranging from vehicle weight reduction, increased engine efficiency and hybridisation and fuel economy and CO<sub>2</sub> emission standards for road freight to battery electric and hybrid hydrogen and fuel cell traction systems for the rail sector can help substantially reduce the carbon dependency of freight transport.

Under all scenarios, the demand for non-urban passenger transport in 2050 will remain considerably greater than for urban passenger transport. Non-urban passenger transport is more challenging to decarbonise than urban mobility. Making passenger transport between and outside cities more sustainable requires a paradigm shift in transport policy. To take transport decarbonisation to a new level, governments could specifically aim to lock in the unforeseen emissions reductions caused by the Covid-19 pandemic. The sub-region's growth in rail transport reflects the prioritisation of planned investment in the development of rail infrastructure, to move towards cleaner transport. The increased use of private vehicles and rising activity in urban freight in cities will lead to congested urban areas. It is essential for policy makers to anticipate such adverse effects and design policies that are more resilient to unforeseen events in the future.



## What we recommend

### Target road freight to achieve significant reductions in transport CO<sub>2</sub> emissions

The emissions from road freight transport are projected to almost double in 2050, under the current policy ambitions. Enacting ambitious policies, such as those under the *Reshape+* scenario, can bring down the emissions from the road freight sector by 62% in 2050, as compared to what could be the resultant emissions under *Recover*. Some of these include an ambitious energy transition for long-haul heavy-duty road freight vehicles, strict fuel economy and CO<sub>2</sub> emissions standards, aerodynamic retrofits, reduced-rolling resistance of tyres, vehicle weight reduction, increased engine efficiency, and hybridisation. In urban areas, freight emissions more than double under the *Recover* scenario. Targeted policies that tackle freight emissions in the cities will be crucial to avoid this from happening.

### Accelerate aviation's technology and fuel transition to reduce emissions

While significant reductions are achievable in road, bus and rail transport under the non-urban passenger sector, it is the aviation sector that is hard-to-abate. Under the two *Reshape* scenarios, hybrid and all-electric aircraft become commercially viable in the coming decades. These technological developments can push down the cost of synthetic fuels, making them more commercially viable in the future. Pushing for the adoption of alternative fuels in aviation would decrease emissions in the short term and boost innovation in the longer term.

### Reduce urban transport's carbon footprint by leveraging public transport and active modes post the pandemic

With the changes seen in the travel patterns after the Covid-19 crisis, proactive measures are necessary to reverse the impact of negative externalities, especially in the cities of the sub-region. Ensuring the safety, reliability and availability of public transport will be essential to minimise the negative environmental impacts. Investing in public transport and active modes will have to be prioritised over developing new infrastructure for private vehicles.

### Link decarbonisation and regional connectivity to develop resilient transport sectors

The recovery from the Covid-19 pandemic can be leveraged as an opportunity to implement targeted policies to improve connectivity in the region and enhance transport sustainability. Building resilience in the sub-region's transport sector to deal with dynamic and unpredictable situations would be critical. This can be done through a mix of policy options, including increasing capacity for planning and crisis response through enhanced co-operation among stakeholders, harmonising border procedures among countries, advancing towards digitalisation of processes and climate-proofing transport infrastructure.

### Establish coherent freight reforms for sustainable outcomes

To mainstream sustainability considerations in freight transport planning, gathering, storing and analysing transport statistics would be crucial, an element that is lacking in the sub-region currently. Transport technologies can contribute immensely to the enhancement of freight sustainability in multifarious ways, including the improved capacity of the network, traffic management, reliability, energy efficiency and lower operating costs. Governments need to create a coherent framework of economic and regulatory incentives and penalties to align economic objectives with sustainability goals. Including freight transport emissions in carbon-pricing schemes is a critical instrument that policy makers have at their disposal to foster a green transition.

## Pathways to decarbonise transport in South and Southwest Asia by 2050

The South and Southwest Asia sub region accounted for a quarter of the total world population in 2020. This proportion is only expected to increase in the coming decades to 2050. Population growth, along with augmenting consumption, also leads to increased emissions. A priority for the sub-region is addressing this rise in emissions and ensuring that socio-economic improvements are achieved. Transport is an important sector for the countries in the sub-region, not only because of the role it plays in physically connecting people and markets and as a facilitator of economic growth and social development but also for its relevance for oil demand and contribution to emissions.

Countries in South and Southwest Asia had been scaling up their ambitions and actions to combat climate change in the last few years, yet the Covid-19 pandemic has strongly affected the transport sector and the connectivity landscape in the sub-region. It has also highlighted areas that can be “built back better”, especially, for example, advancing national and regional initiatives that support the environmental sustainability of freight transport operations.

South and Southwest Asia is defined according to the United Nations Economic and Social Commission for Asia and the Pacific’s (ESCAP) categorisation of the South and Southwest Asia sub-region in this report. This includes Afghanistan, Bangladesh, Bhutan, India, Islamic Republic of Iran, the Maldives, Nepal, Pakistan, Sri Lanka and Turkey. Nine out of the ten countries in the sub-region have submitted Nationally Determined Contributions to the United Nations Framework Convention on Climate Change (UNFCCC) under the Paris Agreement.

This report presents future demand scenarios of passenger mobility, freight volumes and the associated transport emissions to 2050 for this sub-region. These scenarios assess potential impacts of future transport activity on climate change through detailed carbon dioxide (CO<sub>2</sub>) emissions projections under different conditions. The ITF models used for the Transport Outlook are demand-based models that show what could be possible under certain policy scenarios, using policies that are already committed as the baseline. These ITF models are global, and as such, there are limitations to how granular the results presented can be. Model outputs are therefore reported at the sub-regional level, except for analysis conducted for specific projects, such as those shown in the connectivity section. For the most recent ITF Transport Outlook (ITF, 2021), three scenarios were considered, *Recover*, *Reshape* and *Reshape+*. These are described in detail in Annex A, with the specific policies for each of the transport models in Annexes B, C and D – all of which are extracted from the original Outlook 2021. Figure 1. gives a high-level summary of the three.

Figure 1. Summary of transport policy measures for the three *ITF Transport Outlook 2021* scenarios

Recover	Current trajectory. Implemented and announced commitments. Established economic practices.
Reshape	A paradigm shift. Transformational commitments. Green recovery.
Reshape+	Reinforce Reshape. Leverage Covid-19 recovery. Achieve decarbonisation faster and with more certainty.

The *Recover* scenario is the baseline in terms of policy measures. Under *Recover*, it is assumed that transport trends return to levels seen prior to the pandemic by 2025. It also assumes that only pre-existing planned or committed policies are implemented, so there are no additional policies that build on the pandemic experience. From a policy perspective, this could be considered the business-as-usual scenario.

Under *Reshape*, transport trends are again assumed to have returned to their pre-pandemic levels by 2025, and it is assumed that significantly more ambitious policies to decarbonise transport will be implemented. This scenario is considered “transformational”. It assumes policy measures that “encourage changes in the behaviour of transport users, uptake of cleaner energy and vehicle technologies, digitalisation to improve transport efficiency, and infrastructure investment to help meet environmental and social development goals.” (ITF, 2021b). Measures such as carbon pricing or port fees would be assumed to be more stringent, while the attractiveness of more sustainable modes would be increased. The improved attractiveness would be due to assumed lower penalties for multimodal interchanges, greater investment in infrastructure and services, more efficient operations (through asset sharing in freight, for example) and broader uptake of innovative transport solutions and alternative fuels or power.

*Reshape+* is the most ambitious of the three scenarios. It assumes that “governments seize decarbonisation opportunities created by the pandemic, which reinforce the policy efforts in *Reshape*.” (ITF, 2021). Under *Reshape+*, any reductions in transport demand observed during the pandemic broadly continue, with a more ambitious policy package also being implemented.

This report can support countries in the sub-region in developing their policy pathways to achieve decarbonisation objectives and to improve future strategies for the transport sector. It also highlights the major transport sector trends and the strategic and policy priorities that the countries in the sub-region are currently focusing on, especially decarbonisation objectives.

## Reshaping transport in the face of immense population growth and dependence on fossil fuels

With two billion people, South and Southwest Asia's population accounted for 25% of the world population in 2020 (UNDESA, 2019). The sub-region is also responsible for 10% of the CO<sub>2</sub> emissions from the transport sector globally. The expectation of rapid growth in population and gross domestic product, combined with growing energy needs, implies that the South and Southwest Asian region will play a significant role in the global efforts to mitigate climate change. The share of fossil fuels in total energy consumption has been rising sharply in the sub-region over the last three decades, while it has been comparatively stable globally and among developing country groups. This threatens to drive up the sub-region's greenhouse gas (GHG) emission rates. Though all sub-regional countries have set ambitious targets for renewable energy generation, a reversal in the growth of non-renewable energy consumption is unlikely in the short term because of the sub-region's huge energy supply deficits. With its traditional dependency on fossil fuels and low penetration of electrified vehicles, the transport sector may remain a major source of emissions, even against a potential rise in the share of renewable energy in the sub-regional countries (UNESCAP, 2021a).

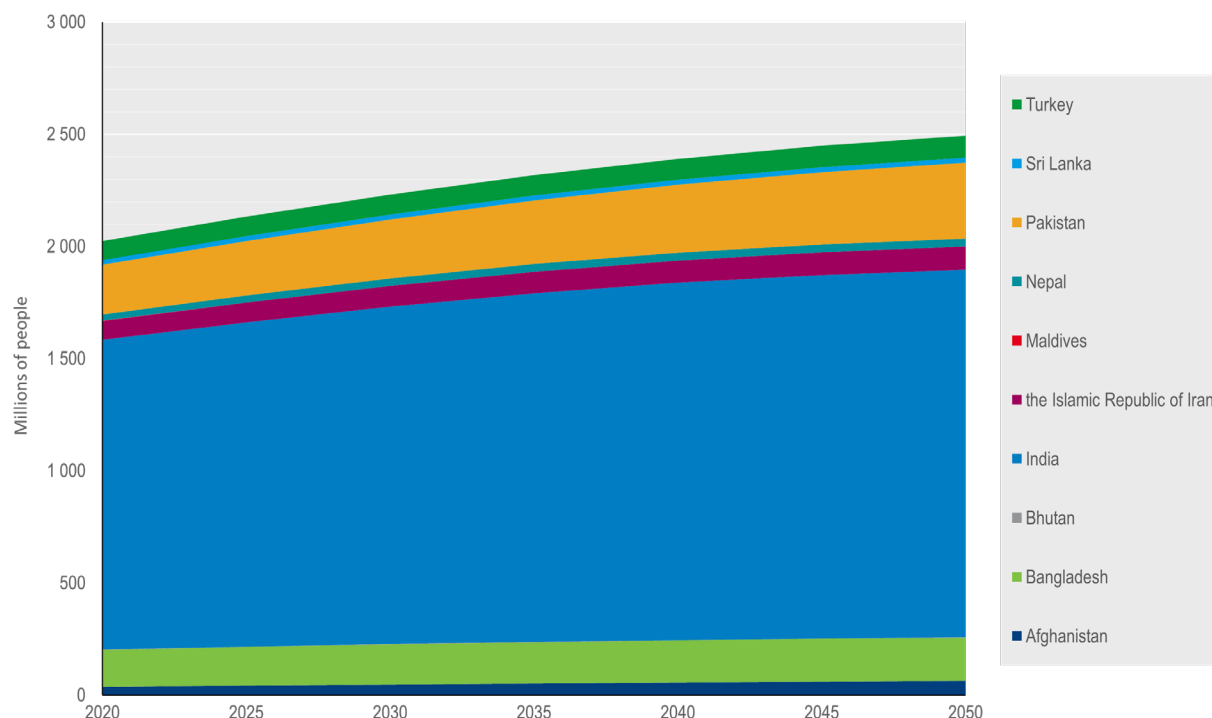
### The human dimension: Catering for massive urbanisation

The population for South and Southwest Asia is expected to grow by 23% between 2020 and 2050 (UNDESA, 2019), reaching an estimated 2.5 billion people (Figure 2). The highest absolute increase during the period is expected to come from the population growth in India, while the highest growth rate is experienced by Afghanistan at 66%. This is followed by Pakistan, which is expected to have a population growth rate of 53% between 2020 and 2050. The Islamic Republic of Iran expects a growth rate of 23% and Nepal 21%. India, Bhutan, Bangladesh and Turkey (in that order) are expected to have a growth rate estimated between 15-19% over the same period. The countries with the lowest expected population growth in the sub-region are the Maldives (at 8%) and Sri Lanka (at 2%). This population growth in the sub-region is expected to have implications for transport policies in the coming decades. More people requiring mobility will place greater pressure on public transport infrastructures, for example.

The age distribution of the population is also important to consider when developing transport policies. As the population ages, there is a decline in the labour force. This, in turn, influences the transport demand itself and the composition of the types of trips taken (Murdock et al., 2015). Importantly, while an older population travels less than a younger population, other needs should be met while undertaking transport planning for an ageing population; road safety and accessibility are some of the major ones (Böcker, van Amen and Helbich, 2017; Shrestha et al., 2017).

The share of people aged over 64 years is estimated to more than double from 6% to 14% between 2020 and 2050 in South and Southwest Asia (Figure 3). In 2050, the regions projected to have the highest populations aged over 64 years are the Maldives (at 25%) and Bhutan (23%). However, the entire sub-region has the advantage of starting with a relatively large proportion (36%) of the population aged under 19 years in 2020. For example, 40-54% of people in Afghanistan, Pakistan and Nepal were aged under 19 years in 2020.

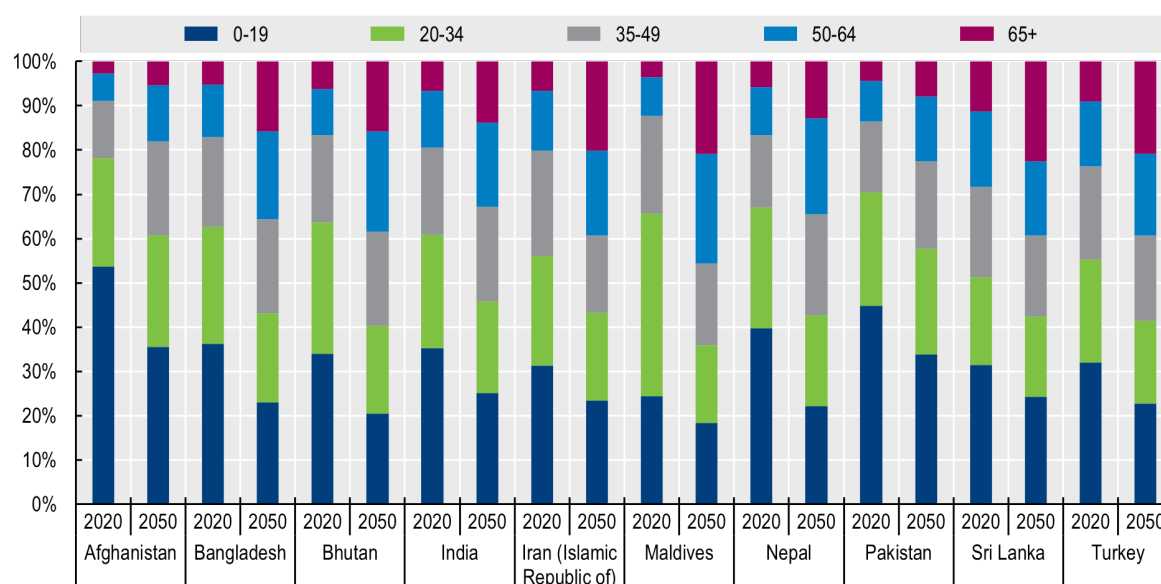
Figure 2. Population projections of South and Southwest Asia countries to 2050



Note: Data are according to the medium-variant projections.

Source: Adapted from UNDESA (2019), *Population Division World Population Prospects 2019* (database), <https://population.un.org/wpp/>.

Figure 3. National population by age (%) in South and Southwest Asia countries, 2020 and 2050

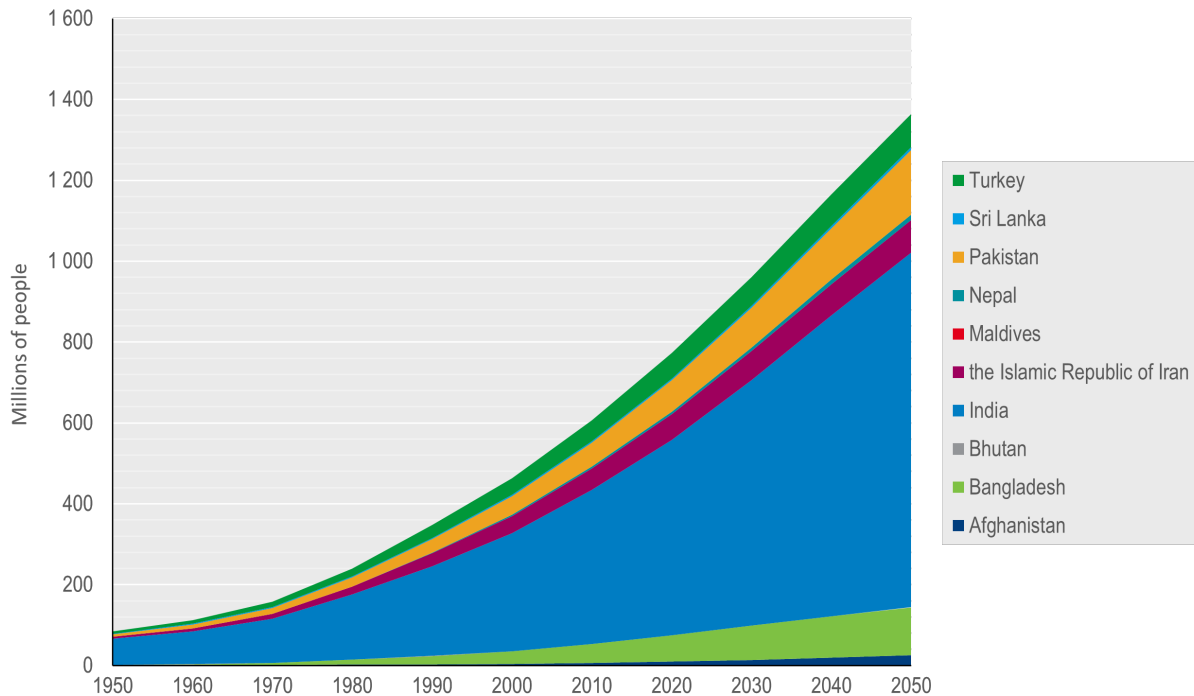


Note: Data are according to the medium-variant projections.

Source: Adapted from UNDESA (2019), *Population Division World Population Prospects 2019* (database), <https://population.un.org/wpp/>.

Of the estimated growth to 2.5 billion people by 2050, almost 1.3 billion are expected to be urban based, accounting for 55% of the total population of the sub-region (UNDESA, 2018). All ten countries in the sub-region are expected to experience a rise in their urban population, as shown in Figure 4. India's urban population, alone, will account for 13% of the total world population. Despite this, India will not have the largest relative population growth from its current numbers. Between 2020-50, the countries in the sub-region that will have the largest growth in their respective urban populations are Afghanistan (157%), Nepal (117%), and Pakistan (107%). Bangladesh follows at 82% and India at 81%. The countries with the lowest urban population growth in the sub-region will be Sri Lanka, the Maldives, Bhutan, Turkey and Iran, following that order, which expect growth rates between 27-67%, over the same period.

**Figure 4. Population living in urban areas in South and Southwest Asia countries, 1950-2050**



Source: Adapted from UNDESA (2018), *World Urbanization Prospects: The 2018 Revision* (database), <https://population.un.org/wup/>.

The tremendous rise in population and urbanisation in the coming decades will inevitably raise the demand for transport within the countries and across the sub-region. Already, the transport sector is the highest GHG emitting sector after electricity generation in the sub-region (ADB, 2013). Therefore, the transport sector will have to create policies that mitigate this further expected rise in CO<sub>2</sub> emissions. In the aftermath of the Covid-19 pandemic, policy makers are presented with an opportunity to rethink mobility, especially in cities, build back better and establish a new paradigm that would enable the transport sector to be greener, more inclusive and more resilient.

## The economic dimension: Planning for growth

South and Southwest Asia's economy was hit hard by the Covid-19 pandemic. However, it recovers as the global demand continues to rebound. Focused containment measures in the sub-region help to minimise the economic impact of the subsequent variants and waves of the pandemic (World Bank, 2021c).

Economic growth in the sub-region before Covid-19 was largely driven by Bangladesh and India. They averaged a 7% growth between 2014-19 (ADB, 2019). Countries such as Nepal and Bhutan also had high growth rates of above 6% on average. Growth rates in Sri Lanka and Pakistan were also above developing countries' average. Economic reforms and other measures to facilitate ease of doing business across most of the countries in the sub-region have helped induce foreign investment. For most of 2020, the Covid-19 pandemic disrupted life across the globe. The combination of health and economic shocks harmed the livelihoods of millions of households, disrupted business activities and highlighted existing fault lines in the sub-region. However, several countries have started to bounce back by increased trade demand from outside the region, speed-up of vaccination drives and focused safety measures.

The UNESCAP's forecasts 0.6% to 9.9% growth in real GDP for sub-region economies for the fiscal year 2021-22 (UNESCAP, 2021b). India, the largest economy in the sub-region, expects public investment to boost domestic demand and incentive schemes to strengthen manufacturing which will generate real GDP growth of 7% in the year 2021-22. Bangladesh expects even higher growth of 7.2% real GDP, as exports and private consumption continue to recoup. With a strong bounce back in the tourism sector, the real GDP in the Maldives is projected to grow by 9.9% in 2021, making it the highest expected growth in the sub-region. Sri Lanka's real GDP is projected to grow by 4.3% in 2021, with import restrictions, elevated food prices and shortages dampening the economic outlook. Growing at a lower rate is Pakistan's real GDP, at 1.5%. The return of migrant labour and investment in infrastructure projects in Bhutan projects an increase in the real GDP to 3.5%. In Nepal, the real GDP is expected to grow by 0.6%, with a slight push from the domestic vaccination drive as well as restoration of tourism and migrant worker flow.

Iran's economy bounced back moderately in 2020-21, compared to two previous years of recession. A steady recovery in global demand and Covid-19 measures contributed to stronger growth in the oil and manufacturing sectors. The UNESCAP projects real GDP growth for Iran to be 4.6% for 2021 (UNESCAP, 2021b). Turkey's economy is expected to rebound in 2021 with an estimated real GDP growth of 3.8%. The recent political situation in Afghanistan has exacerbated the existing economic challenges in the country. In the aftermath of the political crisis, the country has seen a further acceleration in inflation, which points to the depreciation of the currency and hoarding and disruptions to international trade (World Bank, 2021e). The United Nations Development Programme's (UNDP) projections for the impact on real GDP in Afghanistan, under different scenarios (varying by the intensity of the crisis), range from a 3.6% decrease to a 13.2% decrease for the year 2021 (UNDP, 2021).

