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# Climate action and resilience in transport

(Background Paper for EST Plenary Session-2)

**Final Draft**

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This background paper has been prepared by Mr. Holger Dalkmann, Founder and CEO, Sustain 2030, Berlin, Germany, for the 13th Regional EST Forum in Asia. The views expressed herein are those of the author only and do not necessarily reflect the views of the United Nations.

# Climate Action and Resilience in Transport

Holger Dalkmann

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# Table of Contents



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# Chapter 1: Background

Despite considerable advancements in vehicle technology and fuel efficiency in recent years, the transportation sector is still one of the largest sources of greenhouse gas (GHG) emissions and air pollution, contributing to climate change and impacting health. According to the International Energy Agency (IEA), in 2018, the transport sector alone was responsible for 24% of direct $CO_2$ emissions from fuel combustion, which is expected to further increase to 46% of global emissions by 2035, and it could reach up to 80% by 2050. Transport $CO_2$ emissions have increased considerably in Asia and are now the highest in the world. For instance, transport $CO_2$ emissions in Asia increased from 35% in 2000 to 41% in 2015. Similarly, freight emissions are now growing much faster than passenger transport emissions.

Asian countries have experienced spectacular economic growth in the past few decades, meanwhile climate change as well as an increasing frequency and magnitude of natural disasters have emerged as the major challenges for the Asian region. Global warming and sea level rises are advancing more rapidly than ever before. Statistics show that sea levels have risen by about 20 cm since 1880 and are projected to rise to 122 cm by 2100. If the current emission trends continue as usual, the resultant increase in average global temperature could exceed 4°C by the end of century (UNEP 2020). Meanwhile, the intensity and the magnitude of the climate induced natural disasters are increasing over time.

Considering the above situation, Asian countries and cities need urgent climate actions to mitigate the climate change impacts and to achieve the targets laid out in the Paris Climate Agreement and the SDGs. Only a substantial transformation of the transport sector will bring Asian countries on a pathway to reach those targets.

## 1.1 Introduction: Latest trends in Asia and the Pacific

Despite the commitment and actions by government to tackle climate change, the motorisation trend in Asia and the Pacific is continuing. Between 2000 and 2017 the numbers of cars per 1000 people almost doubled from 51.4 to 96.4. At the same time the economy grew by 116% and the population by 21% (SLOCAT 2020).

While the economy in Asia was impacted by the COVID-19 pandemic, the increase of car sales in China and India is continuing the motorisation trend. In India sales in April came almost to a standstill but by September the sales were up again to 1.97 million, which is the same level than pre-COVID-19 (Trading Economics 2020). Also in China figures reached last years sales with 1.94 million sold passenger cars. While the increase was mostly driven by the increase of sales of SUVs, 138,000 units were either electric or plug-in hybrids vehicles (Bloomberg News 2020).

The impact on motorisation can be seen in the continuous growth in emission. With more than a third of the 2.4 Gt of $CO_2$ emissions coming from transport in 2019.

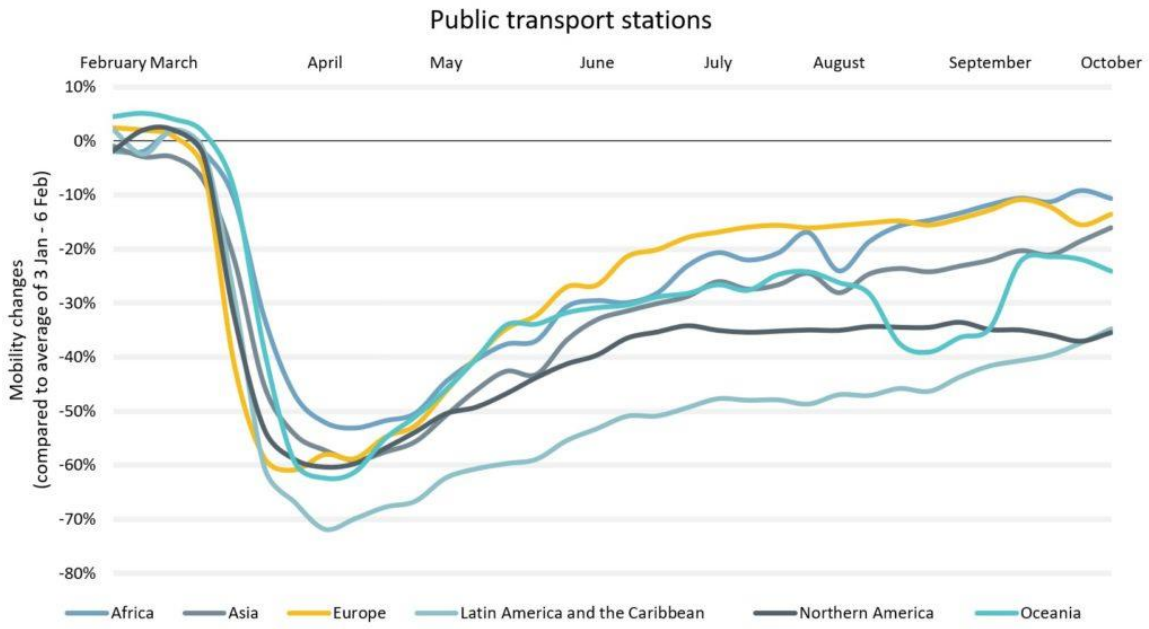
With the increase of $CO_2$ emissions the impact of climate change is notable. The annual loss of human life and property damage from climate-related disasters has increased significantly. According to the United Nations Office for Disaster Risk Reduction (UNDRR) in the period 2000 to 2019, there were 7,348 major recorded disaster events claiming 1.23

million lives, affecting 4.2 billion people (many on more than one occasion) resulting in approximately US$2.97 trillion in global economic losses.
Much of the difference is explained by a rise in climate-related disasters including extreme weather events: from 3,656 climate-related events (1980-1999) to 6,681 climate-related disasters in the period 2000-2019. In that time period, Asian countries like China (577 disasters), India (321), The Philippines (304), and Indonesia (278) are among the most impacted.
A report on Assessing the Costs of Climate Change and Adaptation in South Asia has revealed that South Asia could lose about 1.8% of its annual GDP due to climate change impacts by 2050, and progressively up to 8.8% by 2100 under the business-as usual scenario (ADB, 2014).
Another negative impact of the growth of fossil fuel-based cars is air pollution. In 2019 the 50 most polluted cities ($PM_{2.5}$) were all in Asia (IQ Air 2020). A paper on air pollution for Asia for the EST Forum 2019 highlighted the continuous increase of the negative impact of air pollution despite significant efforts by Asian countries (Dalkmann 2019).

## 1.2 Impact of COVID-19 on the transport system in Asia

Transport is at the heart of the pandemic. Freight restrictions affected access to food and concerns about infection impacted people's willingness to travel and commute via public transport. On the other hand, reduced vehicle usage during lockdowns brought benefits - better air quality, fewer accidents and lower Greenhouse Gas (GHG) emissions - for a short period of time.
At the beginning of the pandemic during periods of lock down, the responses in countries were similar and led to a reduction of public transport use of up to 80%. As Figure 1 shows the decrease in Asia during April and May was almost on the same level as the rest of the world. Over the last months there has been a global recovery, with the Asian numbers following a similar trend to Europe and Latin America with an overall decrease of about 15% on pre pandemic rates.