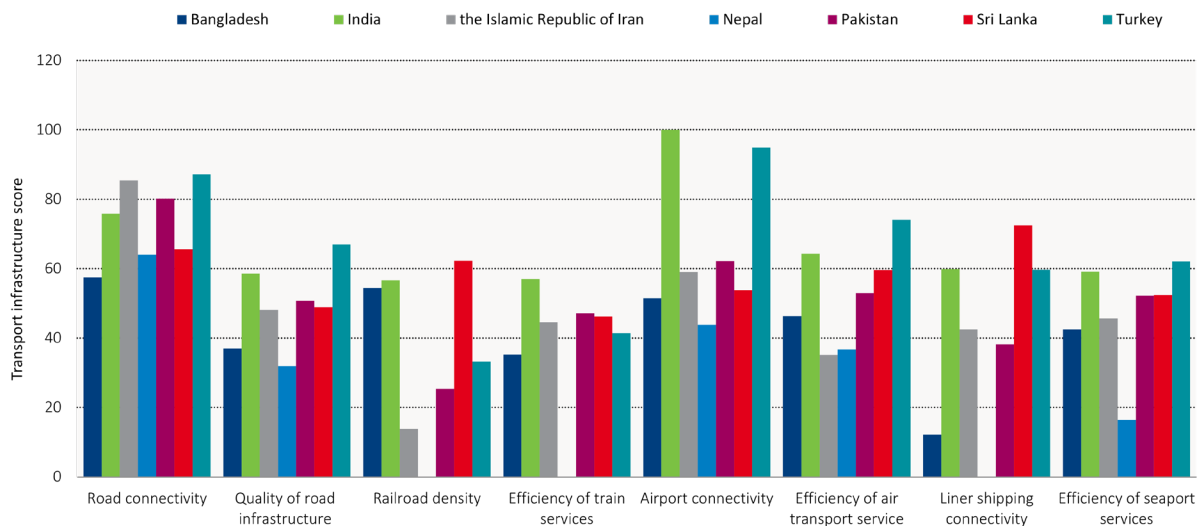
Different countries in the sub-region are expected to recover from the pandemic at different paces. The pandemic impacted people around the world, but the lower-income groups tend to be the hardest hit. Based on Gross National Income (GNI) per capita, in 2020, eight out of the ten countries in the South and Southwest Asia region were classified as lower middle-income groups in the World Bank Atlas Method (World Bank, 2020). The impact of the Covid-19 crisis in these countries would be more acute than others, especially for sectors with big informal economies, such as transport. In the aftermath of the pandemic, it is essential for countries in the sub-region to implement inclusive recovery policies in these sectors that protect workers and businesses and boost the provision of public services while ensuring that these plans are resilient to future uncertainties.

## Selected transport developments in South and Southwest Asia

Before the Covid-19 pandemic, South and Southwest Asia had been one of the fastest-growing sub-regions in the world, pushing the world's economic centre of gravity to the East. Despite this growth, the transport connectivity gaps have always been and remain a serious challenge for the sub-region to achieve more profound development. When compared with Southeast Asia, this sub-region lacks sound business environments and supply chains for high value-added products. The situation is particularly serious for the three landlocked countries in the sub-region, Afghanistan, Bhutan, and Nepal. According to UNESCAP's estimations, if trade costs in South Asia can be brought down to the levels enjoyed by the Association of Southeast Asian Nations (ASEAN) countries, intra-regional trade could increase by nearly 11%, more than three times what would accrue from the elimination of tariffs (UNESCAP, 2017). Better connectivity across the sub-region and beyond can certainly harness the sub-region's strategic location to re-emerge as the hub of Europe and Central Asia's trade with East Asia (UNESCAP, 2012).

Insufficient transport infrastructure is one of the major causes of low connectivity within the sub-region. No South and Southwest Asia country is within the top 50 among 141 countries in terms of transport infrastructure according to the World Economic Forum (WEF) global competitiveness report (WEF, 2019). Turkey (ranked 61st) and India (ranked 68th) are the two with a relatively better overall score. Three countries have a ranking beyond one hundred, Bangladesh ranks 105th, Nepal 108th, and Pakistan 110th. Meanwhile, the three countries (Afghanistan, Bhutan, and the Maldives) not included in the evaluation are also believed to have significant room for improvement. The WEF transport infrastructure score includes eight sub-indicators on road, rail, sea, and air transport infrastructure. These are road connectivity, quality of road infrastructure, railroad density, the efficiency of train services, airport connectivity, the efficiency of air transport services, liner shipping connectivity and efficiency of seaport services, for which the scores of the South and Southwest Asia countries are illustrated in Figure 5. The data for Afghanistan, Bangladesh and Bhutan are unavailable for these indicators.

Figure 5. World Economic Forum transport infrastructure scores for seven South and Southwest Asia countries



Source: Adapted from World Economic Forum (2019) *The Global Competitiveness Report 2019*.



South and Southwest Asia's major air and maritime routes are generally connected to global transport networks, prioritising the European market. In contrast, the road and railway routes between neighbouring countries are relatively underdeveloped. This absence of connectivity creates high intra-regional trade costs, undermines the benefits of geographical proximity, and poses crucial barriers for landlocked countries to participate in global supply chains. Private sectors have been active in developing and managing infrastructures for maritime shipping and aviation. However, the land-based transport infrastructures still require substantial involvement from governments and international organisations.

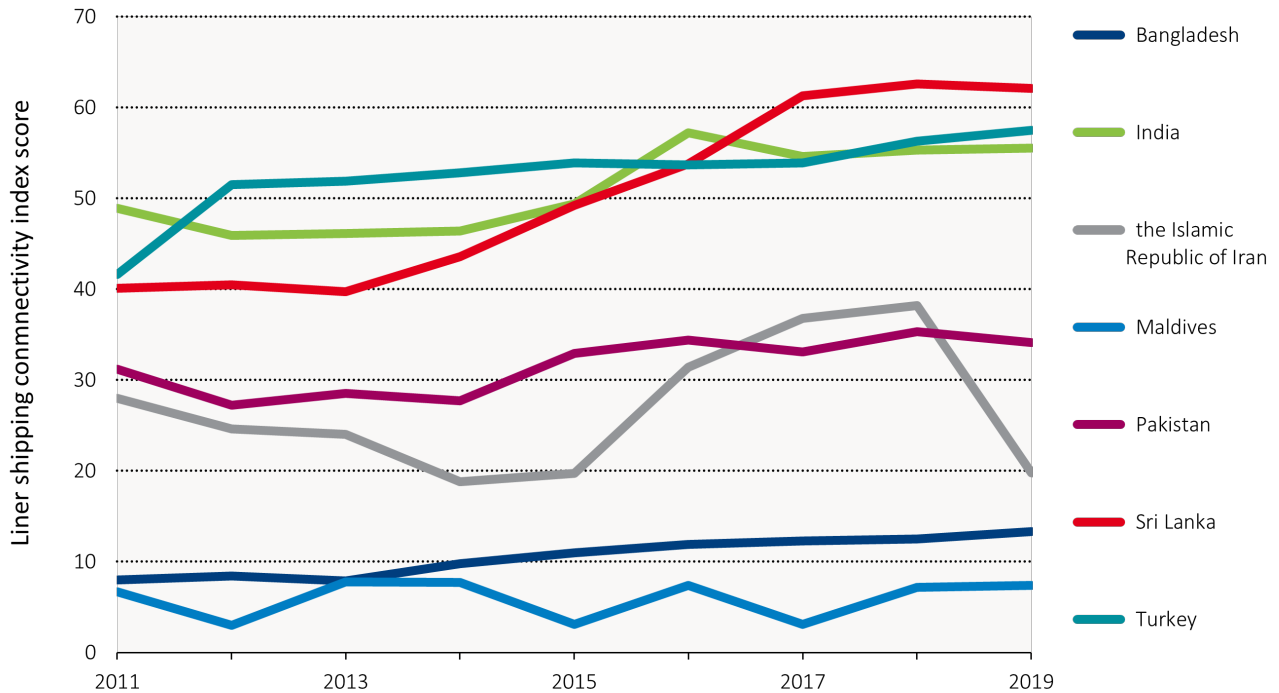
The networks of Asian Highways and Trans-Asian Railways are an advantage to road and rail connectivity in South and Southwest Asia. Network improvement measures have been included in the national transport plans of many countries in the sub-region as soon as they were announced. Among the initiatives related to the Asian Highways, the Turkey – Iran – Pakistan – India – Bangladesh – Myanmar (TIPI-BM) Road Corridor is particularly relevant to this sub-region. Given its critical coverage, it would become Asia's Southern silk highway (UNESCAP, 2018). As for the Trans-Asian Railways, the Istanbul – Tehran – Islamabad – Delhi – Kolkata – Dhaka-Yangon (ITI-DKD-Y) Container Rail Corridor opens the possibility of new cost-effective transport options. Compared with existing rail alternatives, the ITI-DKD-Y Corridor can lead to an estimated USD 1 122 cost reduction per container (twenty-foot equivalent unit), potentially halving the current costs under modest assumptions (UNESCAP, 2019c). These corridors can also vertically connect the landlocked developing countries of this sub-region as well as those in Central and North Asia. The improved connectivity will stimulate the economic activities of the lagging areas and help to re-emerge the sub-region's strategic hub role.

All coastal countries in South and Southwest Asia are now linked by direct shipping services or by transshipment through hub ports. Shipping connectivity has increased significantly in a couple of South and Southwest Asian countries. The United Nations Conference on Trade and Development (UNCTAD) Liner Shipping Connectivity Index for 2011-19 measures increases for countries such as Sri Lanka (from 40.1 to 62.1) and Turkey (from 41.6 to 51.5) (World Bank, no date). These countries act as regional hubs based on their larger shipping capacity and wider service coverage. On the other hand, the increases for other countries tend to be mild, for example, India (from 48.9 to 55.5) and Pakistan (from 31.2 to 34.1), as seen in Figure 6. Access to seaports for the landlocked countries remains challenging, given that the transit operations in the sub-region are far from seamless.

Several countries in South and Southwest Asia expanded their air transport services impressively between 2011-19. The following countries doubled their air passengers: India (from 74.0 to 167.5 million), Turkey (from 53.5 to 111.1 million), and Bangladesh (from 2.02 to 6.26 million) (World Bank, no date). These increases are mainly from investments made into new and existing airports and increased flight frequencies significantly attributed to the entry of low-cost carriers. In contrast, the number of air passengers only increased at a mild rate in other countries in the sub-region.

Air cargo operations were stable in most countries of the sub-region during 2011-19, without any substantial growth. Nonetheless, Turkey has made remarkable progress, with its air cargo volume increasing from 1 544 million tonne-kilometre to 6 815 million tonne-kilometre (World Bank, no date). This achievement was mainly due to the long-term effort of building infrastructure in Istanbul to make it a hub between Asia and Europe. Air links are particularly important for landlocked and island countries. To further develop the aviation sector in this sub-region, particularly in remote areas, the liberalisation of air services should be considered. The liberalisation of air travel as well as air freight services through the ASEAN Single Aviation Market has demonstrated the effect of open-sky policies on facilitating the flow of tourism and business.

**Figure 6. The United Nations Conference on Trade and Development Liner Shipping Connectivity Index scores for a selection of countries in South and Southwest Asia, 2011-19**



Source: Adapted from the United Nations Conference on Trade and Development (2021) UNCTAD STAT, available at: <https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=92>

In addition to the above individual transport modes, multimodal connectivity is crucial for both operational efficiency and emission reductions in the sub-region. The network of dry ports already in existence can increase the operational efficiency of the highway and railway networks, extending their reach to wider areas and facilitating their integration with the sub-region's sea ports and other transport modes (UNESCAP, 2019b). South and Southwest Asia has the greatest number of dry ports in the sub-regions of Asia. It has 73 existing dry ports and 39 listed as potential opportunities. Countries such as Afghanistan, Bhutan, Nepal, and Pakistan, as well as the inland parts of India, can greatly benefit from the enhanced connectivity through dry ports (UNESCAP, 2019b). These countries can draw on ESCAP's Intergovernmental Agreement on Dry Ports which provides a uniform definition of a dry port of international importance, identifies the network of existing and potential dry ports, and proposes guiding principles for their development and operation. As of 2019, the Agreement has 14 Parties and covers 226 dry ports.

The growing population and fast urbanisation in this sub-region have necessitated a substantial rise in mobility. For example, India's passenger transport activity grew by 122% between 2010 and 2019 (UNESCAP, 2021c). To accommodate the growing mobility needs, private vehicle ownership has continued to grow, but many countries have also launched various public transport projects, including mass transit systems in urban areas. Designing urban transport systems that are inclusive, accessible, safe, and environmentally sustainable remains a great challenge for many countries in the sub-region. Some of the factors that have contributed to this outcome include a lack of land use and transport integration, institutional fragmentation, budgetary constraints due to other urgent needs for public funds, and the existence of faster and more affordable informal paratransit operators.

Globally, the transport sector was one of the hardest hit by the Covid-19 pandemic. Despite reduced transport demand, many transport systems, such as ports and inland transshipment hubs, are facing severe traffic congestion. Lockdowns, shortage of labour, and quarantine measures have led to operational delays and a decrease in capacity and service frequency. Unfortunately, such disruptions are more severe in countries and sub-regions with weak logistic performance, such as South and Southwest Asia. Additionally, a heavy reliance on road transport for inland cross-border traffic denies the advantages of inter-modal shifts to rail systems (UNESCAP, 2021c). Creating policy priorities for resilient cargo transport is a critical issue of the post-Covid-19 new normal.

## **Strategic policy priorities at the national level**

The priorities, opportunities and challenges of South and Southwest Asian transport sectors differ greatly between countries. Many countries are landlocked, especially the least-developed countries (Afghanistan, Bhutan and Nepal). Their major trade is largely with the neighbouring country India and making transport connectivity, especially road, is one of their highest transport policy priorities.

While some countries have been focusing on enhancing the uptake of electric vehicles (EVs) and sustainability of transport infrastructure, others still have a focus on improving road connectivity in rural and remote areas. This section outlines some of the strategic policy priorities for the countries in the sub-region.

The sub-region's transport sector has continued to receive development aid from institutions such as the International Development Agency (IDA), the International Bank for Reconstruction and Development (IBRD) and the International Finance Corporation for a multitude of projects (World Bank, 2021b). The sub-region here refers to the World Bank's definition for this particular publication and includes Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka. The focus of these projects has been wide-ranging and reflects the transport priorities that countries are focusing on. Aid to Afghanistan's transport sector has focused on improving road conditions and traffic flow. Bhutan and the Maldives have both received some IDA financing which targets green development. Bangladesh and Nepal have received IDA and IBRD aid for the expansion and improvement of road networks to enhance transport connectivity. For Pakistan, the aid received focuses on improvements in port operations, and for Sri Lanka, a significant portion has been targeted at sustainable transport infrastructure. India has become increasingly prominent in the International Finance Corporation's (IFCs) investment portfolio, with projects supporting integrated transport systems. These aid projects indicate the main priorities of the countries in the sub-region, where enhanced transport connectivity, improved road networks, sustainable transport infrastructure are some of the common goals.

## **Moving towards sustainable transport systems**

Countries in the South and Southwest Asia sub-region have been scaling-up their ambitions and actions to combat climate change in the last few years. Globally, reducing the CO<sub>2</sub> emissions from the transport sector has been one of the focus areas of these ambitions. A push to electrify transport, which is one of the main end-use sectors of energy, is a common goal across some of the countries. The following section enumerates some of these plans in detail.

Bangladesh's national development plans have a specialised focus on the transport sector. Its Seventh Five-Year Plan from 2016-20 targeted the continued development of the transport sector, recognising that it has an important role in connecting people and firms to markets and to social opportunities (ADB,

2020b). In its first Nationally Determined Contribution (NDC), Bangladesh pledged to reduce GHG emissions from the power, transport and industry sectors by 5% by 2030 in comparison to a national business as usual scenario (Climate Analytics, 2019a). In 2021, Bangladesh updated the NDCs, separating the three sectors and proposing a 12% GHG emission reduction by 2030 as the unconditional contribution from the transport sector. Furthermore, transport sector priorities in the National Sustainable Development Strategy 2010-21 include expansion and renewal of the railway network, maintenance of the existing road infrastructure, and the development of rural transport infrastructure by integrating road and inland water transport and improving channel and waterway conditions (Dietrich, 2020). The Strategic Transport Plan (STP) for Dhaka focusing on developing mass transportation will provide affordable, inclusive, safe transport modes for mobility. The construction of five Mass Rapid Transit (MRT) lines and one Bus Rapid Transit (BRT) line is in progress.

Bhutan is prioritising the development of a safe, affordable, efficient, sustainable, and inclusive transport system in its 12th Five Year Plan and beyond. The government pledged to remain carbon neutral at the 15th Conference of Parties (COP) to the UNFCCC, which was reiterated through its Intended NDC submitted in September 2015. Bhutan also adopted the Bali Declaration on Vision Three Zeros — Zero Congestion, Zero Pollution, and Zero Accidents towards Next Generation Transport Systems in Asia in April 2013 during the Seventh Regional Environmentally Sustainable Transport Forum in Asia. The government aims for approximately 300 internal combustion engine taxis to be replaced by electric taxis and a network of charging stations to be established in all 20 districts of the country by the end of 2022. The government has continued investment in urban transport systems and introduced a BRT system in Thimphu and other major urban centres. The government is working on a comprehensive National Surface Transport Policy to flag the emerging priorities for the transport sector while addressing climate change.

India announced at the UNFCCC COP26 that it will achieve net-zero carbon emissions by 2070 and will reduce the total projected carbon emissions by one billion tonnes between 2021 and 2030. Additionally, the carbon intensity of the economy would be reduced to less than 45% by 2030. India's policies that aim to decarbonise the transport sector can be broadly categorised into three groups: travel demand and modal choice management, energy efficiency, and diversification towards low-carbon energy vectors.

India's NDC includes measures that are directly related to travel demand and modal choice management, aiming to foster economic competitiveness and the relevance of energy-efficient modes, such as public transport, rail and waterborne transport (MOEFCC, 2016). Indian Railways aims to become the largest green railway in the world and is moving towards becoming a net-zero carbon emitter by 2030. Indian Railways' Dedicated Freight Corridors are being developed as a low-carbon green transportation network under a long-term low carbon roadmap.

Several policies and programmes in the country focus on enhancing the energy efficiency of transport systems, including pushing for EV uptake and transitioning to low-carbon electricity (especially for light vehicles and passenger cars), and more recently, other low carbon transport fuels (ITF, 2021a). Notably, the Ministry of Road Transport and Highways of India has formulated the Vehicle Scrappage Policy to enable the phasing out of old polluting vehicles and their replacement with fuel efficient, environment-friendly, new generation vehicles. The government has formulated standards that match global standards, to better enable manufacturing and adoption of EVs. Furthermore, the National Policy on Biofuels (2018) aims to increase the usage of biofuels in the transportation sectors in the country.

The Maldives has a net-zero emissions target by 2030, one of the most ambitious targets for an island nation. For the transport sector, it has planned to implement a zero-emission inter-city public transport system comprised of EVs. The government will also strengthen the legal framework governing the

maritime sector to ensure international standards on quality, safety, compliance and protection of the natural environment.

Nepal, smaller than most countries in the sub-region, and landlocked, is considering import substitution, energy security and reliability of energy supply (UKAid, 2020). This provides an opportunity for promoting low-carbon solutions in the transport sector. Nepal is committed to the United Nation's 2030 Agenda for Sustainable Development and has mainstreamed Sustainable Development Goals (SDGs) in national policies and plans. It aims to reduce GHG emissions from the transport sector by 28% by 2030, as reflected in the updated NDCs to the Paris Agreement.

Nepal's National Sustainable Transport Strategy runs to 2040 and aims to develop a transport system that is efficient, accessible, affordable, reliable, safe, inclusive, environmentally friendly, and climate and disaster-resilient (UNCRD, 2015). The strategy promotes a shift to the "avoid, shift and improve approach", which discourages unnecessary travel and supports reduced trip distances. Broadly, it encourages a shift towards more sustainable transport modes, especially within the public transport system, and encourages the adoption of cleaner technologies to support the goal.

#### **Box 1. Decarbonising Transport in Emerging Economies and the Nationally Determined Contribution Transport Initiative for Asia**

The ITF's Decarbonising Transport in India stream of work includes two projects, namely, Decarbonising Transport in Emerging Economies (DTEE) project and the Nationally Determined Contribution Transport Initiative for Asia (NDC-TIA) project.

The DTEE project helps the government of India to identify ways to reduce their transport CO<sub>2</sub> emissions and meet their climate goals, <https://www.itf-oecd.org/dtee-india>. The project supports transport decarbonisation in Argentina, Azerbaijan, India, and Morocco through the development and the provision of a framework allowing the quantitative assessment of transport mitigation actions while also facilitating policy dialogue across all relevant stakeholders. The ITF is developing a life cycle assessment (LCA) tool that will help India to implement ambitious CO<sub>2</sub> reduction initiatives for its transport sector. The project also includes capacity building activities such as training and stakeholder workshops, ensuring that partner institutions can work increasingly independently when revising nationally determined contribution (NDC) commitments in the five-year review cycle.

The NDC Transport Initiative for Asia (NDC-TIA) supports the People's Republic of China, India and Viet Nam to define policies that may enable them to meet the objectives of their NDCs, <https://www.itf-oecd.org/ndc-transport-initiative-asia>. The focus is to increase capacity to take mitigative action against GHG emissions in the transport sector. In particular, the ITF involvement in the NDC-TIA India project will leverage the LCA developed in the DTEE India project to help local research and academic institutions support the government in the definition of GHG emission mitigation policies in transport.

The DTEE and the NDC-TIA projects are funded by the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). As such, the authors would like to thank BMU for supporting this project.

The Nepalese government has reduced import taxes for EVs and plans to have up to 90% of all private passenger vehicles electric by 2030. The government is also procuring 200 electric buses to operate in Kathmandu and the Nepal Electric Authority is developing 500 charging stations in Kathmandu and already planning to install some beyond the capital. The private sector is already operating a fleet of electric buses and minibuses in Kathmandu and has installed 80 fast and slow charging stations and plans to expand service to other cities.

Pakistan, in recent years, has focused on air pollutant emission reduction and improved air quality as well as developing climate resilient infrastructure. The National Climate Change Policy (2012) addresses the impact of climate change by promoting the development and adoption of environmentally friendly transport technologies and fuels, as well as other carbon reduction strategies (Government of Pakistan, 2012). The National Transport Policy of Pakistan (2018) guides the overall development of the transport sector with the vision to provide safe, affordable, efficient, durable and environmentally friendly means of transport (Government of Pakistan, 2018). Several other plans and programmes have been put in place to achieve the sustainable mobility targets of the country. The Green Line bus service programme, comprised of 80 hybrid buses, started in Karachi in January 2022 and there are plans to revive the Karachi circular railway as well. The government has developed the National Electric Vehicle Policy with targets and incentives aimed at seeing EVs capture 30% of all the passenger vehicle and heavy-duty truck sales by 2030 and 90% by 2040. It sets even more ambitious goals for two- and three-wheelers and buses; 50% of new sales by 2030 and 90% by 2040 (Uddin, 2020).

In Sri Lanka, much like the other countries in the sub-region, roads act as the backbone of the country's passenger transport sector. The transport Nationally Appropriate Mitigation Action (NAMA) programme for Sri Lanka focuses on the introduction and adoption of electric buses instead of conventionally fuelled buses in the planned BRT system in the Colombo Metropolitan Area (UNDP, 2016). This would help the country address the objectives of reducing GHG emissions and achieving its SDGs, such as increased energy security, improved access to transport, improved air quality and local job creation.