*Figure 1: Mobility changes accessing public transport stations*

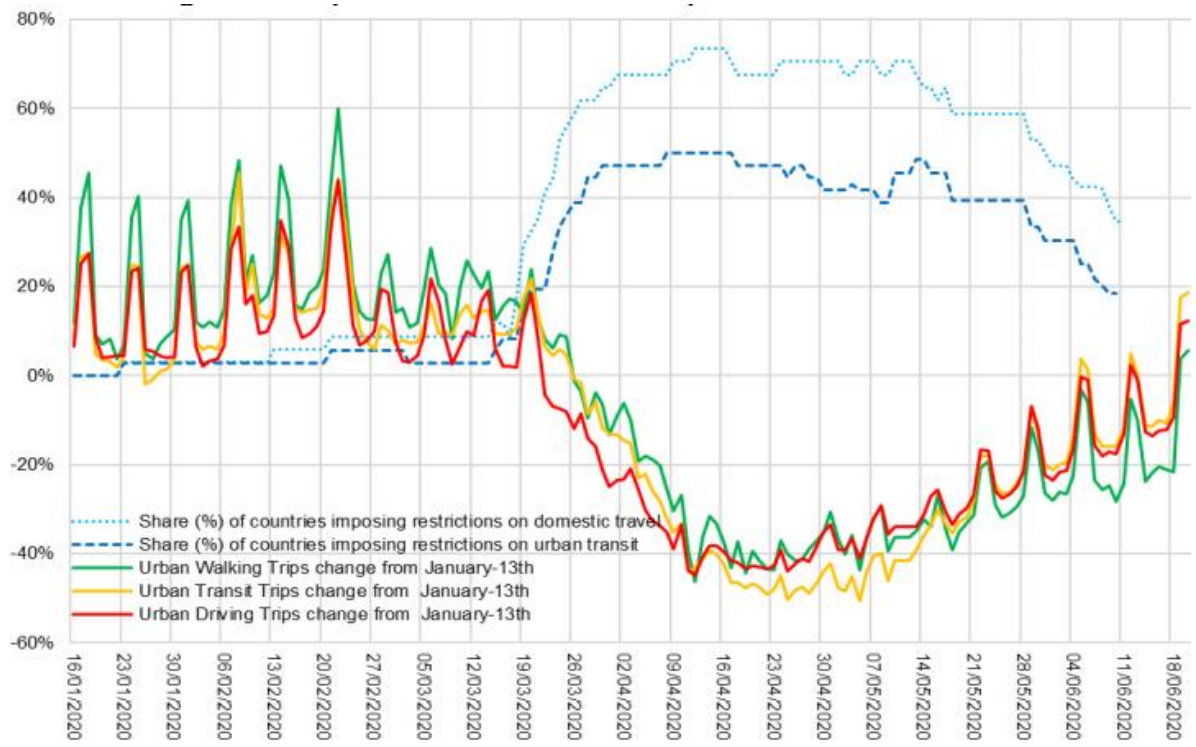



Source: SLOCAT (2020)

*Figure 2 again shows the reduction in trips in Asian countries during the lock-down period across March, April and May. After restrictions eased, trip numbers slowly returned close to pre-pandemic level, however some significant changes can be observed: more walking, cycling and car use and less use of public transport (See*

Figure 2).

*Figure 2 Impact of COVID-19 on Transport in Asia and the Pacific*



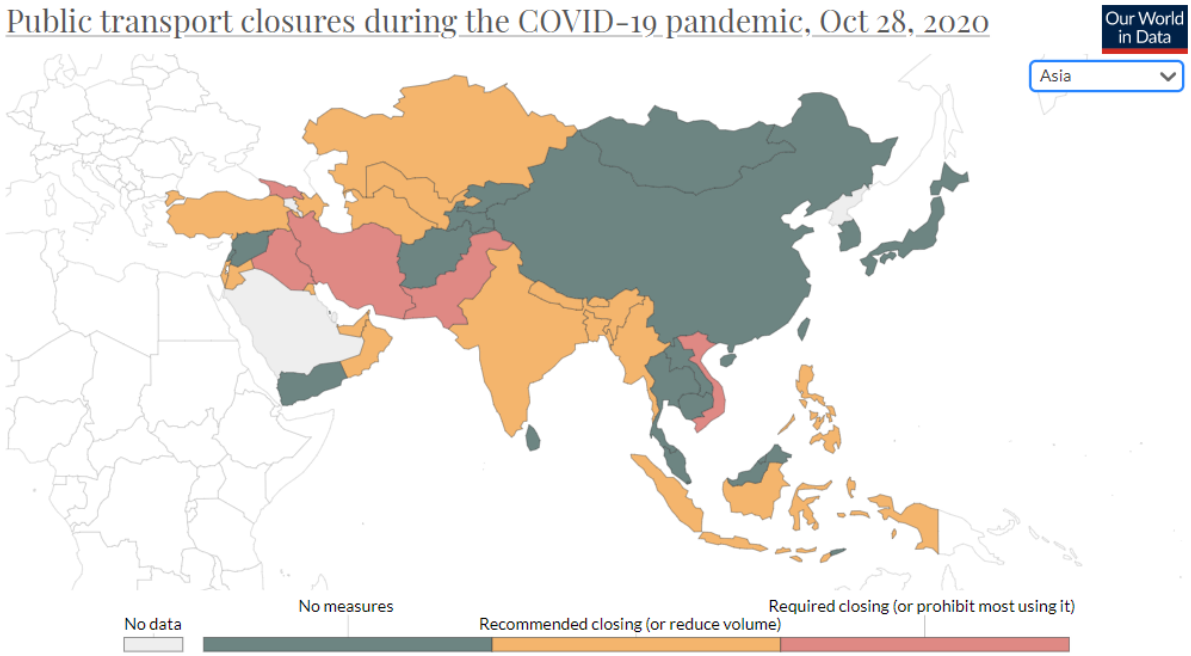

Source: ADB (2020)

Walking and cycling are being recommended by the World Health Organisation (WHO) as the preferred mode to keep physical distance and staying outside where there is a lower risk of infection (WHO 2020). At the same time there are public concerns about public transport. Car use in many Asian countries has increased. For example, according to a survey by ITDP, 40% of the public transport users in China switched to motor vehicles (private cars, taxis and ride-hailing) (Zhou et al 2020).

At the same time, more than 30% of people were able to work from home and online retailing went up by over 70% against 2019 (Zhou et al 2020).

COVID-19 policy responses vary across Asian countries in terms of restriction of public transport services. Figure 3 shows public transport closures across Asia as of October 28th 2020. While countries like Japan, Sri Lanka and Thailand have no restriction, many other countries like India and Indonesia have recommended closing or reducing the carrying capacity of public transport to enable physical distancing. A few countries in Asia, like Pakistan, have currently (as of October 28th, 2020) closed or severely restricted use of their public transport services.

*Figure 3 Public transport closures during the COVID-19 pandemic (October 28th 2020)*

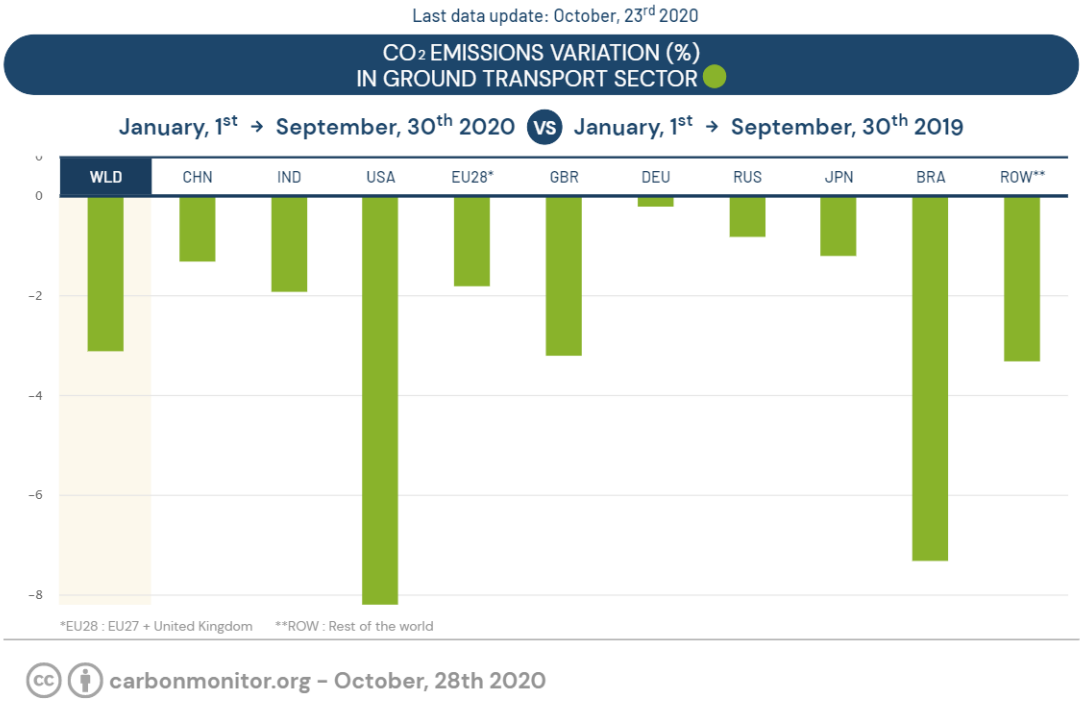



Source: Oxford University (2020)

The initial lock down lead to a substantial reduction of transport and economic activities, which led globally to a reduction of GHG emission of 8% against 2019 (Forster et al, 2020). However, with the increase in passenger car usage and decrease of public transport use, $CO_2$ emissions from transport are expecting to rise again with the increasing economy activities.

To take the global reduction into context, according to United Environmental Program Report, there is a need to cut global emissions by 7.6 % each year for the next decade to meet the 1.5 $^{o}$C Paris target (UNEP 2020). So, in other words, the world globally has to reduce emissions by almost the same amount as during the pandemic this year. Assuming an economy recovery, this would require a substantial change of current policies, which will be further discussed in Chapter 4. However, transport emissions reduction of China, Japan and India in comparison to the other largest global $CO_2$ emitters, is only between 1 and 2% against last year in the same period of time (See Figure 4).

*Figure 4: $CO_2$ emissions variation in ground transport sector (selected countries)*




Source: Tsinghua University (2020)

# Chapter 2: Driver for $CO_2$ emissions, mitigation potential and resilient solutions

Based on the described urgency to tackle climate change and the need to reduce $CO_2$ emissions from transport to achieve the Paris Agreement, this chapter will look in more detail at the following main driver of transport growth, the COVID-19 impacts and the options for national government responses.

At the beginning the following main driver for $CO_2$ emission increase will be described:

- The increase in freight transport (particular non-urban);
- The continuous increase of passenger cars; and
- The growth of urban transport through continuous urbanisation.

Though the three areas are not entirely separate, e.g. passenger vehicles are used in an urban and non-urban environment and freight transport is also part of urban transport, these groupings relate to different policy areas and therefore are discussed separately whilst acknowledging the interconnectivity.