The NAMA is also aligned with the country's national and regional objectives of promotion and adoption of EVs. This commitment is mentioned in numerous policy documents, including the country's Intended NDC to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat, as well as its National Transport Policy and Urban Transport Master Plan. Initial steps have been taken towards e-mobility through a feasibility study on Developing Green and Smart Urban Transport System in Colombo city. In 2021, Sri Lanka's State Minister for Renewable Energy also announced plans to produce 70% of the electricity from renewable energy by 2030.

Like several other countries in the sub-region, Turkey is highly dependent on fossil imports and its energy demand is set to increase in the future. Turkey has taken steps towards decarbonising both the road and rail passenger transport sector. For example, Turkish climate policy includes the objective of developing and promoting alternative fuels and clean vehicle technologies and also aims at manufacturing its own EVs by 2022 (Climate Analytics, 2019b). In accordance with the UN SDGs, Turkey is developing policies and strategies for providing innovative, sustainable, smart, and integrated mobility that focuses on accessibility and is inclusive for all segments of society. Turkey has instituted plans focused on emissions standards, biofuel targets, encouraging modal share shift, e-mobility and taxation on fuels to advance towards its sustainability targets for the transport sector.

Air pollution, particularly in cities, is becoming an increasingly alarming issue in the sub-region, with 46 Indian cities, 6 Pakistani cities and 4 Bangladeshi cities appearing in the 100 most polluted cities in the world in 2020, according to the concentration of PM<sub>2.5</sub> (IQAir, 2020). In India, 1.67 million deaths were

attributable to air pollution in 2019, accounting for 17.8% of the total deaths in the country (Pandey et al., 2021). The sub-region must co-operate and co-ordinate regionally to manage this crisis.

## Enhancing sustainable transport connectivity

The South and Southwest Asia sub-region has increasingly recognised the relationship between good regional transport connectivity and market competitiveness. Enhancing regional transport connectivity not only helps the efficient movement of goods and people but also improves the connectivity between markets, hence, reducing costs and boosting trade across the sub-region. Transport corridors are increasingly seen to stimulate regional integration as well as economic growth. The interaction of improved trade, enhanced connectivity, and converging regulations can accelerate growth and can benefit the slower-growing and landlocked countries in the region (Ahmed, Kelegama and Ghani, 2010).

Countries in the sub-region have been working towards enhanced national connectivity, especially since the Covid-19 pandemic. For example, Bangladesh has been focusing on enhancing connectivity through the physical alignment of the Asian Highway Route, and through implementing the South Asia sub-regional Economic Cooperation (SASEC) Corridor projects in the country to improve international and regional transport and logistics network.

The Maldives, an island state, is focussing on increasing the connectivity of the administrative islands and improving the mobility of individuals, goods and services. The Maldives' Flight Plan 2020-25 is the first long-term aviation policy that addresses the necessity of connectivity developments within and internationally for the Maldives through safe and economically sustainable aviation practices. In Nepal, a landlocked country, the government wants to provide road access to all district headquarters and improve national and international transport connectivity; North-South corridors and links from the Southern border (India) to the Northern border (China) are also the government's priority. The government of Turkey is starting to plan new standards for resilient global supply chains based on lessons learned from the global pandemic.

The national transport agendas and plans by the countries in the sub-region have been giving greater importance to regional transport connectivity as well as global linkages in the recent past. Investment in rail, road and inland waterways are all viable ways of enhancing connectivity. There are several national, bilateral and multilateral projects in the sub-region that support this aim of enhancing regional connectivity. Some of these most recent ones are listed below.

**Table 1. Regional connectivity projects in South and Southwest Asia**

Project	Goal
The Nepal-India Regional Trade and Transport Project (2013-21) by the World Bank	Decreasing transport time and logistics costs for bilateral trade between Nepal and India and also transport trade along the Kathmandu-Kolkata corridor. Traders would benefit from reduced infrastructure bottlenecks in Nepal and the adoption of modern approaches to border management (World Bank, 2021a).
The Transport Connectivity Improvement Preparatory Facility Project (2020-24) in Bangladesh, funded by the Asian Development Bank	Supporting the improvement of transport connectivity and facilitation of multimodal transport in the country and in South Asia (ADB, 2020a).

Project	Goal
The Khyber Pass Economic Corridor Project (2018-26) by the World Bank	Enhancing economic activity between Pakistan and Afghanistan by improving regional connectivity, including the development of the Peshawar – Kabul – Dushanbe Expressway (World Bank, 2021d).
The Islamabad-Tehran-Istanbul Road Transport Corridor Project (2011-21), agreed at the 8 <sup>th</sup> ECO Ministers of Transport and Communications meeting in Turkmenistan in 2011	Moving goods across multiple international borders, saving time and costs for transport operators and customs authorities while ensuring safety and reliability (Global Trailer, 2021).
The Trans-Caspian East-West-Middle Corridor	A priority in Turkey's infrastructure investment aiming to provide high-quality intermodal transport and logistics services, harmonise cross-border rates, and automate cargo transport services along the corridor. It starts from Southeast Asia and China runs through Kazakhstan, the Caspian Sea, Azerbaijan, Georgia and further to European countries.
The Bangladesh, Bhutan, India (BBIN) Motor Vehicle Agreement and the India, Myanmar, Thailand (IMT) Trilateral Highway agreement	Improving the regional transport connectivity via road within neighbouring countries.

The sub-region also hosts numerous regional co-operation programmes and organisations. Some of these are the South Asian Association for Regional Cooperation (SAARC), South Asia Sub-regional Economic Cooperation (SASEC) and the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC).

SAARC is a regional intergovernmental organisation with member states including Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan and Sri Lanka. It is dedicated to improving the welfare of the people of South Asia through economic growth, social progress and cultural development. The SAARC Development Fund finances regional opportunities via three categories: socially, economically, and through infrastructure. It has highlighted the importance of developing transport infrastructure and transit facilities, especially for landlocked countries, as a means to promote intra-SAARC trade.

SASEC unites Bangladesh, Bhutan, India, the Maldives, Myanmar, Nepal, and Sri Lanka in a project-based partnership to promote regional prosperity by improving cross-border connectivity, facilitating faster and less costly trade among member countries, and strengthening regional economic co-operation. Under the SASEC transport programme, regional connectivity improvements aim to increase sub-regional trade and improve the competitiveness of local industries, particularly for Bhutan and Nepal, which are landlocked, as the deficiency of the cross-border infrastructure network results in high transport costs and impedes regional integration and trade with indirect neighbours.

BIMSTEC is a regional organisation comprising seven member states, Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka, and Thailand. It focuses on sharing regional resources and geographical advantages to accelerate growth within these countries. Connectivity has been one of the main areas of co-operation in the BIMSTEC since its established in 1997. It has always emphasised an importance for regional co-operation and integration to accelerate economic growth and social development.



### Box 2. Supporting regional co-operation on sustainable freight in Asia Pacific

The United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) is working on a regional strategy to deepen sustainability in freight transport and give further momentum and coherence to initiatives being undertaken at the region-wide level for Asia-Pacific. The outline of the proposed strategy addresses common challenges and offers a guiding vision, objectives, linkages to SDGs directly supported, enablers, priority areas and implementation arrangements. This policy document could bring a range of stakeholders onto a common platform to plan and implement sustainable freight-transport policies that contribute to achieving SDGs in the decade of action for sustainable development.

#### Regional strategy to deepen sustainable freight transport in Asia and the Pacific

Guiding vision	Efficient, connected, safe and clean regional freight transport system to support the realisation of Sustainable Development Goals (SDGs)
Objectives	Providing coherence to the sustainable freight initiatives Creating synergies through partnerships Ensuring high-level political affirmation Sharpening the links between freight transport policies and SDGs
SDGs supported directly	SDG Targets 9.1, 9.a, 3.6, 12.3, 9.4, 7.3, 13.1
Enablers or cross-cutting issues	Strengthening governance for sustainable freight transport at a national level Enhancing co-ordination for sustainable freight transport at sub-regional level Building the capacity of transport officials Promoting use of digital transport technologies Encouraging private sector engagement for sustainable freight transport policies Diversifying sources of financing for sustainable freight transport
Priority areas	Decarbonising freight transport Building resilience of freight transport to effectively deal with climate challenges and pandemics Strengthening cross-border and transit-transport connectivity Enhancing rural freight transport linkages Improving urban freight logistics Reducing freight-transport-related accidents Increasing share of rail freight and other sustainable transport modes
Implementing arrangements	Establishing a sustainable freight co-ordinating platform Developing a sub-regional action plan on sustainable freight transport Monitoring and evaluating through a results framework

Source: ITF (2022).

Lack of transport connectivity and poor infrastructure in the sub-region have resulted in high costs of trade transactions and low volumes of intra-regional trade. Increased regional connectivity leads to increased trade within the region. Short-distance trade between partners means that supply chains are also shorter, leading to fewer emissions from trade. Growth in regional trade is therefore also aligned with the objective of meeting sustainability targets. To this end, the regional co-operation agreements and organisations, like the ones mentioned above, play an important role in facilitating enhanced trade within the region through improved regional connectivity.

A recent step towards regional connectivity that also promotes sustainable transport in Asia and the Pacific is the new Regional Action Programme (RAP) for 2022 to 2026 (UNESCAP 2021d). Adopted by ESCAP Member Countries in December 2021, it advises concerted actions to address rising freight and passenger volumes and rapid urbanisation with high motorisation rates, and encourages accelerated use of digital technologies, deployment of smart transport systems and transitioning towards more inclusive and low-carbon transport systems.

There is a lack of sufficient and cost-effective cross-border transport alternatives within the South and Southwest Asia sub-region. Some examples are several different technical standards to be adhered to, inconsistent and complex border-crossing procedures and excessive documentation. To facilitate multimodal transport across the region, countries should work on removing these barriers and harmonising procedures, standards and regulations. Unilateral measures usually have a limited impact on transport facilitation since gains on one side of the border may be lost on the other. Regional co-operation is therefore essential.

## **The trade dimension: Measuring connectivity gaps**

A large part of South and Southwest Asia is connected through integrated road and rail networks. It is part of the regional land transport network, as formalised by the intergovernmental Agreements on the Asian Highway Network, the Trans-Asian Railway Network and Dry Ports.

Despite efforts made to enhance connectivity in the region and the existence of bilateral and multilateral free trade agreements, South Asia remains one of the least economically connected regions in the world (Sinha and Sareen, 2020). Several factors have led to this outcome, some of which include protectionist policies, high logistics cost, lack of political will and a broader trust deficit. Sinha and Sareen (2020) estimate that intra-regional trade in South Asia accounts for about 6% of total global trade, whereas in East Asia and the Pacific it accounts for almost 50% and its 22% in Sub-Saharan Africa (Kathuria, 2018).

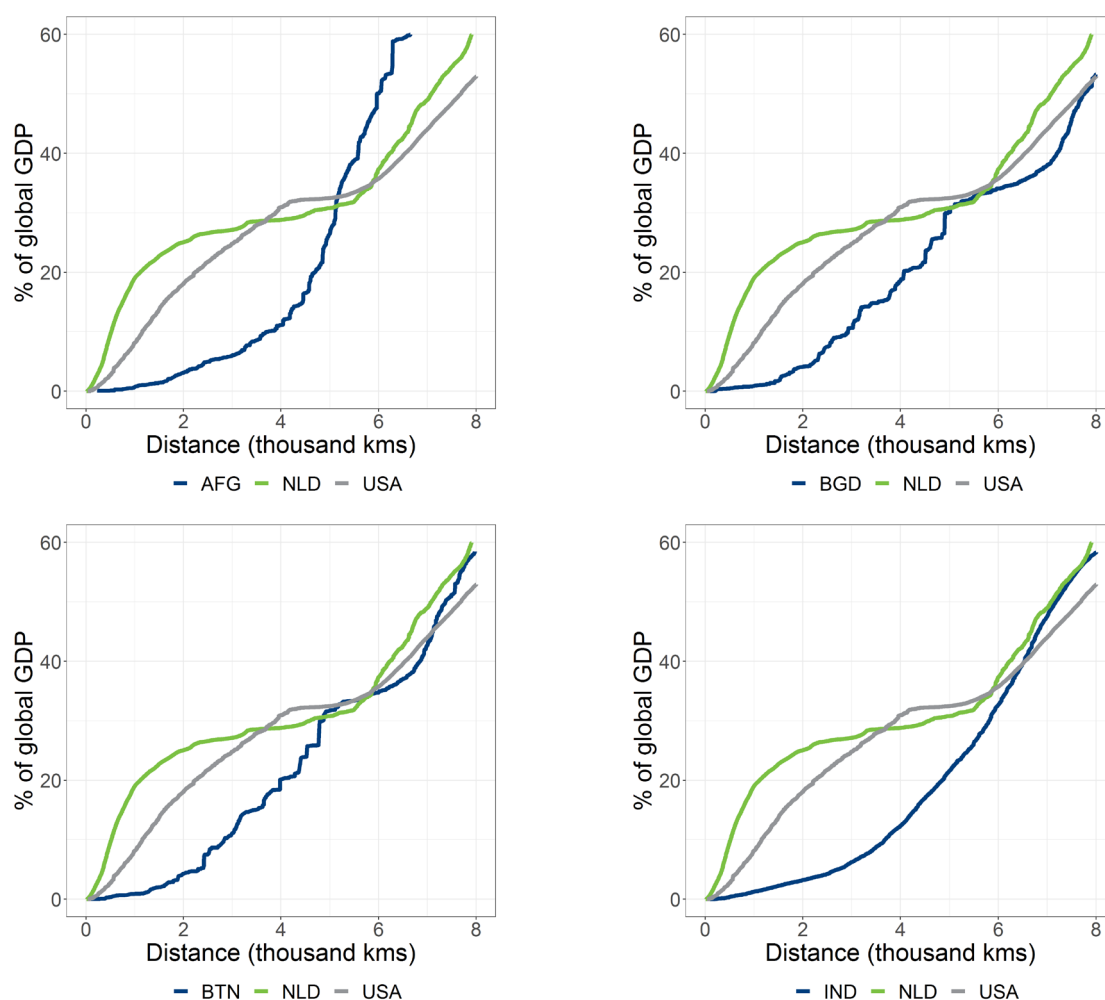
There is a connectivity gap between countries in the South and Southwest Asia sub-region and the developed economies in the rest of the world. Overall, the connectivity (measured in terms of access to global GDP) is half of, or less-than-half of that of most developed economies. This is driven by a multitude of factors. The landlocked countries of Afghanistan, Nepal and Bhutan have an added disadvantage of lack of access to markets through effective and low-cost maritime connections. Other factors that have an impact on connectivity include the physical distance, lack of infrastructure and operational connectivity, and more broadly on the availability of trade corridors and transit systems (ITF, 2019; UNESCAP, 2019b).

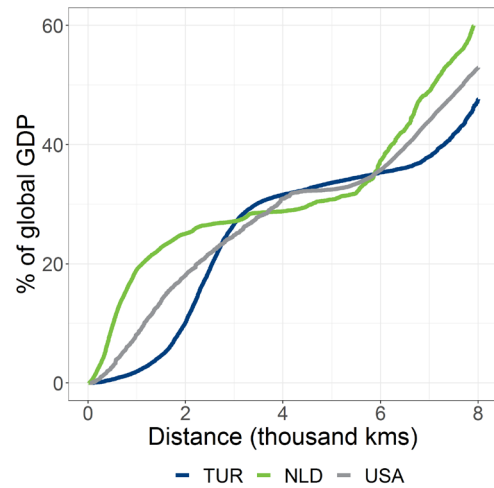
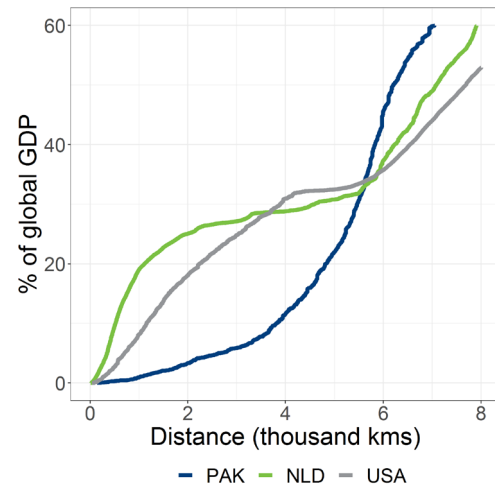
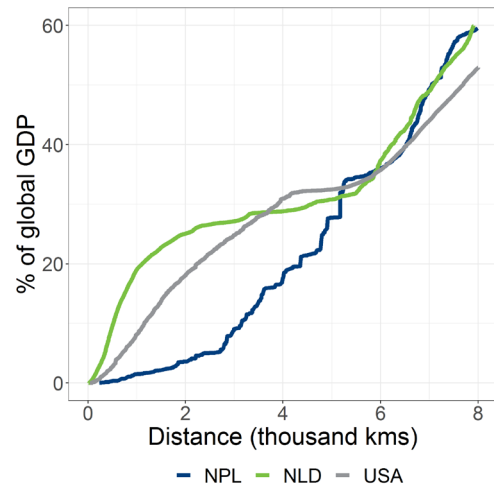
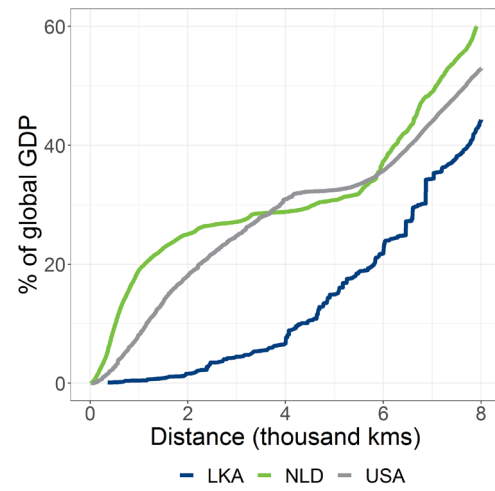
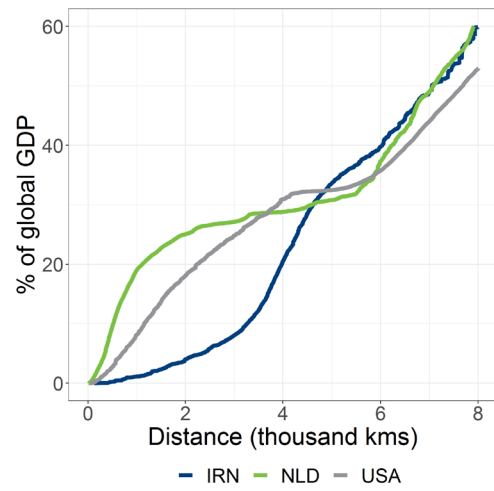
Figure 7 shows the impact of distances on reaching global centres of production and consumption for the countries in South and Southwest Asia. The Maldives is not included in this analysis due to the lack of data for this particular study. The comparison for each is made to the Netherlands since it is currently estimated to be the best performer for the connectivity indicator in the world. The United States is included as an example of a large, developed economy with significant international trade. A manufacturer in the

Netherlands can reach 20% of the global GDP within a 1 000 km distance and the United States can reach the same percentage within 2 000 kilometres. For a Bangladeshi manufacturer, the average distance for the same 20% is over 4 000 kilometres. This distance is already a major obstacle to trade. As shown in the figure below, all the countries in the South and Southwest Asia sub-region have half, or less-than-half the connectivity observed in the Netherlands and the United States. Turkey is an exception where 20% of the global GDP can be reached within almost the same distance as the United States.

Box 3 explains an indicator that can be used to estimate the connectivity of one country relative to another. The connectivity gap of countries in the sub-region is almost 50% that of the Netherlands (Figure 8). This adversely impacts the ability of the countries to integrate into global value chains (ITF, 2019).

**Figure 7. Impact of distances on reaching global centres of production and consumption for South and Southwest Asia countries**

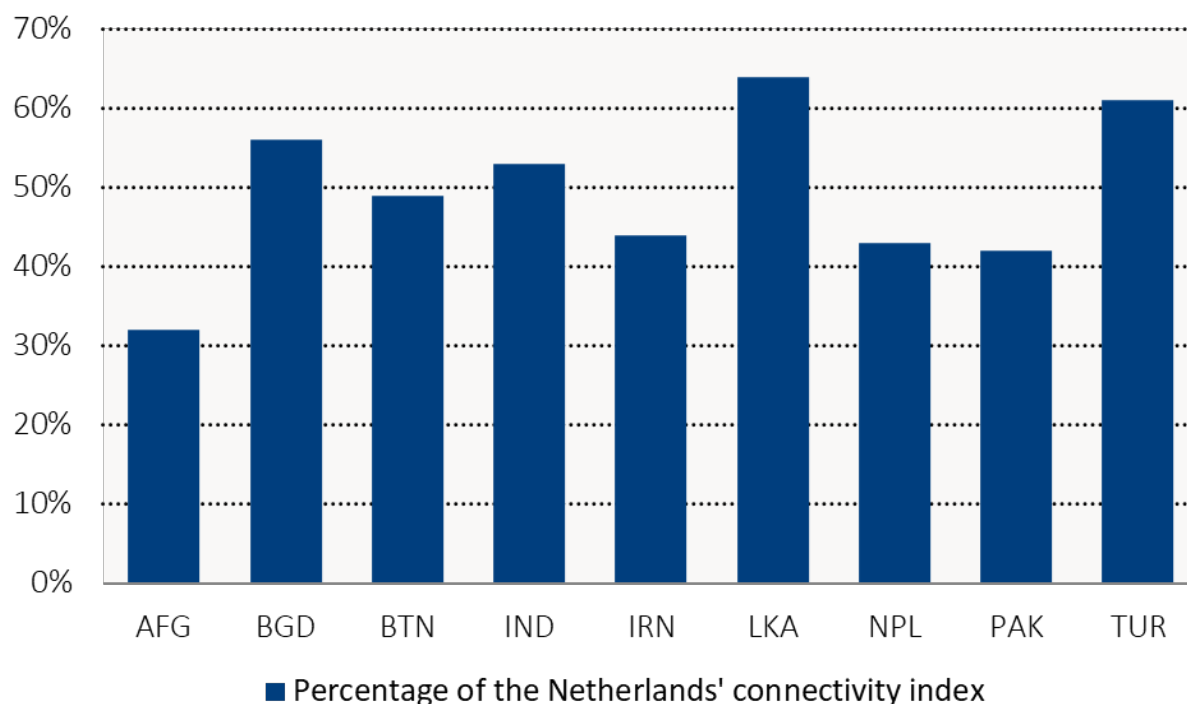




Planning for transport logistics involves many different stakeholders, complex procedures, and co-ordination between the public and private sectors. Transport and connectivity policies should focus on reducing the logistical barriers and harmonising procedures, thus making up for the countries in the South and Southwest Asia sub-region being far from global economic centres. To reduce the connectivity gap, countries need to focus not only on transport costs but also on reducing border crossing times and their variability. This is important because increased border crossing times and delays at the border also increase the logistics costs.

Historically, the sub-region has high total costs of trade, which is due to lower productivity, high energy costs, transportation costs, specific duties, tariffs, and customs duties (ADB, 2009). The trade costs of sub-regional countries are among the highest in the world, with intra-regional trade costs much more than double that of neighbouring East and Southeast Asia regions (UNESCAP, 2019a). Improvements in cross-border infrastructure, especially through road and rail links, are key to enhancing connectivity in the region. Improved infrastructure will lead to greater connectivity which would, in turn, strengthen production networks in the sub-region.

**Figure 8. Connectivity gap for South and Southwest Asia countries compared with the Netherlands**



Note: AFG = Afghanistan; BGD = Bangladesh; BTN = Bhutan; IND = India; IRN = Islamic Republic of Iran; LKA = Sri Lanka; NPL = Nepal; PAK = Pakistan; TUR = Turkey

Several initiatives in the last few years have already been implemented, including the upgrading of land customs stations to Integrated Check Posts (ICPs) in India, the extension of rail networks such as the Agartala – Akhaura railway link (Bangladesh) and the Jogbani – Biratnagar railway line (Nepal), the establishment of the second border check-post between India and Myanmar (Zokhawthar – Rikhawdar). Such improvements in cross-border infrastructure are essential to enhance connectivity in this sub-region.

### Box 3. Measuring the connectivity gap between countries

The methodological approach for measuring connectivity in this report is a gravity-based model which measures how many opportunities (defined as GDP) can be reached from each country relative to other countries. The explanatory components are calculated for road, rail and maritime transport modes and include distance, transport cost (including border crossing and handling cost), travel time (speed) and border crossing time.

The following formula represents the indicator structure:

$$I = \sum_{c \text{ in countries}} \frac{GDP_c}{(g_c/\beta)^\alpha}$$

where  $g$  is the generalised cost, including all the explanatory factors;  $\alpha$  is the elasticity of the index to the generalised cost and is set to equal 0.4 (a commonly used value for trade patterns elasticities);  $\beta$  is arbitrarily set so that the ratio  $g_c/\beta$  is always below one and close to 1 for adjacent countries.

The index measures the “economic space” available to trade by country, given the explanatory factors.

Source: extract from ITF (2019), “Enhancing Connectivity and Freight in Central Asia”, International Transport Forum Policy Papers, No. 71, OECD Publishing, Paris., p.45

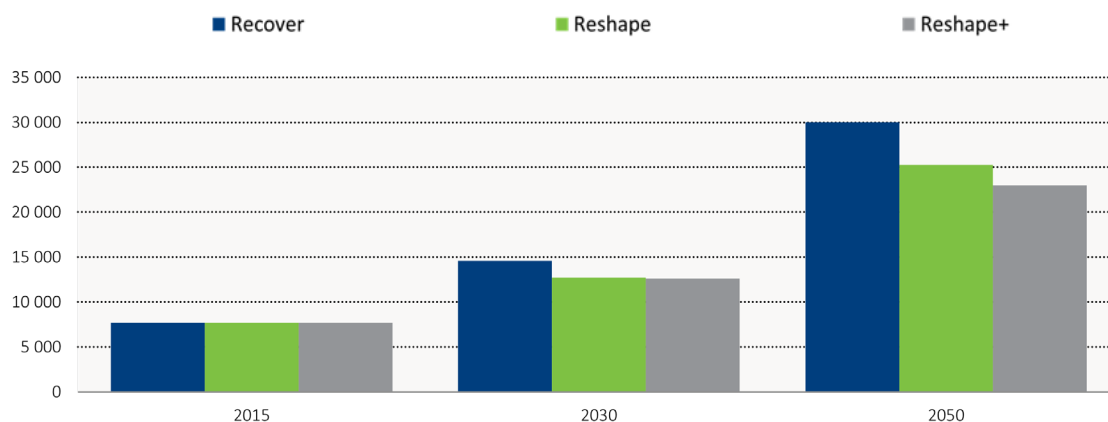
## Freight transport: Managing the tripling of demand

The freight transport sector is crucial in the development of a sustainable transport system and reducing transport emissions from the sector. The sector is also an important facilitator of regional trade among the countries in the South and Southwest Asia sub-region and beyond. Freight transport in the sub-region was responsible for 45% of total transport CO<sub>2</sub> emissions in 2015. Even with the most ambitious set of mitigation policies, the demand for freight transport is projected to almost triple by 2050. Robust and rapid action is required to limit the associated emissions from the sector.

Freight currently accounts for about 45% of total transport emissions in the sub-region and will still be responsible for 40% of emissions by 2050, under current policies. However, ambitious policies can lead to a 23% decrease in the demand for freight transport by 2050, compared to the current trajectory, as shown in Figure 9. For example, new measures implemented under the *Reshape* scenario which would issue a shift in current policy paradigm would mean that emissions from freight transport could be 62% less by 2050 than in *Recover* (business-as-usual) scenario by that same time, and 27% less than they were in 2015. The reductions in a *Reshape+* scenario which would not only reinforce and reshape current policy but also leverage on lessons learned from the Covid-19 pandemic are even greater. They would be 73% below where *Recover* will take things by 2050 and be 48% less than they were in 2015.

Freight transport and trade are highly interrelated. After a brief slump in trade supply and demand due to the Covid-19 pandemic, the trade volumes quickly bounced back to pre-pandemic levels and continue to rise in South and Southwest Asia. This is also reflected in the demand for freight transport increasing sharply in the coming years, especially under the *Recover* scenario. South Asia is expected to grow by 7.1% in 2021-22 (World Bank, 2021c). At the same time, South Asia remains the region that is unable to realise its full potential for trade. The intra-regional trade constitutes less than 5% of the total trade among South Asian countries. Despite liberalisation in tariffs by South Asian countries, average tariffs in the region remain high. Several efforts have been made to promote intra-regional trade by countries in the sub-region and to overcome such barriers to trade, especially in the aftermath of the Covid-19 pandemic. Increased trade regionalisation, when combined with the measures under the *Reshape+* scenario, can lead to slower growth in freight activity in the region.

Figure 9. Freight activity for surface, domestic air and sea movements in South and Southwest to 2050



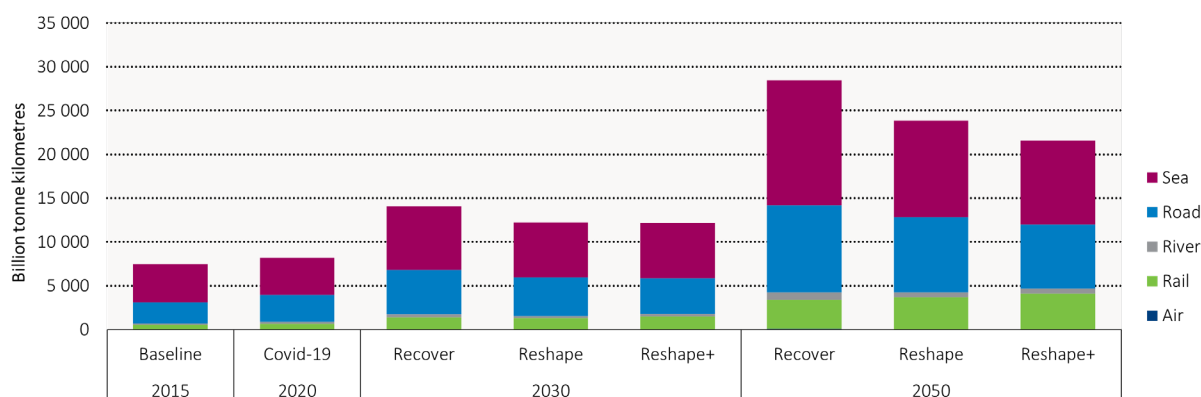
Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+* refer to the three scenarios modelled, which represent increasingly ambitious post-pandemic policies to decarbonise transport.

## Non-urban freight transport: Encouraging the sustainable movement of goods

Non-urban freight transport accounted for 97% activity in the South and Southwest Asia sub-region's freight sector in 2015. Under the current trajectory (*Recover*), the total demand for non-urban freight transport increases by almost a factor of 4 between 2015 and 2050, as shown in Figure 10. The same total increase comes to 3.1 times for the *Reshape* and 2.8 times for the *Reshape+* scenarios. As in most economies, maritime transport plays a central role as an international trade enabler for South and Southwest Asia due to the long distances required for the international movement of goods and accounts for substantial tonne-kilometres. It remains the mode that accounts for the largest share under non-urban freight throughout all the scenarios, followed by road and then rail transport.

Comparing *Reshape+* to *Recover* in 2050, the total demand for air, sea, inland and road transport decreases while the demand for rail transport increases. With 7% of non-urban freight activity in 2015, rail as a mode will capture 12% in *Recover*, 15% in *Reshape* and 19% *Reshape+* by 2050. This is reflective of the policy actions that the sub-region takes in the coming decades, with an emphasis on development as well as the improvement of rail infrastructure and the introduction of carbon taxation. However, even with this growth in the share of rail transport for non-urban freight, sea freight will continue to remain the dominant mode of surface transport in all three scenarios for most countries the sub-region. The share of air freight activity, measured in tonne-kilometres, remains constant in the sub-region at less than 1% throughout all the scenarios.

Figure 10. Non-urban freight demand by mode and scenario for South and Southwest Asia to 2050



Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+*, which refer to the three scenarios modelled, which represent increasingly ambitious post-pandemic policies to decarbonise transport.

## Emissions projections for non-urban freight

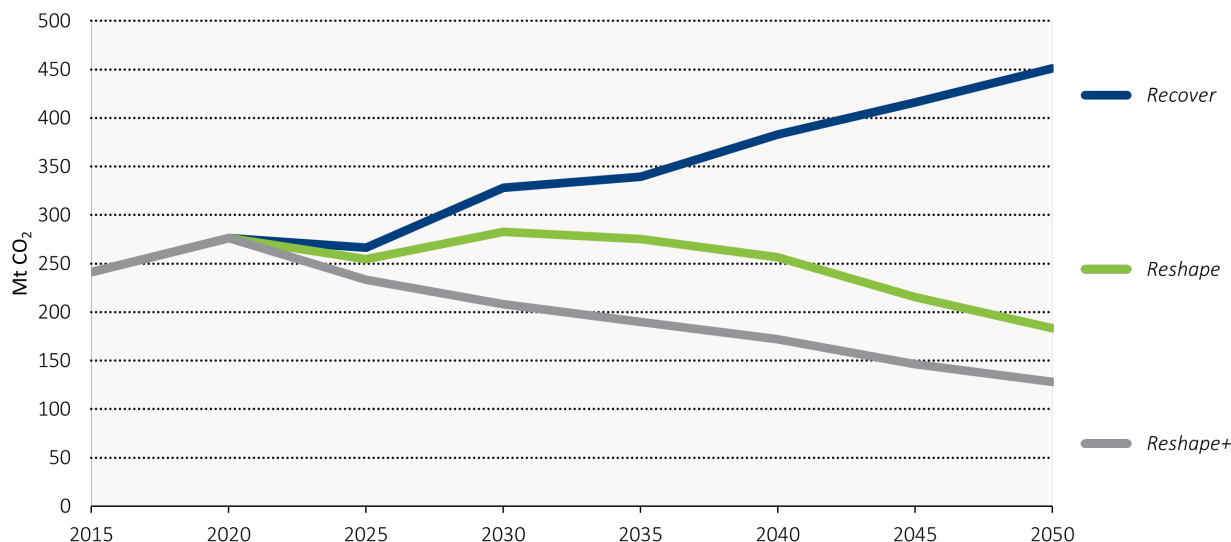
The emissions from the non-urban freight sector are projected to increase by 87% in 2050 under *Recover* assumptions but decline from 2015 levels by 24% in *Reshape* and 47% in *Reshape+*, as shown in Figure 11. This can be partly explained by a 16% activity drop in *Reshape* and 24% drop in *Reshape+* compared to *Recover*, in 2050. The emissions peak by 2020 and then fall temporarily due to the Covid-19 pandemic.

Figure 11 shows that under *Recover*, the tank-to-wheel emissions from non-urban freight transport in South and Southwest Asia do not peak until 2050. Under *Reshape*, emissions initially fall in the aftermath of Covid-19 but then rise until 2030 before they start declining. Under *Reshape+* policies, with the efforts



to leverage the decarbonisation opportunities of the Covid-19 recovery, the emissions fall continuously starting from the year 2020.

**Figure 11. Non-urban freight tank-to-wheel emissions by scenario for South and Southwest Asia to 2050**



Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+*, which refer to the three scenarios modelled, which represent increasingly ambitious post-pandemic policies to decarbonise transport.

It is also interesting to compare the trends between demand and emissions for non-urban freight transport, shown in Figure 12. Even though road transport accounts for 33-38% of the total demand, its emissions vary between 83-89% of the total emissions from the non-urban freight sector. Similarly, while the share of sea freight tonne-kilometres ranges between 45-59% under the different scenarios, it only accounts for 5-8% of emissions up to 2050. This discrepancy between the share of tonne-kilometres and the share of emissions can be explained through the carbon intensity per tonne-kilometre of different modes; road freight is and remains highly carbon-intensive in the sub-region.

The demand for rail transport increases between 2015 and 2050 with tonne-kilometres rising by six to eight times across scenarios. Additionally, the emissions from rail transport double between 2015 and 2050 under the *Recover* scenario and remain approximately the same during the same period for *Reshape* and *Reshape+*, even as the tonne-kilometres increase under these two scenarios. This reflects the greening of rail transport in the sub-region. Several countries in the sub-region have already put in place targets to electrify their railways and improve and enhance the network, which can significantly limit emissions from this mode when combined with cleaner energy grids of the future.

Decarbonisation of the freight sector can be advanced through a combination of policy actions. Some of the solutions that are readily available for road freight include aerodynamic retrofits, reduced-rolling resistance of tyres, vehicle weight reduction, increased engine efficiency and hybridisation (ITF, 2021b). In the rail sector, battery electric and hybrid hydrogen fuel cell traction systems have gained prominence as alternatives to the more costly traditional decarbonisation methods with recent technological developments.

Figure 12. Non-urban freight demand and emissions by modal split for South and Southwest Asia to 2050



Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+*, which refer to the three scenarios modelled, represent increasingly ambitious post-pandemic policies to decarbonise transport.

These measures can be further strengthened through fuel economy and CO<sub>2</sub> emission standards, pricing mechanisms and other incentives, such as zero-emissions zones, charging infrastructure, promoting off-peak deliveries, voluntary emissions reduction programmes, to name a few. Such measures are detailed in various ITF and ESCAP publications, including the *Transport Climate Action Directory* (ITF, 2021c), “Regulations and Standards for Clean Trucks and Buses: On the Right Track?” (ITF, 2020b), “Enhancing shift towards Sustainable Freight Transport in Asia and the Pacific-Opportunities through railway Decarbonization” (UNESCAP, 2021e), “Towards Road Freight Decarbonisation Trends, Measures and Policies” (ITF, 2018a), “Decarbonising Maritime Transport Pathways to zero-carbon shipping by 2035” (ITF, 2018b) and, “How Urban Delivery Vehicles can Boost Electric Mobility” (ITF, 2020a).

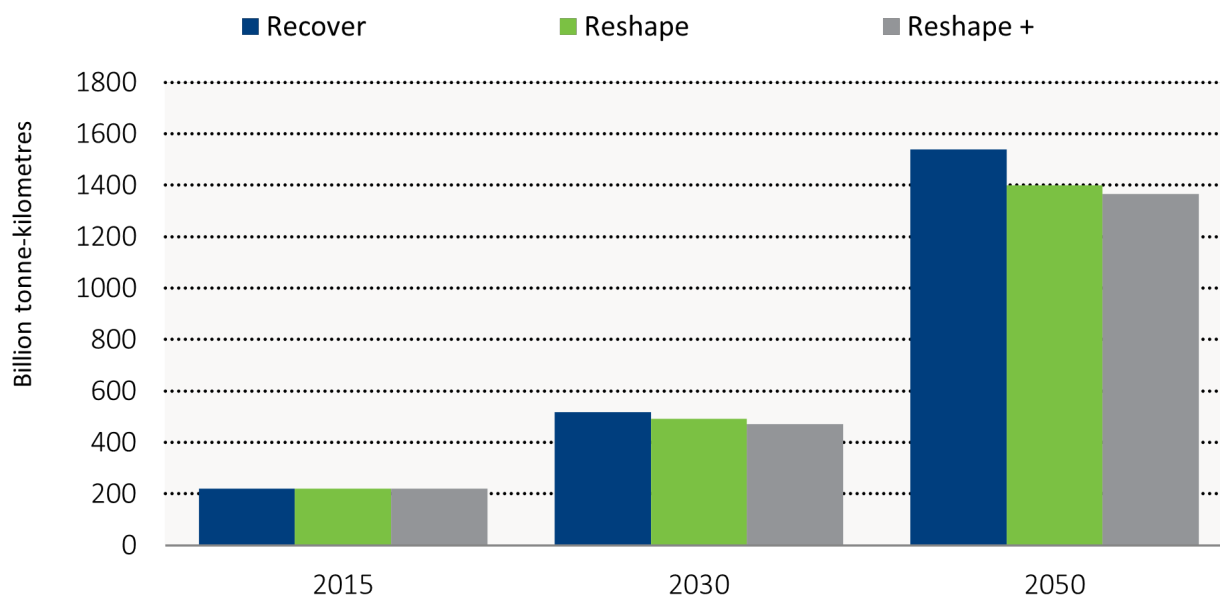
## Urban freight transport: Improving efficiencies and fleets

The South and Southwest Asia sub-region is experiencing rapid urbanisation that is set to continue. By 2050, 52% of the sub-region's population (1.3 billion people) will be living in cities. As cities experience increasing population growth and e-commerce becomes more prevalent, urban freight transport will become a major sector when it comes to the decarbonisation of transport.

Urban freight transport usually includes multiple short-distance trips with small carry loads. These trips represented only 3% of total freight activity in 2015 but were very carbon intensive. Even though they make up a small proportion of the total demand for freight transport in the sub-region, urban delivery trips account for 8% of all total emissions from the transport sector.

The demand for urban freight transport, under the current policy ambitions, could increase by seven times between 2015 and 2050, reaching 1 539 billion tonne-kilometres, as shown in Figure 13. Under all three policy scenarios, the activity in urban freight transport already more than doubles between 2015 and 2030. Under a set of highly ambitious policies in the *Reshape+*, the demand in 2050 could be reduced by 11%, compared to what it would be for *Recover*.

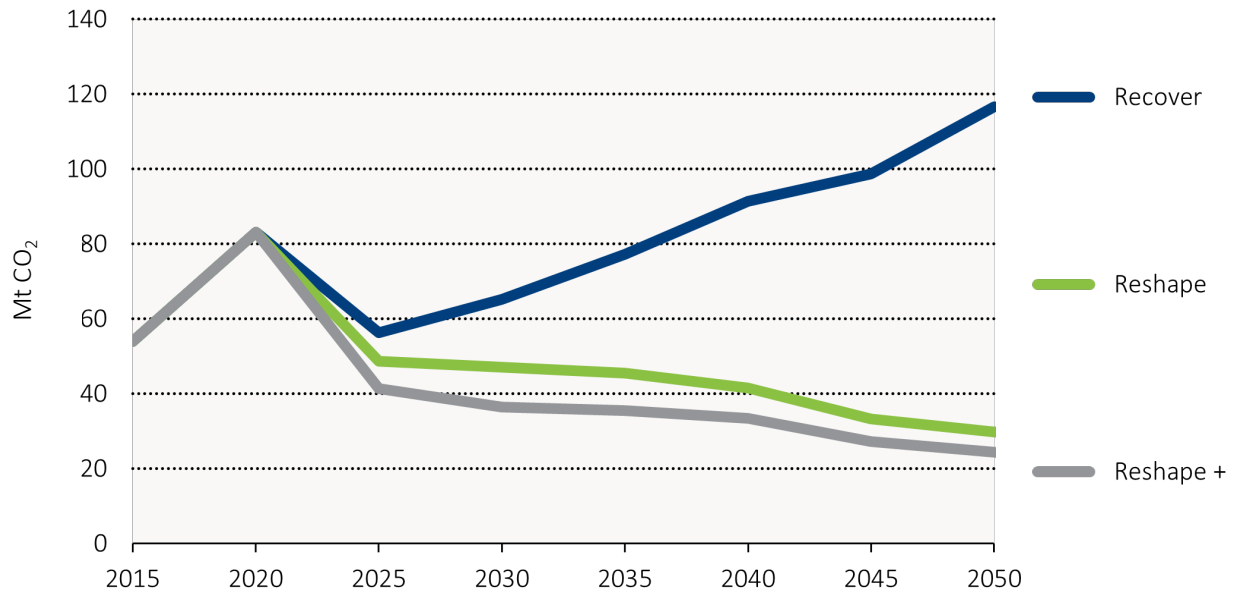
Figure 13. Total urban freight tonne-kilometres by scenario for South and Southwest Asia to 2050



Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+*, which refer to the three scenarios modelled, represent increasingly ambitious post-pandemic policies to decarbonise transport.

## Emissions projections for urban freight

As shown in Figure 14, CO<sub>2</sub> emissions will more-than-double under the *Recover* scenario between 2015 and 2050. After a temporary fall between 2020 and 2025, the emissions begin rising again and would peak beyond 2050, under current policies. Under the more ambitious *Reshape* and *Reshape+* scenarios, 2020 becomes the year when the emissions peak for urban freight transport and will fall continuously after, rapidly between 2020 and 2025 and then gradually beyond 2025. Under *Reshape+*, with a set of highly ambitious policies, the emissions in 2050 could be almost 80% lower in 2050, compared to what it would be for *Recover*.

Figure 14. Urban freight tank-to-wheel CO<sub>2</sub> emissions by scenario for South and Southwest Asia to 2050

Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+*, which refer to the three scenarios modelled, represent increasingly ambitious post-pandemic policies to decarbonise transport.

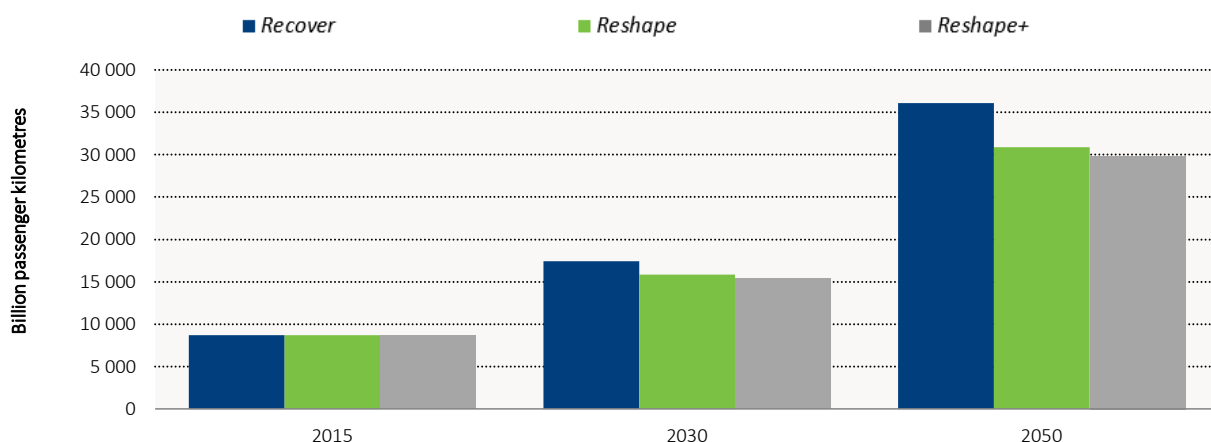
Solutions, such as switching to alternative fuels, carbon pricing, stricter emission standards, zero-emissions zones, more recharging points and incentives for greening the entire vehicle fleets are all viable options in the short term for urban freight transport. Some other ways in which the carbon footprint of the sector can be reduced include training of drivers (eco-driving), incentivising off-peak deliveries, creating collection points, route optimisation, fuel economy and CO<sub>2</sub> emission standards, pricing mechanisms, zero-emissions zones and voluntary emissions reduction programmes. Collaboration between different fleets by different companies, such as sharing vehicles to reduce empty runs, can reduce both costs and emissions.