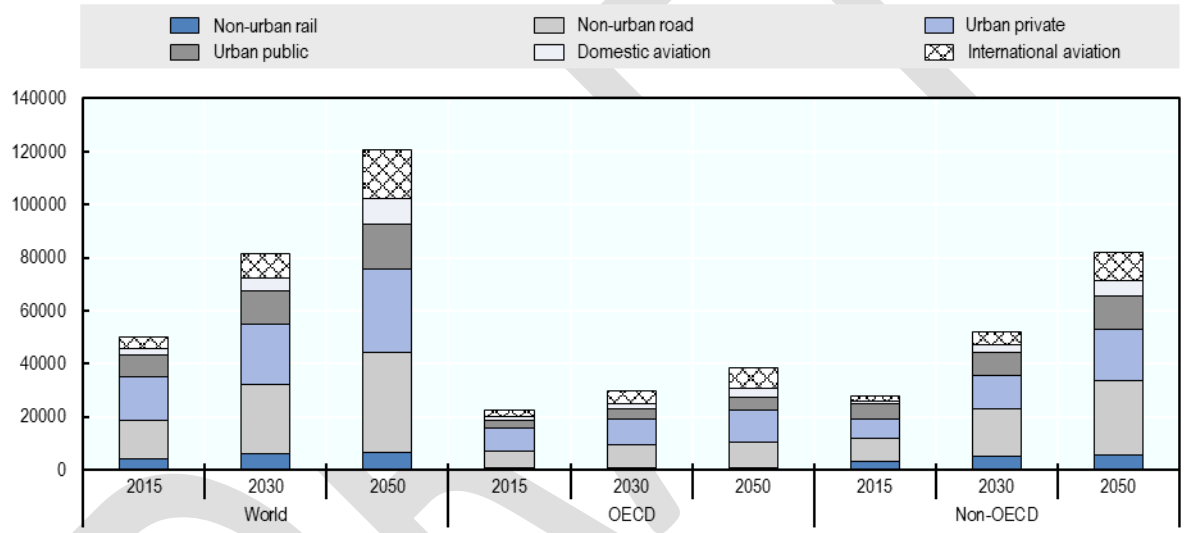
Understanding the latest published trends and scenarios related to those identified drivers and its carbon footprint will allow a better, more targeted policy response and a clearer understanding of the scale of the challenge.

As COVID-19 brought a new level of uncertainty into predicting and acting on the future of transport, potential impacts of COVID-19 will be described for key drivers of transport $CO_2$ emissions (see above).

## 2.1 Transport as a key driver for increasing $CO_2$ emissions

As described in Chapter 1, personal motorisation is one of the major drivers increasing GHG emissions, contributing 24% of direct $CO_2$ emissions globally. ITF as well as the International Energy Agency (IEA) predict that the global car fleet will more than double from 1 billion to over 2 billion by 2050 while the average annual distance travelled is assumed to keep on the 2015 level (See Figure 5). The largest growth is expected to be outside the OECD where Asia is covering the largest increase.

*Figure 5: Demand for passenger transport by mode*

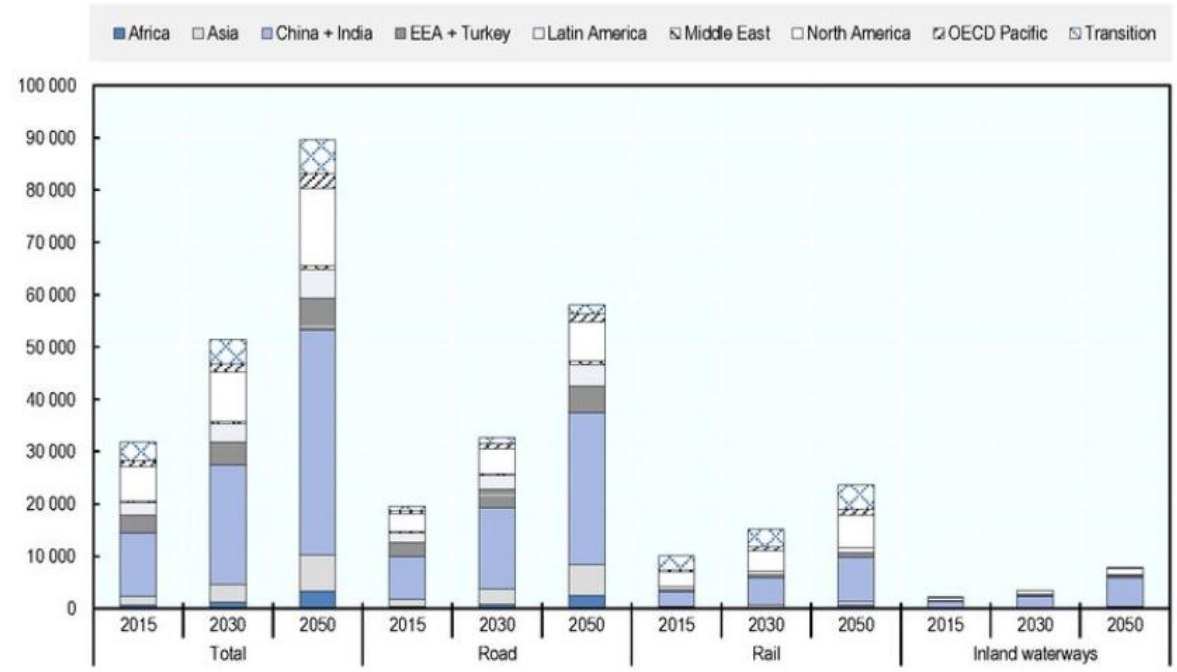



Source: ITF 2019

Another key driver in Asia for the continuous increase of GHG emissions, resulting from a growing economy, is freight transport. This is becoming another major source of $CO_2$ emissions contributing more than 40% of the global total $CO_2$ emissions from transport worldwide (SLOCAT 2018).

The International Transport Forum (ITF), in their business as usual scenario, predicts a global increase of $CO_2$ emissions from transport by 60% by the year 2050 on the base year of 2015 (ITF 2019). ITF assumes that the main increase will come from freight. The largest increase of global surface freight demand is predicted for Asia. By 2050 Asia will be responsible for 56% of the global surface freight demand (see Figure 6, ITF 2019). This is driven by the predicted high economic growth with an annual growth rate for India of 5.2 percent (2015 – 2050) and for China of 3.2 percent (World Bank 2019).

*Figure 6 Projected demand for surface freight transport by region (ITF demand pathways, billion tonne-kilometres)*




Source: ITF 2019

Between 2014 and 2017 the largest increase in tonne kilometres in India (9.4%) and China (9.3%) were seen in road freight, though capacity on rail freight grew between 2014 and 2017 by 13.3 % (China) and 5.5% (India). However, the largest percentage growth in the freight transport sector was in aviation. Though only 200 billion tonne-kilometres (t-km) out of 90 trillion t-km of the total freight demand were covered by aviation, due to its high $CO_2$ emissions factor, the role of aviation is very relevant from a climate perspective (ITF 2019). Furthermore, ITF predicted prior to the pandemic a fivefold increase in the aviation sector over the next 30 years. As aviation is not part of the Paris agreement and not accounted for within national emission inventories, it often does not receive the necessary attention by the national governments.

In addition to the $CO_2$ increase caused by freight transport and the growth of passenger cars, urban mobility is another main source of $CO_2$ emissions from transport. World-wide about a third of transport emissions are emitted in urban agglomerations by urban transport (SLOCAT 2018), and ongoing urbanisation will continue to fuel this growth. The Asia Pacific region had a population of 4.48 billion people in 2017, which accounted for more than 60% of the global population (SLOCAT 2018). More than half of these residents already lived in urban agglomerations (2.38 billion) in 2015 (SLOCAT 2018). It is estimated that the population of Asia will grow by 50% in Asia by 2050 based on 2015 levels, with and 2 out of every 3 people living in cities in Asia and the Pacific (UNHABITAT, UNESCAP 2015).

According to a projection of mitigation measures by ITF, the prospects for $CO_2$ emission reductions has the highest potential from the urban mobility sector. In ITF's ambitious scenario (reducing $CO_2$ emissions by transport by 60% percent), the share of passenger kilometres in cities using private vehicles declines from 70% in 2015 to 40% by 2050. ITF

assumes that shared modes (ride-hailing, bike sharing, e-scooter, etc.) will grow and account for over 20% of the total demand in cities. Public transport would have a modest increase from 30 to 35%. ITF predicts, that these changes and an improved vehicle fuel efficiency of passenger cars, would lead to a 20% reduction in $CO_2$ emissions by 2050 compared to 2015 though the passenger kilometres double. However, due to ongoing urbanisation and with that an increase of transport demand in cities, all the outlined measures need to be aligned with the Paris Agreement. Even though these reductions outlined in the ITF scenario are already ambitious, they are not sufficient for reaching the Paris Agreement targets.

## 2.2 The new uncertainty due to COVID-19

Due to the timing of the publication of the Transport Outlook prior to spring 2020, the ITF analyses does not take the impacts of COVID-19 into account. The International Energy Agency (IEA) in their annual World Energy Outlook (WEO) published in October 2020 includes the potential impact of the pandemic into their different scenarios on the future energy use and fuel market for the next decade. (IEA 2020). In their Stated Policies Scenario (SPS) they assume that COVID-19 will be brought under control in 2021, while a delayed recovery scenario assumes a full control over the pandemic and a global economic recovery by 2023 with substantial impacts on the energy market (IEA 2020).
When formulating future policies it is necessary to consider the following substantial uncertainties surrounding COVID-19 recovery:
a) Transport behaviour change (travel reduction): The longer the disruption, the more some changes that result in reduced fuel consumption become engrained, such as working from home or avoiding air travel.
b) Transport behaviour change (mode shift): Not all the shifts in consumer behaviour reduces fuel and therefore $CO_2$ emissions. It benefits from a near-term aversion to public transport, the continued popularity of SUVs and the delayed replacement of older, inefficient vehicles.
c) Fuel use for passenger cars peaks could lead to lower by continued improvements in fuel efficiency and robust growth in sales of electric cars.
d) Lower fuel prices, compared with pre-crisis trajectories, mean that payback periods for efficiency investments are extended, slowing the rate of global efficiency improvement.
As shown in Chapter 1, the pandemic and its aftermath can suppress emissions, but “low economic growth is not a low-emissions strategy. Only an acceleration in structural changes to the way the world produces and consumes energy can break the emissions trend for good.” (IEA 2020).