## Passenger transport: Separating transport demand from economic activity

As economies and the populations of the countries in the sub-region continue to grow in the coming decades, so does the number of people who want to and have the means to travel. This section outlines the projections for passenger transport in the South and Southwest Asia sub-region. Passenger transport includes both urban passenger transport and non-urban passenger transport unless specified otherwise. The growth in the economy is bound to grow the demand for transport activity. In turn, this inevitably leads to an increase in emissions from the transport sector. Therefore, to sustain a strong and growing economy while meeting the climate targets of the transport sector it is essential that the sub-region decouples the demand for transport from economic activity.

Passenger demand in South and Southwest Asia is projected to quadruple between 2015 and 2050 under *Recover* scenario of current policy ambitions (Figure 15). Under *Reshape* and *Reshape+*, the demand for passenger activity still increases but is constrained by ambitious policies. The demand for passenger transport can drop by 17%, from roughly 3.6 trillion passenger-kilometres to 2.9 trillion passenger-kilometres under *Reshape+*, compared to the business-as-usual *Recover* one.

Figure 15. Passenger activity in South and Southwest Asia by scenario to 2050



Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+*, which refer to the three scenarios modelled, represent increasingly ambitious post-pandemic policies to decarbonise transport.

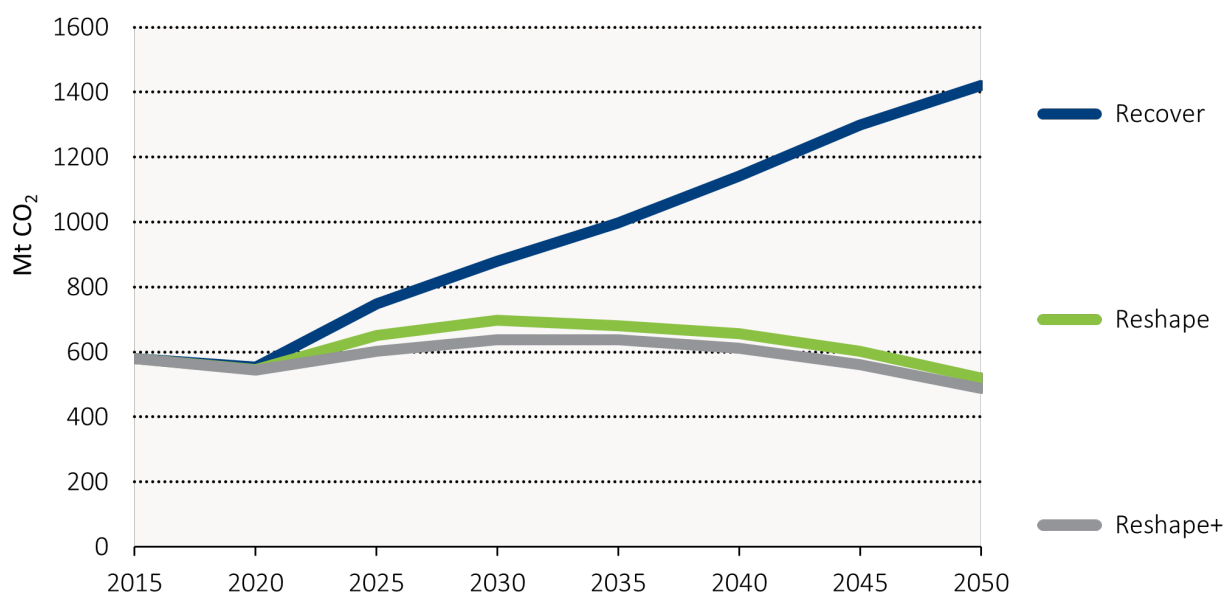
The demand for passenger transport is comprised of urban and non-urban cohorts. Urban passenger transport demand accounts for all passenger transport that takes place within cities. Non-urban passenger transport demand is the sum of regional (peri-urban and rural) and intercity transport. The demand for non-urban passenger transport is considerably greater than urban passenger transport under all the scenarios in 2050 (Figures 18 and 21). Though the demand split is almost even between urban and non-urban passenger transport until 2030, non-urban passenger demand experiences high growth of 135-140% between 2030-50. This growth is mainly driven by an increase in the demand for rail transport that would be needed to meet sustainability goals.

Emissions in the passenger transport sector could grow by 145%, increasing from 579 million tonnes of CO<sub>2</sub> in 2015 to 1 142 million tonnes of CO<sub>2</sub> in 2050. This trend can be reversed under the *Reshape* and *Reshape+* scenarios. These can decrease the emissions in 2050 by 10% with *Reshape* policies and 15% with *Reshape+*. Figure 16 shows that under the current ambition (*Recover* scenario), the emissions from the passenger sector for the sub-region do not peak until 2050. Whereas, under both *Reshape* scenarios, emissions from the sector peak by 2030.

The total baseline emissions from freight and passenger transport in the sub-region are split quite evenly, with passenger transport accounting for 54% of the total emissions (Figure 17). This split between passenger and freight transport becomes more uneven as time draws closer to 2050. Under the *Recover* scenario, the total emissions are split 59% for passenger and 42% for freight transport in 2050. Under *Reshape+*, this gap widens to 64% and 36% between passenger and freight transport emissions.

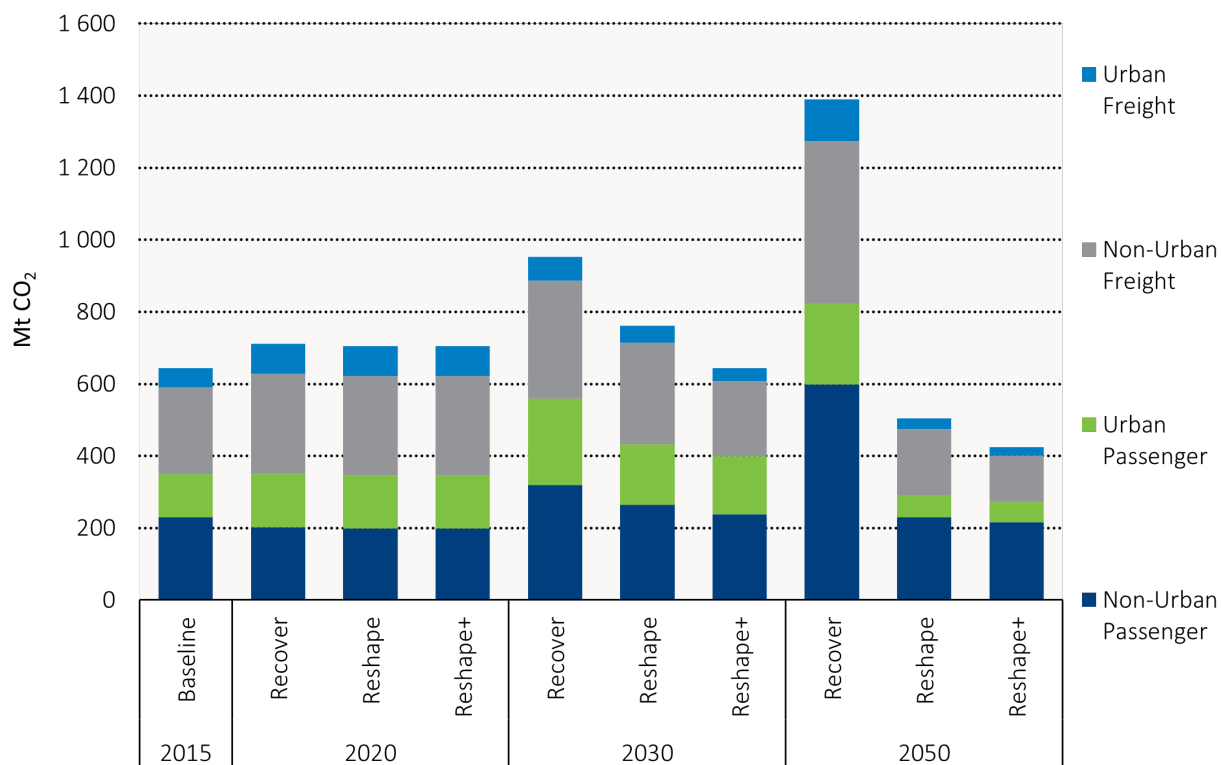
Most of these emissions from the passenger sector come from non-urban transport between 2015 and 2050. The trend is similar for freight transport. Urban freight transport accounts for a small percentage throughout the period, totalling up to 8% of total emissions in 2050, under *Recover*. On the other hand, non-urban freight transport is responsible for 32% of total emissions in 2050, in the same scenario. While the total emissions from the transport sector can drop drastically under *Reshape+*, non-urban travel continues to account for most emissions; 51% from passenger travel and 30% from freight transport in 2050.

Figure 16. Passenger transport emissions by scenario for South and Southwest Asia to 2050



Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+*, which refer to the three scenarios modelled, represent increasingly ambitious post-pandemic policies to decarbonise transport.

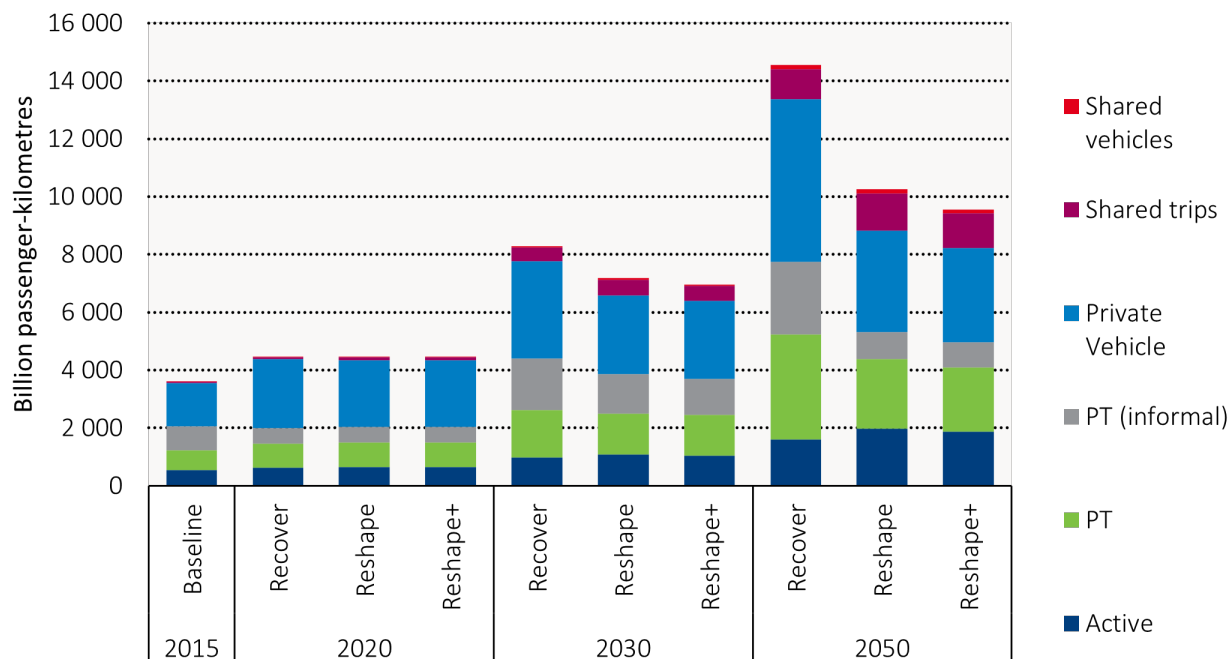
**Figure 17. Total tank-to-wheel emissions for freight and passenger transport by scenario in South and Southwest Asia to 2050**



Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+*, which refer to the three scenarios modelled, represent increasingly ambitious post-pandemic policies to decarbonise transport.

## Urban passenger transport: Cleaner vehicle fleets crucial for reducing emissions

The demand for urban passenger transport includes active travel modes, public transport, informal public transport, private vehicles, shared vehicles and shared trips. Urban passenger trips accounted for 41% of the total demand for passenger travel in the South and Southwest Asia sub-region in 2015. In absolute terms, the demand for urban transport grows from 3.5 trillion passenger-kilometres in 2015 to 14 trillion passenger-kilometres in 2050, under the *Recover* scenario. This represents a 305% increase in urban passenger transport activity during the period. However, with highly ambitious policies under the *Reshape+* scenario, the demand for urban passenger transport is 34% lower at 9.5 trillion passenger-kilometres in 2050 than a business-as-usual situation.

**Figure 18. Urban passenger demand by mode and scenario for South and Southwest Asia to 2050**

Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+*, which refer to the three scenarios modelled, represent increasingly ambitious post-pandemic policies to decarbonise transport. Active mobility and micromobility include walking, biking, scooter-sharing, and bike-sharing. Public transport includes PT rail, metro, bus, LRT, and BRT. Paratransit includes informal buses and PT three-wheeler. Shared vehicle includes motorcycle and car-sharing. Private Vehicle includes motorcycles and cars. Shared mobility includes taxis, ridesharing, and taxi buses.

Population size, changing demographics, economic activity and land-use patterns are interconnected and inevitable elements that will shape the demand for urban passenger transport. The urban population for the South and Southwest Asia sub-region is expected to double (UNDESA, 2018) between 2015 and 2050. The demand for urban passenger transport is expected to remarkably exceed this growth by a factor of approximately 2.6 in *Reshape+* and 4 in the *Recover* scenario.

Private vehicles remain the dominant mode of urban and non-urban transport under all scenarios for the different years through 2050. Comparing the baseline with 2050, the passenger-kilometres for private vehicles increase by a factor of 3.7 under *Recover* and 2.1 under *Reshape+*. The total share of private vehicles declines between 2015 and 2050 by 2% in the *Recover* scenario to 7% in *Reshape+*, reflecting a gradual shift away from private vehicles. By 2050, there is a noticeable increase in the proportion of shared trips, which amount to almost 1% in 2015 and 2% in 2020. By 2050 shared trips account for 7% of the total activity by 2050 under business-as-usual policies (*Recover*) but by 12% under more ambitious policies of *Reshape+*. The two *Reshapes* encourage the move towards shared mobility in urban areas. When it comes to active travel, the proportion declines between 2015 and 2050 under *Recover* but increases by 4 percentage points under *Reshape* and *Reshape+*.

The total emissions from urban areas in the South and Southwest Asia sub-region are projected to increase by 26% under the *Recover* scenario between the 2015 and 2050, as shown in Figure 19. These can be halved by 2050. A reduction of 49% is possible using *Reshape* policies or even 52% with *Reshape+* ambitions.



In the baseline scenario, private vehicles account for almost 60% of the total emissions from the urban passenger transport sector. This matches the activity split from urban passenger transport where private vehicles also account for most passenger-kilometres. The share of emissions from private vehicles increases to around 70% in all three scenarios by 2020. By 2050, the share of emissions from private vehicles reduces across all the scenarios, dropping to 38% under *Recover* and 22% under *Reshape+*.

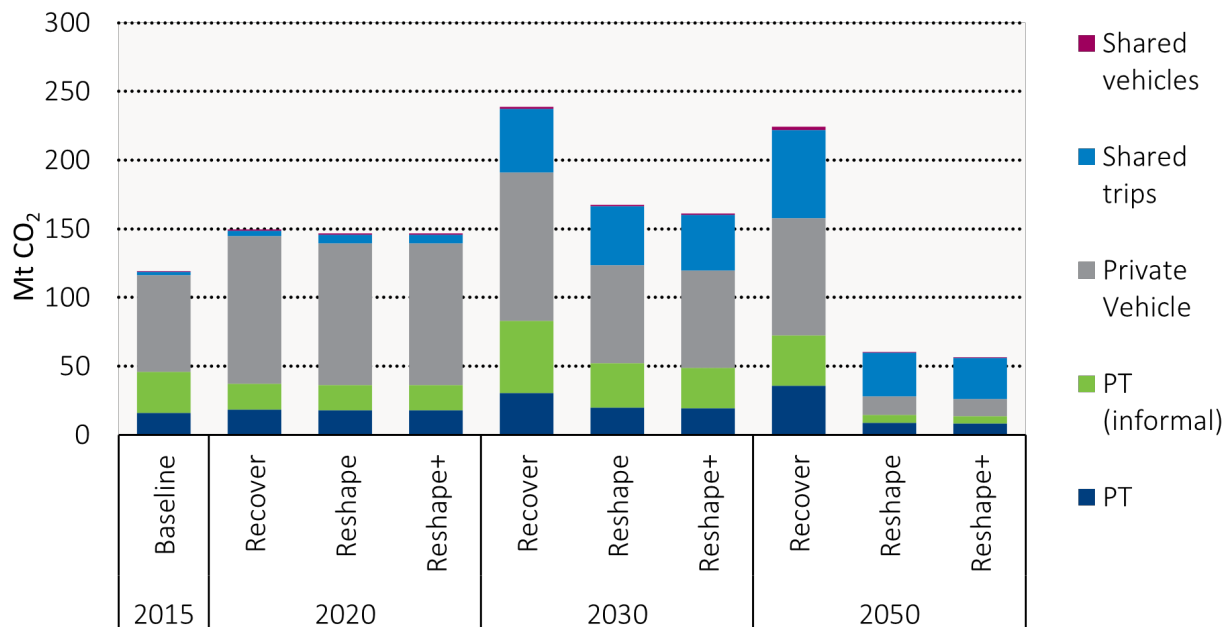
Informal public transport is the second-highest CO<sub>2</sub> emitting mode in the baseline scenario, accounting for 25% of the total emissions in and around the cities. By 2050, the emissions from informal public transport reduce to 16% of the total under *Recover*. Under *Reshape* and *Reshape+*, the proportion of CO<sub>2</sub> emissions from informal public transport reduces to 9% of the total by 2050. In absolute terms, the emissions from informal public transport reduce by a factor of almost 6, between the baseline scenario and *Reshape+*. The absolute demand for informal public transport, however, remains more or less constant when comparing the baseline and *Reshape+* in 2050. This reflects a shift towards cleaner fleets in informal public transport.

The proportion of emissions from public transport remains relatively constant between the baseline and 2050. These emissions differ between 13% under *Recover* and 15% with *Reshape+*. In absolute terms, emissions from public transport are projected to more-than-double between 2015 and 2050 under *Recover* and projected to be halved by 2050 under *Reshape+*. This falls in line with the slight shift in demand towards public transport that can be observed in Figure 19.

There is an increase in the demand for shared trips (Figure 19) between the baseline scenario and the *Reshape+* scenario in 2050 by almost a factor of 39. This translates to the increase in emissions from shared trips in urban areas under all three scenarios. In fact, the emissions from shared rides increase by 270%. More precisely, from 2.3 million tonnes of CO<sub>2</sub> to 64 million tonnes of CO<sub>2</sub>. Under *Reshape* and *Reshape+*, the emissions increase by 126%, still a significant increase but half that under *Recover*.

Cities in South and Southwest Asia will have to adopt smarter and more sustainable ways to travel to mitigate increased emissions from urban passenger transport caused by rapid urbanisation. More sustainable urban mobility will mean improving public, shared and active transport services, combined with encouraging reduced use of private vehicles in cities. This can be achieved by prioritising funding for sustainable public transport, providing financial incentives for increasing the uptake of electric vehicles (EVs) and other new fuel technologies and ensuring adequate charging infrastructure. Integrating transport, and land use and planning will also be crucial for managing the rising urban travel demand.

Figure 19. Urban passenger emissions by mode and scenario for South and Southwest Asia to 2050



Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+*, which refer to the three scenarios modelled, represent increasingly ambitious post-pandemic policies to decarbonise transport.

## Accessibility

As cities grapple with the impacts of Covid-19 on urban transport, it is important to remember that these impacts could be significant in the short as well as medium to long term. In most countries, a fall has been observed in the usage of bus and metro services, and instances of shared mobility have dropped as well. One survey reports that roughly 35% of the commuters in India are likely to change their mode of transport for work trips post Covid-19 (Thakur, P. et al., 2020). This shift is expected to be towards increased use of private vehicles and intermediate public transport (IPT) such as taxis and auto-rickshaws. The share of non-motorised modes may also rise, particularly for short-distance trips. Overall, the study indicates an increase in private vehicles in Indian cities in the aftermath of the crisis. The problems of congestion and pollution that are already grave in Indian cities could worsen in the coming years. Similar trends can be expected in the other countries in the sub-region.

The impacts of the pandemic on urban transport are not limited to passenger transport. The rise of e-commerce during and after the crisis could also lead to increased emissions. Combined, the increased use of private vehicles and rising activity in urban freight could lead to congestion in urban areas. It is essential for policy makers to anticipate these impacts and to mitigate the adverse effects of the pandemic in a targeted manner. Looking at the trends emerging in the aftermath of the Covid-19 crisis with the increasing urbanisation in countries in the sub-region, a rise in congestion in the cities seems inevitable. Several of the cities in the South and Southwest Asia sub-region already rank very high in congestion globally. According to the TomTom Traffic Index, three Indian cities (Mumbai, Bengaluru and New Delhi) and Istanbul all come in the top ten most-congested cities in the world.

Congestion is measured as a share of the available transport network capacity consumed on average over the day. Congestion in cities of the sub-region falls, on average, between 2015 and 2050, under *Recover*. For cities with less than 100 000 inhabitants, the average proportion of the network consumed by traffic over the course of the day falls to 1% from 19% between 2050 and 2015. For cities with a population

between 100 000 and 300 000 inhabitants, the average use of the network falls very sharply, from more than 50% consumption to approximately 4% during the same period. In cities with between 300 000 and 1 million inhabitants, the congestion is the worst when compared with other smaller or bigger cities at 70% in 2015. This falls to 4% in *Recover* and 3% in the *Reshape* scenarios in 2050. Finally, cities with over 1 million inhabitants also experience a steep decline in the average use of network consumed from 57% in 2015 to 3% under *Recover* and 2% under *Reshape* and *Reshape+* in 2050.

Attractive walking and cycling infrastructure in cities are crucial to encourage the use of active modes over short-trip distances taken by vehicles. As cities grow and policies that promote active modes are created, the modal dependency for shorter trips will reduce due to the reduction in the availability of public transport modes and shared mobility for shorter trips. Looking at the availability of modal mix in the cities, we can estimate the dependency of passengers on a given mode to complete a journey of a given length. Box 3 explains in detail the methodology behind this indicator that is used to understand the modal dependency. The modal dependency changes over time under each individual scenario.

Under the ambitious *Reshape* and *Reshape+* scenarios, the modal dependency tends to become more uniform over time. These scenarios include more sustainable mode choices being available. This will improve modal dependency, especially through shared mobility, which is expected to become more prevalent with time. A significant part of the transport demand is met through informal modes in the sub-region. Over time, as these informal modes are formalised by standards and regulations, there will be an increase in the shared trips, rather than the introduction of new modes altogether. For this reason, drastic changes in modal dependency in the sub-region will not occur before 2050.