## 2.3 National policy responses

One response to the drivers that supports the future decarbonisation of transport is the commitment of national governments to reduce GHG emissions. For example, Chinese President Xi Jinping announced before the U.N. General Assembly on September 22nd 2020 that his country aims “to have $CO_2$ emissions peak before 2030 and achieve carbon neutrality before 2060” (Monteith, Wang 2020). While this chapter is summarising key national responses to decarbonise, Chapter 3 will look into more details on the role of

current climate change policies on transport manifested in its latest submission of National Determined Contributions (NDCs) to the UNFCCC.
Key policy response will be shared in this chapter framed around the main identified sources of transport $CO_2$ emissions (freight, motorisation, urban transport). The "Avoid-Shift-Improve" paradigm describes the key elements needed to achieve sustainable mobility and reduce carbon emission (Dalkmann and Brannigan 2007). Avoiding or reducing the need to travel, shifting towards more energy-efficient transport modes and to improve the efficiency of fuels and vehicles are the core elements to decarbonise transport. Table 1 highlights key policy actions which are often identified as the ones with the largest $CO_2$ reduction potential. As described in Chapter 1, some of these policies like road charging and taxes affects several of the high emitting sectors.

Table 1: Key carbon reduction policies based on Avoid-Shift Improve Paradigm
*Table 1: Key carbon reduction policies based on Avoid-Shift Improve Paradigm*

| | Freight | Motorisation | Urban Transport |
|---|---|---|---|
| Avoid/Reduce | Introducing/increasing Road Charges and Taxes | | |
| Shift | Enhancing Railfreight | Strengthening Public Transport and shared modes | |
| Improve | Scaling Electrification | | |

Source: Own

The following sub-chapters will describe the policies presented in Table 1.

### 2.3.1 Road Charges and Taxes (Avoid/Shift – freight, motorisation and urban transport)

Road charges and taxes are a key element of any decarbonisation strategy. For several decades it has been argued that external costs like congestion, air pollution and impact of climate change need to be internalized into the costing of transport infrastructure investments and the use of transport services (ECMT 1998, UIC, 1994) . In other words the costs to mitigate and adapt the negative impact need to be borne by the emitting sector and be considered as part of the assessment for future investment to steer towards decarbonisation.
To increase the costs of freight by road, there are a variety of options to either implement charges or taxes:

- Vehicle taxes
- Fuel excise duty
- User Charges: Vignettes
- User Charges: Tolls on distance and weight

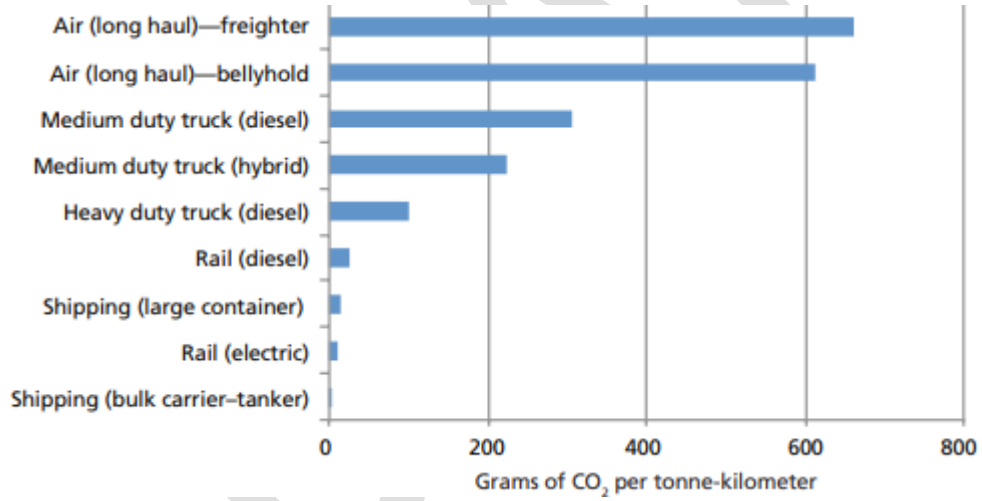
Fuel taxes are the most common instrument used and seen as a key part of a strategy to increase efficiency in road freight as well as to steer towards an increase the use of rail freight.
With the substantial projected increase in air-freight, future fuel taxes are a vital element of a decarbonisation strategy for aviation (T&E nd). Currently, in most countries the fuels used in commercial aviation are exempt from excise duties. Introducing fuel taxes would also