#### Box 4. Measuring systemic modal dependency

The methodological approach for measuring modal dependency in this report is an entropy-based indicator that provides an indication of the diversity and viability of modal alternatives. The following formula represents the indicator structure:

$$EI = - \sum_{i=1}^k \frac{p_i \cdot \ln(p_i)}{\ln(k)}$$

where  $p_k$  is the proportion of the total realised mobility performed with the  $k^{\text{th}}$  transport mode type. In this study, available modes are grouped into five categories ( $k = 5$ ) of transport modes: (1) non-motorised (including micromobility), (2) private vehicles (including but not limited to cars), (3) shared motorised, (4) heavy public transport (i.e., trains, metros/subways, trams, bus rapid transit), (5) light equivalent public transport.

The index measures the viable transport alternatives available to travel in a particular city based on the current conditions and the estimated mobility and mode choice. It is an application of the entropy index used to measure land-use mix developed by Potoglou and Kanaroglou (2008), based on Cervero and Kockelman (1997).

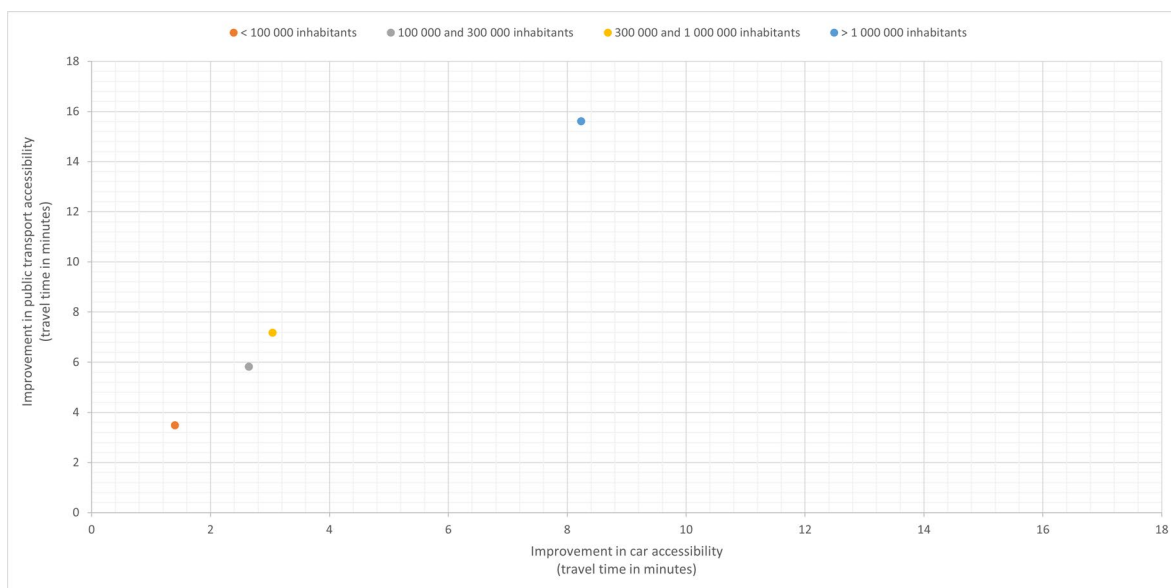
0 represents a dependency on a single transport mode, and one a uniform distribution between the transport modes.

Source: ITF (2022).

Transport affordability is measured as a proportion of the available GDP per capita that is spent on mobility per year. The ambitious policies of the *Reshape+* scenario result in slight improvements in transport affordability for all cities of under one million inhabitants. In cities with more than one million inhabitants, which tend to have higher mobility costs to begin with, there is a small deterioration in the affordability between *Recover* and *Reshape+*. At the same time, it is important to note that the policies under *Reshape+* in cities with over one million inhabitants lead to an average 16-minute improvement in public transport accessibility.

The ascending measures applied between the three scenarios clearly contrast the impacts on the public transport and road networks. As shown in Figure 20, there are differences between the *Recover* and *Reshape+* scenarios by 2050 regarding the average time it takes by either mode to travel from the centre of the city to its edge. Under *Reshape+*, travel times improve for both cars and public transport accessibility in three of the four city size categories. Only cities in the 300 000 to 1 million inhabitants category see a decline in accessibility by car, and the second-lowest improvement in public transport. The smallest cities (fewer than 100 000 inhabitants) gain less than one minute in improvements to public transport accessibility between the *Recover* and *Reshape+* scenario. People in larger cities will benefit most from the public transport accessibility gains shaped by the more ambitious *Reshape+* policies. These ambitious policies create an 18-minute improvement for the public transport accessibility in cities larger than one million people, compared to the *Recover*.

Figure 20. Difference in average travel time across the radius of a city in 2050 under the *Reshape+* scenario compared to the *Recover* scenario in South and Southwest Asia, by car and public transport

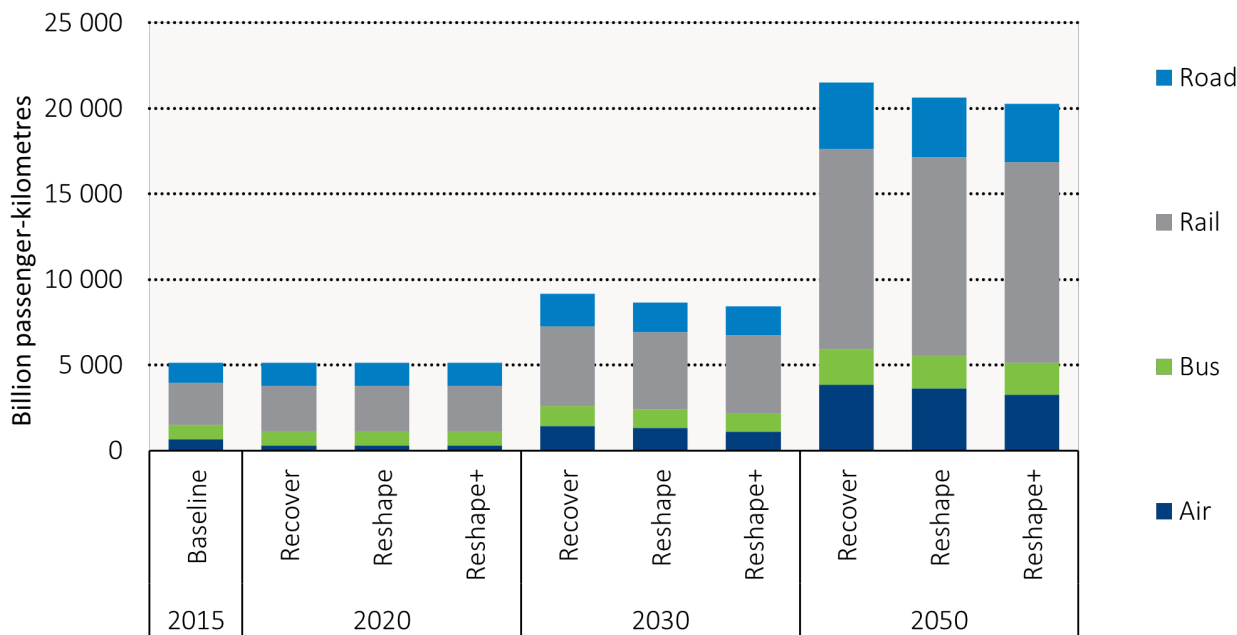


## Non-urban passenger transport: Increasing low-emission vehicles and fuels

In 2015, non-urban passenger demand for the sub-region was around 5 trillion passenger-kilometres, with 90% coming from domestic transport in the sub-region. In absolute terms, non-urban passenger activity would at least quadruple by 2050 compared to 2015, under all scenarios. Under *Recover* it grows by 318%

and by 300% under *Reshape*. *Reshape+* will limit demand growth by another 7 percentage points to 293%, aided by policies that encourage teleconferencing and local tourism to continue after the pandemic.

**Figure 21. Non-urban passenger demand by mode and scenario for South and Southwest Asia to 2050**



Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+*, which refer to the three scenarios modelled, represent increasingly ambitious post-pandemic policies to decarbonise transport.

Rail transport, of all modes, is the one that experiences the highest growth between 2020 and 2050, increasing by the same growth of almost 330% across all the scenarios. The total activity under rail transport increases by an even factor of roughly 4.3 under all the scenarios between 2020 and 2050. Rail transport also remains the dominant mode of transport for non-urban passenger travel under all scenarios and years. In 2050, it accounts for 54% of the total demand under *Recover* and about 58% under *Reshape+*. The share of rail transport increases when comparing *Recover* scenario to the more sustainably focused *Reshape+*. Accordingly, there is a decrease in the shares of private road transport (cars and two-wheelers) and bus transport under *Reshape+*. The growth in rail transport in the sub-region is reflective of the planned investment in the development of rail infrastructure; increased frequencies as well as the move towards high-speed rail being some of the key drivers (ADB, 2017; Railway Technology, 2020; Tehran Times, 2020; SASEC, 2021; The Times of India, 2021). Given the lower energy and CO<sub>2</sub> intensities of rail transport, shifting passenger activity from more intensive modes such as private cars and aeroplanes to rail is critical to meeting the climate goals of the transport sector.

The Covid-19 pandemic halved the share of air transport from 12% in 2015 to 6% in 2020 under all three scenarios. However, this fall in the share of aviation is not long-lasting as it climbs back to 16-17% of total non-urban passenger activity in 2050. In 2015, aviation was responsible for 646 billion passenger-kilometres in absolute terms and this increases by a factor of 5 to 6, depending on the scenario, reaching over 3 trillion passenger-kilometres in 2050.

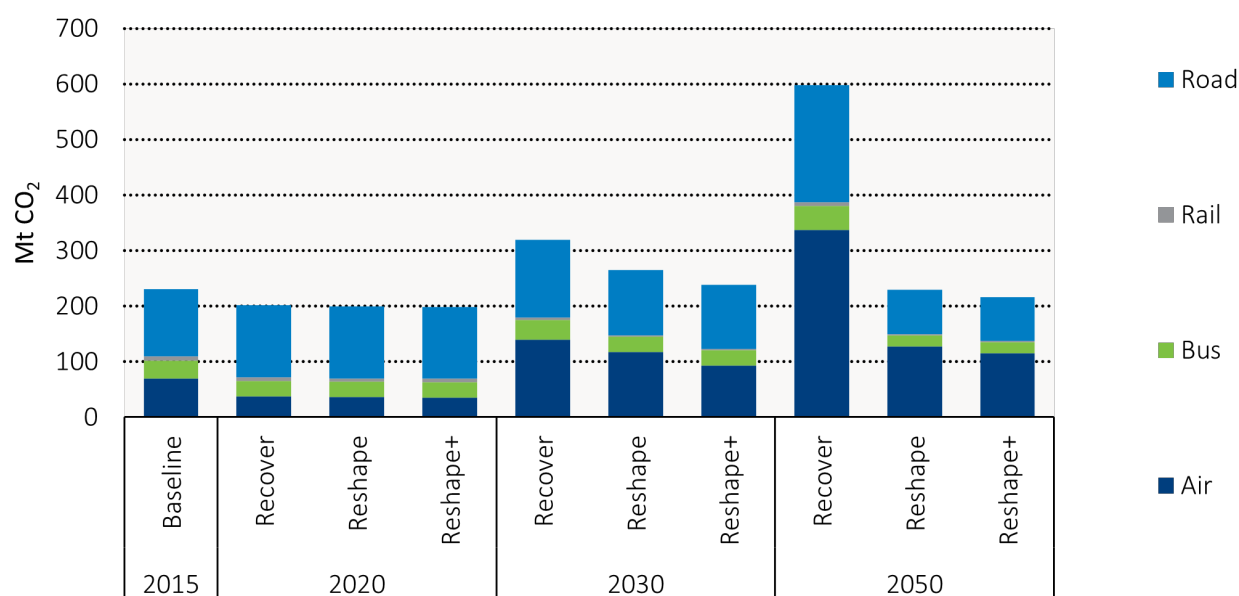
Emissions from non-urban passenger transport in the sub-region are projected to increase by a factor of 2.5 under *Recover*, despite a decline caused by the Covid-19 pandemic (Figure 22). These emissions could be drastically lower by 2050; by 61% under *Reshape* and 63% under *Reshape+*. The sector generated

230 million tonnes of CO<sub>2</sub> emissions in 2015 and around 200 million tonnes of CO<sub>2</sub> emissions in 2020 under both the *Reshape* and *Reshape+*. This represents 66% of total passenger sector emissions in 2015 and 79% of total emissions under the *Reshape* scenarios in 2050. The increase in the share of emissions from the non-urban passenger sector reflects the hard-to-abate nature of this sector in the South and Southwest Asia sub-region.

The relatively constant level of emissions from the non-urban passenger sector between 2015 and 2050 can be linked to decarbonising policies curtailing emissions despite a growing demand during the same period (Figure 22). Even as the emissions from road transport fall under the *Reshape* scenarios, the increase in emissions from the aviation sector makes up for the difference, keeping the overall absolute emissions constant.

Road transport remains the biggest contributor of emissions from 2015 to 2020. It accounts for 52% of total non-urban passenger emissions in 2015 and 64% 2020. During the same timeframe, aviation accounts for the second-highest share of emissions, followed by bus transport and then rail, which accounts for 3% of total emissions. By 2030, the split between emissions from aviation and road transport equalises to some degree. Both sectors accounting for 43% in *Recover*, 44% in *Reshape* whereas aviation is at 39% and road 48% in *Reshape+*. By 2050, total emissions for aviation account for almost 56% under a *Recover* scenario and 53% under *Reshape+*, followed by road transport at 35% under *Recover* and 36% under *Reshape+*, and then bus at 7% under *Recover* and 8% under *Reshape+* and rail at 1% for all scenarios.

Figure 22. Non-urban passenger emissions by mode and scenario for South and Southwest Asia to 2050



Note: Figure depicts ITF modelled estimates. *Recover*, *Reshape* and *Reshape+*, which refer to the three scenarios modelled, represent increasingly ambitious post-pandemic policies to decarbonise transport.

Aviation has the highest emissions from the non-urban passenger sector in 2050, under all scenarios, yet the sector can reduce its emissions under the highly ambitious scenarios. Aviation emissions amounts to 337 million tonnes of CO<sub>2</sub> emissions under *Recover*, 127 million tonnes of CO<sub>2</sub> under *Reshape* and 115 million tonnes of CO<sub>2</sub> emissions under *Reshape+*. Despite an increase in the demand for aviation by a factor of 5 or 6 between 2015 and 2050, the emissions only increase by a factor of 5 under *Recover* but under the two *Reshape* scenarios, they only increase by a factor of 1.8 and 1.6.

Road transport remains the second-highest emitting mode under all scenarios in 2050. They account for 210 million tonnes of CO<sub>2</sub> emissions under *Recover*: an increase by a factor of 1.7 from 2015. Between 2015 and 2050, emissions reduce to 80 million tonnes of CO<sub>2</sub> under *Reshape* (a fall of 33%) and 78 million tonnes of CO<sub>2</sub> under *Reshape+* (a fall of 34%). These decreases in emissions are despite the growth in passenger-kilometres in road transport by a factor of 2.9 under both the *Reshape* scenarios. Emissions from bus transport are projected to increase by 35% between 2015 and 2050 under *Recover*. However, they can be decreased by 38% with the *Reshape* and 40% under the *Reshape+* scenarios.

Rail transport is the only mode that can reduce its emissions (by 20%) from 2015 to 2050 under *Recover*. Policies under *Recover* see emissions increase for all other modes. Under the *Reshape* scenarios, the emissions reduce by 70%. The activity by rail between 2015 and 2050 increases by a factor of almost ten under all the scenarios. This is reflective of how clean passenger as well as freight rail transport becomes over the next few decades with the right policies in place.

For the non-urban passenger sector to reduce its emissions in the coming decades, countries in the sub-region will need to increase the uptake of sustainable fuels and implement carbon pricing schemes, improve the efficiency of vehicle fleets and boost the uptake of low-carbon fuels and EVs. Some of the ways in which this can be accelerated are establishing fuel mandates, providing purchase subsidies, tax rebates and exemptions for EVs and investing in charging infrastructure. Greening the grid that powers EVs and improving battery technologies will also be crucial in decarbonising the transport sector comprehensively.

A paradigm shift in policy would pave the way for more sustainable non-urban passenger transport. Its emissions can be reduced over the next three decades if the decarbonisation windfall of the Covid-19 pandemic can be reinforced and made long term. Conscious and targeted policies for decarbonisation must be prioritised as part of economic recovery programmes to ensure that the growth of non-urban passenger transport stays on the right path.

## Conclusions and policy insights

The transport sector is vital to people's well-being in any region of the world. It not only facilitates the movement of goods and services and people but also enables access to economic and social opportunities. However, CO<sub>2</sub> emissions from the transport sector present huge costs to society and the environment. The Covid-19 pandemic has temporarily reduced transport emissions, but they are set to rebound unless ambitious policies are created to address them. Hence, the transport decisions made in the coming years will determine the path that the sector takes; one that leads to increased emissions and lowered chances of limiting climate change and another one that sees growth in transport demand but a fall in emissions, improved resilience and sustainability of the sector and a better chance of mitigating climate change.

### Target road freight to achieve significant reductions in transport CO<sub>2</sub> emissions

If the transport sector in the sub-region is to reduce its emissions, it is essential to scale-up decarbonisation efforts for the road freight sector. Emissions from road transport in the non-urban freight sector alone account for 31% of the total transport emissions of the baseline and almost two-thirds of total freight transport emissions in the sub-region. These emissions from road freight transport are projected to almost double in 2050, under the current policy ambitions of sub-region governments.

Several solutions already exist and can be applied to advance the emissions reduction from the sector. Some of these include aerodynamic retrofits, reduced rolling resistance in tyres, the light-weighting of materials, and more fuel-efficient engine technologies. Tougher standards for fuel economy and CO<sub>2</sub> emissions of heavy-duty vehicles must be a priority if they are to be adopted widely enough to hit decarbonisation targets. The Covid-19 pandemic presents an opportunity to accelerate the transition towards green road freight. Recovery programmes should prioritise green transport infrastructure and the production, and distribution and supply of alternative fuels. Ambitious policies, such as those under the *Reshape+* scenario, can decrease the emissions from the road freight sector by 62% in 2050, as compared to the emissions under a *Recover* scenario.

Freight emissions more than double in urban areas under the *Recover* scenario. To avoid this, targeted policies that mitigate freight emissions in cities is crucial. Carbon pricing, deployment of charging infrastructure, stricter emissions standards, promoting off-peak deliveries are some low-hanging fruits that can be adopted to reduce emissions from freight transport in cities. Addressing urban freight challenges in the sub-region could be among the toughest transport-related due to the involvement of multiple stakeholders. There are various ways to improve urban freight transport, including developing urban consolidation centres, shifting freight traffic to off-peak hours at night, and online freight exchanges to match the demand for capacity with available supply online.

### Accelerate aviation's technology and fuel transition to reduce emissions

The Covid-19 pandemic temporarily reduced the emissions from non-urban passenger transport, particularly those from aviation. Non-urban passenger emissions reductions are achievable in road, bus and rail transport; however the aviation sector is hard-to-abate. Under current policies, the emissions from passenger aviation alone end up accounting for almost a quarter of the total transport emissions in 2050. It is therefore critical to create and enact ambitious policies to decarbonise the aviation sector that limit emissions to the extent possible.



It is possible to halve urban passenger, urban freight and non-urban freight emissions by 2050. Emissions compared to 2015 can be reduced by 52% for urban passenger, 54% for urban freight and 46% non-urban freight sectors if policies are reinforced, reshaped and leverage Covid-19 recovery. Emissions from non-urban passenger transport, of which aviation is a big part, can only be reduced by 6%, even under *Reshape+*.

Developments in hybrid and all-electric aircraft in the coming decades can push down the cost of synthetic fuels, making them more commercially viable. Pushing the adoption of alternative fuels in aviation would decrease emissions in the short term and boost innovation in the long term. Fuel mandates would also stimulate innovation and uptake of new sustainable aviation fuel in the future, providing greater incentives for improving aircraft efficiency. This measure would increase the cost of flying, which can help to manage demand. Governments can help the uptake of these alternatives by taxing the use of carbon and increasing levies on options that are currently exempt or taxed marginally. A carbon tax can also drive the availability of greener alternatives.

### **Reduce urban transport's carbon footprint by leveraging public transport and active modes post the pandemic**

The urban population in the South and Southwest Asia sub-region is expected to rise by 76% between 2020 and 2050. This will increase the demand for transport in the urban areas, several of which are already highly congested and suffering from poor air quality. Transport activity is projected to quadruple for passenger transport and rise by seven times for freight under current policy ambitions in the sub-region. However, if highly ambitious policies, as detailed under the *Reshape+* scenario (see Annexes) are implemented, this could reduce the demand and the total associated emissions in cities by almost 70% in 2050, compared to *Recover* scenario.

Proactive measures are necessary to reverse the impact of negative externalities of the changes seen in travel patterns after the Covid-19 crisis, especially in cities. Ensuring the safety, reliability and availability of public transport will be essential for ensuring that the negative environmental impacts are minimised. The promotion of active modes of transport also plays an important role in preventing an increase in the use of private vehicles. Investing in public transport and active modes must be prioritised over developing new infrastructure for private vehicles.

Reducing emissions from private vehicle trips will require technology improvements that increase fuel efficiency. It is essential that these technologies are affordable, especially in zones where there is a lack of alternatives other than using private vehicles. Vehicle improvements will also be important for public transport bus fleets as that will not only help reducing emissions but also improve the local air quality in cities. It is therefore important to plan for the funding of these policies and programmes. Cities can generate funds from road pricing instruments and fuel taxes, in addition to targeted budgeting for sustainable urban transport in the cities.

### **Link decarbonisation and regional connectivity to develop resilient transport sectors**

The disruptions to supply chains caused by the Covid-19 pandemic has further complicated addressing the negative externalities of freight transport. The pandemic has exposed the vulnerability of extended and complex value chains to production disruptions. Still one of the least economically integrated sub-regions in the world, the recovery from the Covid-19 pandemic can be leveraged as an opportunity to implement targeted policies for the transport sector and improve connectivity in South and Southwest Asia.

Building the resilience of the transport sector to deal with dynamic and unpredictable situations, including climate-induced and natural disasters, is critical for countries in South and Southwest Asia. This can be done through a mix of policy options. Certainly, policy makers need to plan and organise pre-emptively for crisis response. Crucial areas forward are enhanced co-operation among stakeholders at national and sub-regional levels, digitalisation of transport services and climate-proofing transport infrastructure.

Unequal transport connectivity between countries within the sub-region and with other sub-regions remains a concern that inhibits sustainable freight transport in South and Southwest Asia. One of the consequences of inadequate transport connectivity within the sub-region is low intra-regional trade among the countries. The weak transport linkages have not allowed countries to benefit from geographical proximity. In addition to inappropriate transport infrastructure, including at the borders, complicated border crossing formalities makes transit and transport costs high, leading to loss of competitiveness of the countries of the sub-region. Most countries do not grant traffic rights and rely on inefficient transshipment processes at the borders to move the freight.

Enhanced transport connectivity is a fundamental block of strengthening regional co-operation. This co-operation accelerates economic growth and social development. Regions with well-functioning transport networks reap the benefits of free trade agreements which promotes trade and investment and grows tourism and knowledge exchange across borders. The Covid-19 recovery policies should not only aim to improve transport connectivity through further development of cross border rail and road networks but also to harmonise procedures and advance the digitalisation of processes. Digitalisation and automation of terminals and logistic hubs can bring efficiency gains. Transport infrastructure improvements will lead to better connectivity and incentivise countries to further increase economic co-operation.

### **Establish coherent freight reforms for sustainable outcomes**

The fractured nature of sustainable freight transport policies in South and Southwest Asia countries requires a major effort to mainstream practices. Better planning of freight transport and gathering and analysing of its statistics is crucial and currently lacking in the sub-region. Transport technologies and transformational transport services can enhance and steer freight sustainability in the direction needed such as the improved capacity of networks, traffic management, reliability, energy efficiency and better customer services and lower operating costs. To reduce costs, digital logistics platforms are being developed that more efficiently share information among various logistics stakeholders, and electronic cargo tracking systems are now used to facilitate transit transport. Freight information exchange systems are being developed as aggregators to balance demand and supply and reduce logistical inefficiencies such as empty runs. However, scaling-up digitisation in transport presents a formidable challenge. There is considerable disparity in digital infrastructure, research and innovation, and digital skills among the countries of the sub-region. Co-operation to harmonise these elements can play an important role in increasing efficiencies, lowering freight emissions, and making supply chains more reliable and resilient.

The use of rail freight transport requires continual efforts and supportive policies. There are already renewed attempts to increase the share of rail freight. For example, Indian Railways, the largest in the sub-region, has a target to move 45% of the country's freight by 2030, a 1.6 increase over the current 27%. The pandemic has reaffirmed the reliability and resilience of railway transport and provided a renewed opportunity to capture larger volumes of sundry freight, which moves mostly by road, as well as to optimise bulk loading to enhance efficiency and productivity.

Sustainable freight transport requires diversified sources of financing, and governments must lead to create an enabling environment where it can thrive. Public funding and financing of economic recovery programmes should prioritise green transport infrastructure. Establishing investment targets can include

the electrification of rail lines and the production, distribution and supply of alternative fuels. Governments need to create a coherent framework of economic and regulatory incentives and penalties to align economic objectives with sustainability goals. This could include carbon taxes, zoning restrictions, fuel mandates, and bailouts conditional on decarbonisation actions. Including freight transport emissions in carbon-pricing schemes is a critical instrument that policy makers already have at their disposal to foster a green transition.

## References

- ADB (2020a), *Proposed Project Readiness Loan People's Republic of Bangladesh: Transport Connectivity Improvement Preparatory Facility*, Asian Development Bank, <https://www.adb.org/sites/default/files/project-documents/50333/50333-001-rpp-en.pdf> (accessed 6 December 2021).
- ADB (2020b), *Sector Assessment: Transport (Bangladesh)*, Asian Development Bank, <https://www.adb.org/sites/default/files/linked-documents/LD-D-Transport-Sector-Assessment.pdf> (accessed 6 December 2021).
- ADB (2019), *How South Asia can continue as world's fastest growing subregion – Lei Lei Song*, Asian Development Bank, <https://www.adb.org/news/op-ed/how-south-asia-can-continue-world-s-fastest-growing-subregion-lei-lei-song> (accessed 22 November 2021).
- ADB (2017), *Sri Lanka: Railway Master Plan*, Asian Development Bank, <https://www.adb.org/projects/51108-001/main> (accessed 30 November 2021).
- ADB (2013), *Economics of Reducing Greenhouse Gas Emissions in South Asia: Options and Costs*, Asian Development Bank, Mandaluyong City, Philippines <https://www.adb.org/sites/default/files/publication/30186/economics-reducing-ghg-emissions-south-asia.pdf> (accessed 10 February 2022).
- ADB (2009), *Study on Intraregional Trade and Investment in South Asia*, Asian Development Bank, <https://www.adb.org/sites/default/files/publication/28658/intraregional-trade-investment.pdf> (accessed 3 February 2022).
- Ahmed, S., S. Kelegama and E. Ghani (eds.) (2010), *Promoting Economic Cooperation in South Asia*, The World Bank, Sage Publications, <https://documents1.worldbank.org/curated/en/182231468170943497/pdf/530590PUBOREPL1e0box0info101PUBLIC1.pdf> (accessed 6 December 2021).
- Böcker, L., P. van Amen and M. Helbich (2017), "Elderly travel frequencies and transport mode choices in Greater Rotterdam, the Netherlands", *Transportation*, Vol. 44(4), pp. 831-852, <http://dx.doi.org/10.1007/s11116-016-9680-z>.
- Cervero, R. and K. Kockelman (1997), "Travel demand and the 3Ds: Density, diversity, and design", *Transportation Research Part D: Transport and Environment*, Vol. 2(3), pp. 199-219, [http://dx.doi.org/10.1016/S1361-9209\(97\)00009-6](http://dx.doi.org/10.1016/S1361-9209(97)00009-6).
- Château, J., R. Dellink and E. Lanzi (2014), "An Overview of the OECD ENV-Linkages Model: Version 3", *OECD Environment Working Papers*, No. 65, Paris, <http://dx.doi.org/10.1787/5jz2qck2b2vd-en>.
- Climate Analytics (2019a), *Country Profile: Bangladesh – Decarbonising South and South East Asia*, <https://climateanalytics.org/media/decarbonisingasia2019-profile-bangladesh-climateanalytics.pdf> (accessed 6 December 2021).
- Climate Analytics (2019b), *Scaling up climate action Key opportunities for transitioning to a zero emissions society*, [https://climateactiontracker.org/documents/672/CAT\\_2019-11-29\\_Scaling\\_Up\\_TURKEY\\_FullReport\\_ENG.pdf](https://climateactiontracker.org/documents/672/CAT_2019-11-29_Scaling_Up_TURKEY_FullReport_ENG.pdf) (accessed 6 December 2021).
- Dietrich, R. (2020), *Country scoping of research priorities on low-carbon transport in Bangladesh*, [https://assets.publishing.service.gov.uk/media/5f8b105f8fa8f56adc30d97f/HVT022.001\\_Low\\_Carbon\\_Scoping\\_Report\\_Bangladesh\\_FINAL.pdf](https://assets.publishing.service.gov.uk/media/5f8b105f8fa8f56adc30d97f/HVT022.001_Low_Carbon_Scoping_Report_Bangladesh_FINAL.pdf) (accessed 6 December 2021).

- Global Trailer (2021), *TIR streamlines Pakistan-Iran-Turkey road transportation*, <https://www.globaltrailermag.com/2021/10/12/tir-streamlines-pakistan-iran-turkey-road-transportation/> (accessed 6 December 2021).
- Government of Pakistan (2018), *National Transport Policy of Pakistan (2018)*, Planning Commission Ministry of Planning, Development & Reform, <https://www.pc.gov.pk/uploads/downloads/policy.pdf> (accessed 6 December 2021).
- Government of Pakistan (2012), *National Climate Change Policy (2012) of Pakistan*, Ministry of Climate Change, Islamabad, <http://www.nrsp.org.pk/gcf/docs/National-Climate-Change-Policy-of-Pakistan.pdf> (accessed 6 December 2021).
- IQAir (2020), *World's most polluted cities 2020 (PM2.5)* (database), <https://www.iqair.com/world-most-polluted-cities> (accessed 6 December 2021).
- ITF (2022), "ITF Southeast Asia Transport Outlook", *International Transport Forum Policy Papers*, No. 103, OECD Publishing, Paris.
- ITF (2021a), "Decarbonising India's Transport System: Charting the Way Forward", *International Transport Forum Policy Papers*, No. 88, OECD Publishing, Paris, <https://doi.org/10.1787/4916dc15-en>.
- ITF (2021b), *ITF Transport Outlook 2021*, OECD Publishing, Paris, <https://doi.org/10.1787/16826a30-en>.
- ITF (2021c), *Transport Climate Action Directory*, [https://www.itf-oecd.org/transport-climate-action-directory-measures?\\_ga=2.262210511.234542422.1637597158-332201527.1628694880](https://www.itf-oecd.org/transport-climate-action-directory-measures?_ga=2.262210511.234542422.1637597158-332201527.1628694880) (accessed 25 November 2021).
- ITF (2020a), "How Urban Delivery Vehicles can Boost Electric Mobility", *International Transport Forum Policy Papers*, No. 81, OECD Publishing, Paris, <https://doi.org/10.1787/eea08a2a-en>.
- ITF (2020b), "Regulations and Standards for Clean Trucks and Buses: On the Right Track?", *International Transport Forum Policy Papers*, No. 77, OECD Publishing, Paris, <https://doi.org/10.1787/ed7ef18b-en>.
- ITF (2019), "Enhancing Connectivity and Freight in Central Asia", *International Transport Forum Policy Papers*, No. 71, OECD Publishing, Paris, <https://doi.org/10.1787/0492621a-en>.
- ITF (2018a), "Towards Road Freight Decarbonisation: Trends, Measures and Policies", *International Transport Forum Policy Papers*, No. 64, OECD Publishing, Paris, <https://doi.org/10.1787/3dc0b429-en>.
- ITF (2018b), "Decarbonising Maritime Transport: Pathways to zero-carbon shipping by 2035", *International Transport Forum Policy Papers*, No. 47, OECD Publishing, Paris, <https://doi.org/10.1787/b1a7632c-en>.
- Kathuria, S. (ed.) (2018), *A Glass Half Full: The Promise of Regional Trade in South Asia*, International Bank for Reconstruction and Development / The World Bank, <https://doi.org/10.1596/978-1-4648-1294-1> (accessed 13 December 2021).
- MOEFCC (2016), *India's Intended Nationally Determined Contributions – Towards Climate Justice*, [https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/India First/INDIA INDC TO UNFCCC.pdf](https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/India%20First/INDIA%20INDC%20TO%20UNFCCC.pdf) (accessed 6 December 2021).
- Murdock, S. H. et al. (2015), "The Effects of Demographic Change on Selected Transportation Services and Demand", in *Population Change in the United States*, Dordrecht: Springer Netherlands, pp. 133-152. [https://doi.org/10.1007/978-94-017-7288-4\\_7](https://doi.org/10.1007/978-94-017-7288-4_7).

- Pandey, A. et al. (2021), "Health and economic impact of air pollution in the states of India: the Global Burden of Disease Study 2019", *The Lancet Planetary Health*, Vol. 5(1), pp. e25-e38, [https://doi.org/10.1016/S2542-5196\(20\)30298-9](https://doi.org/10.1016/S2542-5196(20)30298-9).
- Potoglou, D. and P. S. Kanaroglou (2008), "Modelling car ownership in urban areas: a case study of Hamilton, Canada", *Journal of Transport Geography*, Vol. 16(1), pp. 42-54, <https://doi.org/10.1016/J.JTRANGE.2007.01.006>.
- Railway Technology (2020), *Pakistan approves \$7.2bn rail project*, <https://www.railway-technology.com/news/pakistan-approves-7-2bn-rail-project/> (accessed 30 November 2021).
- SASEC (2021), *SASEC Railway Project in Bangladesh 62% Completed*, <https://www.sasec.asia/index.php?page=news&nid=1315&url=sasec-rail-project-ban-63percent> (accessed 30 November 2021).
- Shrestha, B. P. et al. (2017), "Review of Public Transport Needs of Older People in European Context", *Journal of Population Ageing*, Vol. 10(4), pp. 343-361, <https://doi.org/10.1007/s12062-016-9168-9>.
- Sinha, R. and N. Sareen (2020), *India's Limited Trade Connectivity with South Asia*, Brookings Institution India Center, <https://think-asia.org/bitstream/handle/11540/12034/Trade-Policy-Brief.pdf?sequence=1> (accessed 13 December 2021).
- Tehran Times (2020), *Rail projects worth nearly \$66m put into operation*, <https://www.tehrantimes.com/news/456061/Rail-projects-worth-nearly-66m-put-into-operation> (accessed 30 November 2021).
- Thakur, P. et al. (2020), *Impact of Covid-19 on urban mobility in India: Evidence from a perception study.*, The Energy and Resources Institute (TERI), <https://www.teriin.org/sites/default/files/2020-05/behavioural-effects-covid19.pdf> (accessed 7 December 2021).
- The Times of India (2021), *Indian Railways plans to be 'net zero carbon emitter' by 2030*, <https://timesofindia.indiatimes.com/city/nagpur/indian-railways-plans-to-be-net-zero-carbon-emitter-by-2030/articleshow/83245398.cms> (accessed 30 November 2021).
- Uddin, M. (2020), *Pakistan's National Electric Vehicle Policy: Charging Towards the Future*, The International Council on Clean Transportation, <https://theicct.org/pakistans-national-electric-vehicle-policy-charging-towards-the-future/> (accessed 10 February 2022).
- UKAid (2020), *Country scoping of research priorities on low carbon transport in Nepal*, [https://assets.publishing.service.gov.uk/media/5f8b1156e90e0727cc8d96b1/HVT022.005\\_Low\\_Carbon\\_Scoping\\_Report\\_Nepal\\_FINAL.pdf](https://assets.publishing.service.gov.uk/media/5f8b1156e90e0727cc8d96b1/HVT022.005_Low_Carbon_Scoping_Report_Nepal_FINAL.pdf) (accessed 6 December 2021).
- UNDESA (2019), *World Population Prospects 2019 Volume II: Demographic Profiles*, Online Edition. Rev. 1., United Nations Department of Economic and Social Affairs Population Division, <https://population.un.org/wpp/>.
- UNDESA (2018), *World Urbanization Prospects: The 2018 Revision, Online Edition*, United Nations Department of Economic and Social Affairs, <https://doi.org/10.18356/b9e995fe-en>.
- UNDP (2021), *Economic Instability and Uncertainty in Afghanistan after August 15*, <https://www.undp.org/publications/economic-instability-and-uncertainty-afghanistan-after-august-15> (accessed 1 December 2021).
- UNDP (2016), *Nationally Appropriate Mitigation Action: Sustainable Transport in Sri Lanka through Electric Bus Rapid Transit Systems*, <https://www.undp.org/publications/sustainable-transport-sri-lanka-through-electric-bus-rapid-transit-system> (accessed 6 December 2021).

- UNESCAP (2021a), *Achieving the SDGs in South Asia: An Integrated Approach to Accelerate SDG Progress and COVID-19 Recovery*, [https://www.unescap.org/sites/default/d8files/knowledge-products/South Asia SDG Report 2021\\_261121.pdf](https://www.unescap.org/sites/default/d8files/knowledge-products/South Asia SDG Report 2021_261121.pdf) (accessed 10 February 2022).
- UNESCAP (2021b), *Economic and Social Survey of Asia and the Pacific 2021: Towards post-COVID-19 resilient economies*, <https://www.unescap.org/sites/default/d8files/knowledge-products/Survey 2021 Towards post-COVID-19 resilient economies.pdf> (accessed 10 February 2022).
- UNESCAP (2021c), *Review of Developments in Transport in Asia and the Pacific 2021: Towards Sustainable, Inclusive and Resilient Urban Passenger Transport in Asian Cities*, [https://www.unescap.org/sites/default/d8files/knowledge-products/Review2021\\_rev\\_0.pdf](https://www.unescap.org/sites/default/d8files/knowledge-products/Review2021_rev_0.pdf) (accessed 10 February 2022).
- UNESCAP (2021d), *Ministerial declaration affirms concerted regional action to speed up transition towards sustainable transport and logistics systems*, <https://www.unescap.org/news/ministerial-declaration-affirms-concerted-regional-action-speed-transition-towards-sustainable#> (accessed 10 May 2022).
- UNESCAP (2021e), *Enhancing shift towards Sustainable Freight Transport in Asia and the Pacific- Opportunities through railway Decarbonization*, <https://www.unescap.org/kp/2021/enhancing-shift-towards-sustainable-freight-transport-asia-and-pacific-opportunities>.
- UNESCAP (2019a), *Asia Pacific Trade Facilitation Report*, <https://www.unescap.org/sites/default/files/asia-pacific-trade-facilitation-report-2019.pdf> (accessed 3 February 2022).
- UNESCAP (2019b), *Review of Sustainable Transport Connectivity in Asia and the Pacific: Addressing the Challenges for Freight Transport*, [https://www.unescap.org/sites/default/d8files/knowledge-products/Review2019\\_LowRes-17Feb2020.pdf](https://www.unescap.org/sites/default/d8files/knowledge-products/Review2019_LowRes-17Feb2020.pdf) (accessed 10 February 2022).
- UNESCAP (2019c), *Strengthening Connectivity for Trade and Development: An Assessment of the Southern Asian Container Rail Corridor*, <https://repository.unescap.org/bitstream/handle/20.500.12870/908/ESCAP-2019-WP-Strengthening-connectivity-for-trade-and-development.pdf?sequence=1&isAllowed=y> (accessed 10 February 2022).
- UNESCAP (2017), *Regional Economic Cooperation and Integration in South Asia: Potential, Challenges and the Way Forward*, [https://www.unescap.org/sites/default/d8files/knowledge-products/UNESCAP\\_RECI\\_Report\\_0\\_Sep2018.pdf](https://www.unescap.org/sites/default/d8files/knowledge-products/UNESCAP_RECI_Report_0_Sep2018.pdf) (accessed 10 February 2022).
- UNESCAP (2012), *Regional Cooperation for Inclusive and Sustainable Development: South and South-West Asia Development Report 2012-13*, <https://www.unescap.org/publications/regional-cooperation-inclusive-and-sustainable-development-south-and-south-west-asia> (accessed 10 February 2022).
- UNCRD (2015), *National Sustainable Transport Strategy for Nepal 2015-2040*, [https://www.uncrd.or.jp/content/documents/3377Background Paper -EST Plenary Session 2 \(No. 1\).pdf](https://www.uncrd.or.jp/content/documents/3377Background Paper -EST Plenary Session 2 (No. 1).pdf) (accessed 6 December 2021).
- WEF (2019), *The Global Competitiveness Report 2019*, [https://www3.weforum.org/docs/WEF\\_TheGlobalCompetitivenessReport2019.pdf](https://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf) (accessed 11 February 2022).
- World Bank (2021a), *Nepal-India Regional Trade and Transport Project*, <https://projects.worldbank.org/en/projects-operations/project-detail/P144335?lang=en&tab=overview> (accessed 6 December 2021).
- World Bank (2021b), *South Asia Transport: March 2021*, <https://events.development.asia/system/files/materials/2021/03/202103-wb-business-opportunities-transport-sector.pdf> (accessed 6 December 2021).

World Bank (2021c), *South Asian Economies Recover Amidst Uncertainties*, <https://www.worldbank.org/en/news/press-release/2021/10/07/south-asian-economies-recover-amidst-uncertainties> (accessed 10 May 2022).

World Bank (2021d), *The Khyber Pass Economic Corridor*, <https://projects.worldbank.org/en/projects-operations/project-detail/P159577> (accessed 6 December 2021).

World Bank (2021e), *The World Bank In Afghanistan*, <https://www.worldbank.org/en/country/afghanistan/overview#1> (accessed 1 December 2021).

World Bank (2020), *The World by Income and Region*, <https://datatopics.worldbank.org/world-development-indicators/the-world-by-income-and-region.html> (accessed 15 December 2021).

World Bank (no date), *World Development Indicators*, <https://databank.worldbank.org/source/world-development-indicators> (accessed 10 February 2022).



## Annex A. ITF Transport Outlook 2021 modelling scenarios: *Recover*, *Reshape*, *Reshape+*

Source: extract from ITF Transport Outlook 2021, (ITF, 2021b, p.55-56)

The *Recover*, *Reshape* and *Reshape+* scenarios assess the impacts of different policy pathways on global transport demand, greenhouse gas emissions (reported as CO<sub>2</sub> equivalents), local pollutant emissions, accessibility, connectivity and resilience (depending on the sector) up to 2050. The emissions are based on transport activity and do not include emissions from vehicle production or construction and operation of transport infrastructure.

The three scenarios represent increasingly ambitious efforts by policy makers to decarbonise the transport sector while also meeting the UN Sustainable Development Goals (SDGs). All scenarios account for the Covid-19 pandemic by including the same baseline economic assumptions for the pandemic's impacts. Uncertainty surrounds its economic fallout, the behavioural shifts it may trigger, and the extent to which it will affect transport supply and travel patterns both in the long and short term. The ITF models use middle of the road assumptions that lie somewhere between the most optimistic and most pessimistic forecasts available at the time of modelling.

For GDP and trade in 2020, the ITF models assume a drop in all world regions, based on the International Monetary Fund's World Economic Outlook June update (IMF, 2020[2]) and the World Trade Organization's Trade Statistics and Outlook (WTO, 2020[3]) applied to baseline GDP and trade values from the OECD ENV-Linkages model (OECD, 2020[4]). Following years assume the previous country-specific growth rates after 2020. This is approximated by a five-year delay in GDP and trade projections compared to pre-Covid-19 levels from 2020. Assumptions of economic activity and trade are held constant between all scenarios to better compare the true transport policy impact on activity, CO<sub>2</sub> emissions and other outcomes. Air connectivity growth is also adjusted to account for the severity of the pandemic's impact on aviation. For 2020, ITF models assume a drop in flight frequencies and pre-Covid-19 growth rates to meet the projections for 2025 by the International Air Transport Association (IATA, 2020[5]).

In *Recover*, governments prioritise economic recovery by reinforcing established economic activities. They continue to pursue existing (or imminent) commitments to decarbonise the transport sector, predating the pandemic. Alongside these, governments take action with policies that ensure some of the transport trends that hinder decarbonisation observed during Covid-19 revert back to previous patterns by 2030, as a bare minimum. These include reversing trends in greater private car use and reducing public transport ridership, for example. Changes in behaviour such as reduced business travel or significant shifts to active mobility, which have lowered CO<sub>2</sub> emissions, also revert to pre-pandemic norms by 2030. These short-term trends are listed in Chapter 1 (Table 1.1.). Due to limited policy action on technology innovation, cost reduction in clean energy and transport technologies does not take place to the extent it could. The *Recover* scenario is an updated version of the Current Ambition scenario in the ITF Transport Outlook 2019, accounting for Covid-19 related changes and policies announced since.

The *Reshape* scenario represents a paradigm shift for transport. Governments adopt transformational transport decarbonisation policies in the post-pandemic era. These encourage changes in the behaviour of transport users, uptake of cleaner energy and vehicle technologies, digitalisation to improve transport efficiency, and infrastructure investment to help meet environmental and social development goals. As in

*Recover*, the *Reshape* scenario also assumes that transport trends and patterns observed during the pandemic revert to previous patterns by 2030.

In *Reshape+*, governments seize decarbonisation opportunities created by the pandemic, which reinforce the policy efforts in *Reshape*. Measures reinforce changes in travel behaviour observed during the pandemic, such as reducing business travel or encouraging walking and cycling. Some of these policies are fast-tracked or implemented more forcefully than in *Reshape*. The scenario assumptions also include pandemic impacts on non-transport sectors that may nevertheless influence transport, for instance, a regionalisation of trade due to near-sourcing to improve resilience. Under *Reshape+*, CO<sub>2</sub> emission targets for the transport sector can be achieved sooner and with more certainty and with less reliance on CO<sub>2</sub> mitigation technologies whose efficacy is still uncertain.

The *Reshape* and *Reshape+* scenarios show what is possible with technologies and policies available today, but with increased investments and more political ambition. The policies act additively, meaning that while there are adjustments made for regions, most policies are applied to most regions with some adjustment for regional contexts. Results are not prescriptive in assigning certain combinations of measures to specific regions. The results show what is technically feasible under full implementation. Still, it is recognised that there may be political and financial constraints that require prioritisation of measures depending on local contexts. The policy scenarios show what may happen at a global and regional level under a set of policies to manage transport demand, shift to more sustainable modes, and improve the energy efficiency of vehicles and fuels.

There are many modelling approaches to assess necessary actions for decarbonisation. The ITF models are demand-based and favour a bottom-up approach which starts with potential policy scenarios and evaluates resulting activity and CO<sub>2</sub> emissions. Other useful modelling exercises such as backcasting from a specific goal offers a different set of advantages and drawbacks. Backcasting starts with a goal and works backwards to see where demand and technologies must be to meet such a goal. The ITF favours the current method over backcasting because it allows for creating the most realistic, and therefore relevant scenarios. The current lack of data available to determine regional and sectoral goals across the globe means that selecting a realistic scenario that reflects the unique constraints of every region is not possible.

## Annex B. Freight transport scenario specifications from the *ITF Transport Outlook 2021*

The below table is an [extract](#) from the ITF Transport Outlook 2021. Shading denotes policies with stronger implementation in *Reshape+*

Measure/ Exogenous factor	Description	Recover	Reshape	Reshape+
Economic Instruments				
Distance charges	Distance based charges for road freight.	Charges introduced in 2030 growing to 1 cent per tonne-kilometre by 2050.	Charges introduced in 2030 growing to 2.5 cents per tonne-kilometre by 2050.	Charges introduced in 2025 growing to 6 cents per tonne-kilometre by 2050.
Port fees	Differentiated port fees depending on environmental performance of vessels, i.e. ships with no clean technologies have higher port fees.	Port fees grow an additional 1% by 2050 decreasing the carbon intensity of shipping by 0.5%.	Port fees grow an additional 20% by 2050 decreasing the carbon intensity of shipping by 10%.	Port fees grow an additional 30% by 2050 decreasing the carbon intensity of shipping by 15%.
Carbon pricing	Pricing of carbon-based fuels based on the emissions they produce.	Carbon pricing varies across regions: USD 150- 250 per tonne of CO <sub>2</sub> in 2050.	Carbon pricing varies across regions: USD 300-500 per tonne of CO <sub>2</sub> in 2050.	
Enhancement of infrastructure				
Rail and inland waterways improvements	Increase in attractiveness of intermodal solutions, namely trips with a rail or inland waterway component.	The penalty for mode transfers at intermodal terminals is decreased and alternative specific constant of rail and inland waterways increases. The rate of change varies by world region, e.g. in Western Europe it grows from 2% in 2020 to 20% in 2050.	The penalty for mode transfers at intermodal terminals is decreased and alternative specific constant of rail and inland waterways increases. The rate of change varies by world region, e.g. in Western Europe it grows from 4% in 2020 to 40% in 2050.	The penalty for mode transfers at intermodal terminals is decreased and alternative specific constant of rail and inland waterways increases. The rate of change varies by world region, e.g. in Western Europe it grows from 10% in 2020 to 80% in 2050.
Transport network improvement plans	Construction and upgrade of new infrastructure, e.g. new roads, railways or port expansion.	The transport network is updated with planned new infrastructure and upgrades (e.g. increases in port capacity, developments in Central Asia, TEN-T European projects) expected to become operational between 2020 and 2050.		
Energy transition for long-haul heavy-duty road freight vehicles	Includes a range of solutions to achieve zero emissions for long haul heavy duty road vehicles, including: Electric Roads (ERS), hydrogen fuel cells, advanced batteries, or low carbon fuels (for more check (ITF, 2019 <sub>[11]</sub> ))	Very low, marginal implementation	14% of heavy trucks tkm are on these systems by 2050. Costs begin higher than conventional fuels but by 2050 become lower. Differences in uptakes and costs by regions.	37% of heavy trucks tkm are on these systems by 2050. Costs begin higher than conventional fuels but by 2050 become lower. Differences in uptakes and costs by regions.

Measure/ Exogenous factor	Description	Recover	Reshape	Reshape+
<b>Operations management</b>				
Asset sharing and the Physical Internet	Sharing assets (e.g. vehicles or warehouses) to make resource management for logistics activities more efficient.	Less than 1% Increase in average loads of road freight by 2020 growing to 2% in 2050.	4% Increase in average loads of road freight by 2020 growing to 10% in 2050.	Less than 4% Increase in average loads of road freight in 2020 growing to 20% in 2050. Accelerated increase between 2020 and 2030.
<b>Regulatory instruments</b>				
Slow steaming and speed reduction for maritime and trucks	Reduction of the average speed of ships or trucks to reduce emissions.	Decrease in the speed of road and maritime transport is less than 1% in 2020, growing to a 10% decrease by 2050.	Decrease in the speed of road and maritime transport is 1% in 2020, growing to a 20% decrease by 2050.	Decrease in the speed of Road and Maritime modes by more than 1% in 2020, growing to a 33% decrease by 2050.
Fuel economy standards for internal combustion engine (ICE) vehicles and fuel	Increase in fuel efficiency of ICE road freight vehicles.	Carbon intensity per tkm of ICE trucks reduces by less than 1% in 2020 up to 10% by 2020.		Carbon intensity per tkm of ICE trucks reduces by 2% in 2020 up to 15% by 2020.
Low emission fuel incentives (including electric vehicles) and investment in distribution/supply infrastructure	Increases the share of low emission vehicles km (e.g. electric, hydrogen, clean biofuels, biogas) in commercial vehicle fleets, lowering the average carbon intensity of road freight.	Increases in low emission fuels vehicle shares vary by world-region, in faster adoption regions (e.g. Western Europe) there is an increase of 1% by 2025, growing to 10% by 2050.	Increases in low emission fuels vehicle shares vary by world-region, in faster adoption regions (e.g. Western Europe) there is an increase of 2.6% by 2025, growing to 20% by 2050.	Increases in low emission fuels vehicle shares vary by world-region, in faster adoption regions (e.g. Western Europe) there is an increase of 4% by 2025, growing to 30% by 2050.
Heavy Capacity Vehicles (HCV)	Road vehicles that exceed the general weight and dimension limitations set by national regulations. Truck loads increase 50% and costs fall 20% per tonne-kilometre where HCVs are adopted.	By 2050 2% of non-urban road freight transport activity (tkm) is done with high capacity vehicles.	By 2050 5% of non-urban road freight transport activity (tkm) is done with high capacity vehicles.	By 2050 10% of non-urban road freight transport activity (tkm) is done with high capacity vehicles.
<b>Stimulation of innovation and development</b>				
Autonomous Vehicles and Platooning	Simulates the adoption of autonomous trucks (platooning and full autonomy) in road freight. The adoption of this technology reduces costs for road freight, but also its CO <sub>2</sub> intensity, on the other hand it can induce demand and reverse modal shift.	Adoption varies by sector (urban and non-Urban) and world-region. Very low to marginal adoption in this scenario.	Up to 45% uptake on non-urban in some regions by 2050 (Europe, North America, China, Japan and South Korea). Uptake on urban freight is lower. Decrease of 14% on carbon intensity and 45% on costs.	Up to 90% uptake on non-urban in some regions by 2050 (Europe, North America, China, Japan and South Korea). Uptake on urban freight is lower. Decrease of 14% on carbon intensity and 45% on costs.
Electric/alternative fuel vehicle penetration and increases in efficiency for all transport modes	Electric/alternative fuel vehicle penetration and increases in efficiency for all transport modes (including average loads and vehicle capacity).	Follows the IEA STEPS Scenario.	Follows the IEA SDS Scenario.	

Measure/ Exogenous factor	Description	Recover	Reshape	Reshape+
Intelligent Transport Systems (ITS) and eco-driving	Development of ITS to provide better quality, real-time, automatic data collection and processing to improve fleet management, routing and assist driving.	Implemented with regional variations, in regions with faster deployment (e.g. Western Europe) reductions of 4% in carbon intensity in 2020 and close to zero in 2050.	Implemented with regional variations, in regions with faster deployment (e.g. Western Europe) reductions of 10% in carbon intensity in 2020 and 1% in 2050.	Implemented with regional variations, in regions with faster deployment (e.g. Western Europe) reductions of 15% in carbon intensity in 2020 and close to 2% in 2050.
<b>Exogenous factors</b>				
3D Printing	Enables manufacturing closer to the point of consumption, leading to drop in long distance trade for several commodities compared to estimated values, namely manufactured goods.	Negligible impact on trade.	International trade shrinks 10% by 2050. Values differ by commodities, electronic and manufactured goods have higher falls.	
Decarbonisation of energy	Decreases in trade and consumption of oil and coal as societies decarbonise, directly impacting freight transport demand for fossil fuels.	Oil and Coal grow less than other commodities (following ENV-Linkages model (ENV-OECD), (Château, Dellink and Lanzi, 2014))	Yearly decrease of 3.35% for coal and 2.1% for oil. By 2050 coal trade has reduced 65% and oil close to 50%, compared to 2020 estimates.	Yearly decrease of 10% for coal and 2.1% for oil. By 2050 coal trade has reduced by 96% being almost phased-out globally and there is close to a 50% decrease in oil consumption compared to 2020 estimates.
Trade regionalisation	Simulates increased trade exchanges within regions or trade blocks, while decreasing longer distance trade between regions.	No additional fees compared to baseline.		5% increase in penalty fees for intra-regional trade.
E-commerce	Simulates the impact of growth in e-commerce and home deliveries. Increases the estimated demand of goods over time in addition to the projected values.	Urban freight with an additional 5% demand increase by 2050, smaller impacts on non-urban freight.		

Note: There is an overlap between the “Energy transition for long-haul heavy-duty road freight vehicles”, “Low emission fuel incentives (including electric vehicles) and investment in distribution/supply infrastructure” and “Electric/alternative fuel vehicle penetration” measures. But they apply differently to different regions of the world and vehicle types, the adoption rate implemented in the scenario matches the highest value between this three measures for each world region and vehicle type/operation.

Source: ITF (2021, p.184-186)

## Annex C. Urban passenger transport scenario specifications from the *ITF Transport Outlook 2021*

The below table is an [extract](#) from the ITF Transport Outlook 2021. Shading denotes policies with stronger implementation in *Reshape+*

Measure/Exogenous factor	Description	Recover	Reshape	Reshape+
Economic instruments				
Carbon pricing	Pricing of carbon-based fuels based on the emissions they produce.	Carbon pricing varies across regions: USD 150-250 per tonne of CO <sub>2</sub> in 2050	Carbon pricing varies across regions: USD 300-500 per tonne of CO <sub>2</sub> in 2050	
Road pricing	Charges applied to motorised vehicles for the use of road infrastructure.	0% to 7.5% increase of non-energy related car use costs by 2050, half for motorcycles.	2.5% to 25% increase of non-energy related car use costs by 2050, half for motorcycles.	
Parking pricing and restrictions	Regulations to control the availability and price of parking spaces for motorised vehicles.	5% to 50% of a city area subject to parking constraints, and 0% to 60% increase in parking prices by 2050.	7% to 75% of a city area subject to parking constraints and 20% to 150% increase in parking prices by 2050.	
Enhancement of Infrastructure				
Land-use planning	Densification of cities.	Density variation of -10% to +20% for the city centre of urban areas over 300 000 inhabitants. Density variation of -10% to +10% for cities under 300 000 inhabitants and for suburbs of urban areas over 300 000 inhabitants.	Density variation of 0% to +40% for the city centre of urban areas over 300 000 inhabitants. Density variation of 0% to +20% for cities under 300 000 inhabitants and for suburbs of urban areas over 300 000 inhabitants.	
Transit-Oriented Development (TOD)	Increase in mixed-use development in neighbourhoods around public transport hubs.	Increases the land-use diversity mix and increases the accessibility to public transit by 5% by 2050.	Increases the land-use diversity mix and increases the accessibility to public transit by 7.5% by 2050.	Increases the land-use diversity mix and increases the accessibility to public transit by 10% by 2050.
Public transport priority measures and express lanes	Prioritising circulation of public transport vehicles in traffic through signal priority or express lanes.	0% to 40% of bus, light rail transit and bus rapid transit network prioritised by 2050.	10% to 60% of surface public transport network prioritised by 2050.	
Public transport service improvements	Improvements to public transport service frequency and capacity.	-10% to +10% service improvement for rail or corridor based public transport systems resulting in a -1% to +1% speed variation by 2050. 10% to 30% service improvement for bus and paratransit transport systems resulting in a 0.25% to 0.7% speed variation by 2050.	10% to 15% service improvement for rail or corridor based public transport systems resulting in a 1% to 1.5% speed variation by 2050. 20% to 50% service improvement for bus and informal public transport systems resulting in a 0.5% to 1.25% speed variation by 2050.	
Public transport infrastructure improvements	Improvements to public transport network density and size.	0% to 100% growth increase for the public transport network by 2050.	0% to 200% growth increase for the public transport network by 2050.	

Measure/Exogenous factor	Description	Recover	Reshape	Reshape+
Integrated public transport ticketing	Integration of public transport ticketing systems.	1.5% to 4.5% reduction of a public transport ticket cost, and 2.5% to 7.5% reduction of public transport monthly subscription cost by 2050.	1.5% to 7.5% reduction of a public transport ticket cost, and 2.5% to 12.5% of public transport monthly subscription cost by 2050.	
Bike and Pedestrian infrastructure improvements	Increase in dedicated infrastructure for active mobility.	20% to 300% increase in road space available to active modes by 2050 and a simultaneous increase in the speed of active modes, including micromobility	40% to 500% increase in road space available to active modes by 2050 and a simultaneous increase in the speed of active modes, including micromobility.	50% to 600% increase in road space available to active modes by 2050 and a simultaneous increase in the speed of active modes, including micromobility.
Speed limitations	Traffic calming measure to reduce speed and dominance of motor vehicles through low-speed zones or infrastructure.	2% to 30% reduction of speed on main roads, by 2050	5% to 50% reduction of speed on main roads, by 2050	
Regulatory instruments				
Urban vehicle restriction scheme	Car restriction policies in certain areas and during certain times to limit congestion. Typically applied in the city centre.	0% to 17.5% reduction of car ownership by 2050, Reduction of the car and carsharing speeds while increasing the car and motorcycle access time.	3.5% to 25% reduction of car ownership by 2050, Reduction of the car and carsharing speeds while increasing the car and motorcycle access time.	
Low-emission vehicles incentives and infrastructure investment	Financial incentives for the purchase and use of alternative fuel vehicles and investment in charging infrastructure.	Decreases average vehicle-kilometres made with diesel, gasoline and methane fuels between 0% and 4% by 2050.	Decreases average vehicle-kilometres made with diesel, gasoline and methane fuels between 0% and 36% by 2050.	Decreases average vehicle-kilometres made with diesel, gasoline and methane fuels between 0% and 45% by 2050.
Stimulation of innovation and development				
Electric/alternative fuel vehicle penetration	Degree of uptake of electric/alternative vehicles in an urban vehicle fleet	Follows the IEA STEPS Scenario	Follows the IEA SDS Scenario	
Carsharing incentives	Incentives to encourage car rental schemes where members have access to a pool of cars as needed, lowering car ownership	0% to 15% increase in shared car availability per capita, and 0% to 40% increase in shared motorcycle availability per capita, by 2050.	5% to 30% increase in shared car availability per capita, and 10% to 60% increase in shared motorcycle availability per capita, by 2050.	
Carpooling policies	Carpooling policies encourage consolidating private vehicle trips with similar origins and destinations.	3.5% to 8.3% increase in average load factor by 2050.	7.6% to 16.7% increase in average load factor by 2050.	
Ridesharing/shared mobility	Increased ridership in non-urban road transport (car and bus)	25% to 200% increase of ridesharing vehicles per capita growth by 2050. Load factor evolution from -50% to +25% by 2050.	25% to 300% increase of ridesharing vehicles per capita growth by 2050. Load factor increase from 0% to 100% by 2050.	

Measure/Exogenous factor	Description	Recover	Reshape	Reshape+
Mobility as a Service (MaaS) and multimodal travel services	Improved integration between public transport and shared mobility (app integration, as well as physical infrastructure, ticketing and schedule integration). Increase in availability and load factors of shared mobility	1.7% to 10% reduction of a public transport ticket cost, and 1.0% to 6.0% reduction of shared mobility cost by 2050. Increase in the number of shared mobility vehicles and stations	3.3% to 20% reduction of a public transport ticket cost, and 2.0% to 12.0% reduction of shared mobility cost by 2050. Significant increase in the number of shared mobility vehicles and stations	
<b>Exogenous factors</b>				
Autonomous vehicles*	Introduction of vehicles with level 5 autonomous capabilities	The percentage of autonomous vehicles in use varies across regions: for car 0% to 3%, for bus 0% to 1.5%, for shared vehicles 0% to 6%.		
Teleworking	Reduces business and commuting trips, while increasing short non-work trips.	2.5% to 20% of the active population could telework by 2050.	3.5% to 30% of the active population could telework by 2050.	5% to 40% of the active population could telework by 2050.

Note: Range of values reflect the varying degrees of implementation of policy measures across the different world regions in each scenario. Unless otherwise specified, a % change indicates an alteration of a certain variable in a given year compared to the absence of a policy. For example, PT ticket costs are endogenously calculated for each city and year by the model, indexed to GDP, assuming no policy action. An X% decrease would be applied to the ticket price of the specific city and year.\*Autonomous vehicles are considered but are not a primary factor in any of the scenarios. All scenarios assume a constant level of introduction of vehicles with Level 5 autonomy. The *ITF Transport Outlook 2019* focussed more specifically on transport disruptions, including autonomous vehicles, and assessed related scenarios.

Source: extract from ITF (2021) Transport Outlook 2021, Table 3.3, p. 93-95



## Annex D. Non-urban passenger transport scenario specifications from the *ITF Transport Outlook 2021*

The below table is an [extract](#) from the ITF Transport Outlook 2021. Shading denotes policies with stronger implementation in *Reshape+*

Measure/Exogenous factor	Description	Recover	Reshape	Reshape+
Economic instruments				
Ticket taxes (air travel)	Percentage tax applied on the cost of airfare	Ticket taxes vary across regions: 3-15% in 2050	Ticket taxes vary across regions: 8-30% in 2050	
Carbon pricing	Charges applied on tailpipe CO <sub>2</sub> emissions	Carbon pricing varies across regions: USD 150-250 per tonne of CO <sub>2</sub> in 2050	Carbon pricing varies across regions: USD 300-500 per tonne of CO <sub>2</sub> in 2050	
Enhancement of infrastructure				
Development of ultra-high-speed rail	Introduction of new ultra-high-speed rail routes, such as Maglev	No development of new ultra-high-speed rail	Development of Maglev routes where economically feasible	
Improvements in rail infrastructure	Investments in existing rail infrastructures leading to frequency and speed increases	Frequency increases by 50% (year of improvement varies across regions)	Frequency (50%) and speed (20%) improvements across regions	Earlier frequency (50%) and speed (20%) improvements across regions
Regulatory instruments				
Synthetic fuels (aviation)	Decrease of synthetic aviation fuel cost relative to conventional fuel as a result of technological developments	Synthetic fuels cost is 3.3 times more expensive than conventional fuel	Synthetic fuels cost is three times more expensive than conventional fuel	
Mandates in aviation for sustainable aviation fuels (SAF)	SAF should constitute a minimum percentage of total fuel used	Minimum SAF percentage varies across regions 5-10% in 2050	Minimum SAF percentage varies across regions 10-25% in 2050	Minimum SAF percentage varies across regions 15-30% in 2050
Operational instruments				
Optimise aircraft movements	Flights are closer aligned to greater circle paths	Deviations are reduced by 50% in 2030	Deviations are reduced by 50% in 2020	
Simulation of innovation and development				
Electric/alternative fuel vehicle penetration	Increased penetration of electric vehicles in non-urban road transport due to financial incentives for the purchase and use of alternative fuel vehicles and investment in charging infrastructure.	Follows the IEA STEPS Scenario	Follows the IEA SDS Scenario	Increased penetration on top of IEAs SDS Scenario

Measure/Exogenous factor	Description	Recover	Reshape	Reshape+
Hybrid-electric planes	Development of new hybrid-electric aircraft.	Hybrid-electric aircraft are available from the year 2030. They provide 5-7.5% of total energy required reaching up to 20-30% in 2050 depending on the region.	Hybrid-electric aircraft are available from the year 2030. They provide 7.5-10% of the total energy required reaching up to 30-40% in 2050 depending on the region.	
Ridesharing/shared mobility	Increased ridership in non-urban road transport (car and bus)	The percentage of shared trips of total trips by car equals 6.7%	The percentage of shared trips of total trips by car varies across regions 13.3% – 20.0%	
Mobility as a Service (MaaS) and multimodal travel services	Improved integration between different transport modes. Integration of ticketing and increase of intermodal terminals/stations	Switching between different modes is twice as penalising as between the same mode	Switching between different mode is no more penalising than between the same mode	
Improvement in range and cost of all-electric planes	Development of all-electric aircraft	Flying range of all-electric planes increases by 2050 up to 1 000 km Cost of all-electric aviation is 1.5 times that of conventional aircraft	Flying range of all-electric planes increases by 2050 up to 1 500 km Cost of all-electric aviation is 1.2 times that of conventional aircraft	
<b>Exogenous factors</b>				
Autonomous vehicles*	Introduction of vehicles with level 5 autonomous capabilities The percentage of autonomous vehicles in use varies across regions: for car 0-2.5%, for bus 0-1.25%			
Reduction in long-distance leisure-tourism	Reduced tendency to take long-distance leisure trips as a consequence of Covid-19 pandemic	none	none	Long distance trips are reduced by 15% to 22% (compared to demand without this factor) between 2020 and 2030. The impact reduces linearly reaching 0% in 2050.
Reduction in business travel due to teleconferencing	Replacement of business trips with teleconferencing as a consequence of Covid-19 pandemic	none	none	Air trips are reduced by 12.5% (compared to demand without this factor) between 2020 and 2030. The impact reduces linearly reaching a 2.5% reduction in 2050.
Reduced propensity to fly	Segments of the population avoid flying due to climate considerations	10-15% fewer people fly in some regions in 2050	5-30% fewer people fly in most regions in 2050	

Note: Range of values reflect the varying degrees of implementation of policy measures across the different world regions in each scenario.

\*Autonomous vehicles are considered but are not a primary factor in any of the scenarios. All scenarios assume a constant level of introduction of vehicles with Level 5 autonomy. The *ITF Transport Outlook 2019* focussed more specifically on transport disruptions, including autonomous vehicles, and assessed related scenarios

Source: extract from ITF (2021) Transport Outlook 2021, Table 4.3, p.142-144

## ITF South and Southwest Asia Transport Outlook

---

This report provides scenarios for future transport demand and CO<sub>2</sub> emissions in South and Southwest Asia up to 2050 to help decision-makers chart pathways to sustainable, resilient transport. The scenarios reflect existing policy initiatives and specific constraints in the region. They also examine the potential impact of policies addressing the challenges and opportunities for transport from Covid-19.

**International Transport Forum**

2 rue André Pascal  
F-75775 Paris Cedex 16  
+33 (0)1 73 31 25 00  
[contact@itf-oecd.org](mailto:contact@itf-oecd.org)  
[www.itf-oecd.org](http://www.itf-oecd.org)