enhance the commercializing of biofuel use for the aviation industry to reduce its carbon footprint.
Finally, the removal of fuel subsidies and the introduction of fuel taxes can have an impact on the growing motorisation and on car use in the urban settings.
The relationship between changes in price and changes in demand is known as the "price elasticity of demand", which measures the responsiveness of demand to changes in price (UNDP 2012). As a comparison between car use in the US and Europe has proven, as demand usually declines in response to increases in price, price elasticities are usually negative (Klier, Linnn 2013). Despite the geographic and cultural differences, the low price of fuel and increased car ownership are the the main factors driving growing motorisation.

### 2.3.2 Strengthening rail freight (Shift – Freight)

Aircrafts have the highest carbon intensity (see Figure 7) in comparison to all other transport modes followed by road transport (IPCC 2014), whilst the most climate friendly modes are rail and shipping. While most of the goods movement by aircraft are high cost goods and therefore not necessarily suitable for shifting towards rail and shipping, there is potential in shifting from road to rail. However, these shifts require changes in the logistical chain as well as the provision of infrastructure.

*Figure 7: Average carbon intensity of freight transport modes*




Source: IPCC, 2014

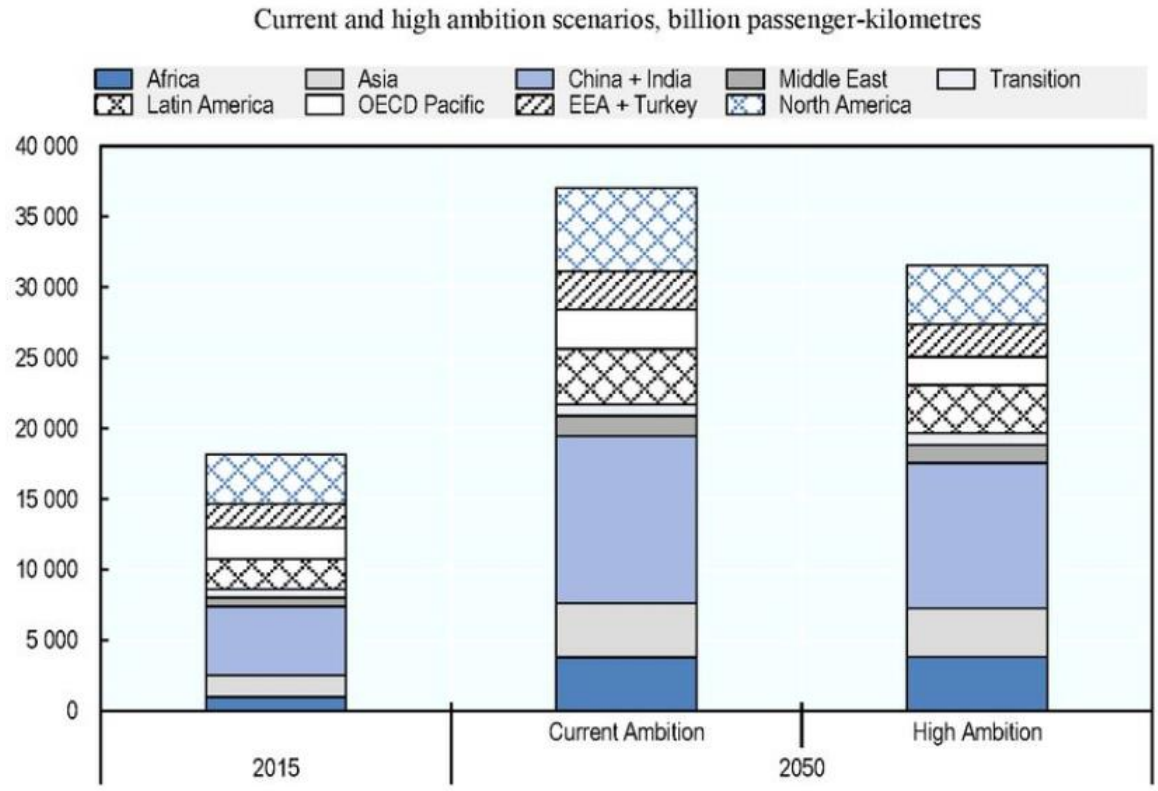
The Asian Development Bank (ADB) in its 2017 report on infrastructure needs, estimated 62.8 billion USD investment is needed for rail to eradicate poverty as well as align the investment with the objectives of climate change. In comparison, the same amount is assumed for road infrastructure (ADB 2017). The report recommends an exploration of not only national governmental sources, but also private investment to increase the investment capacity.

### 2.3.4 Public Transport and shared modes (Shift – motorisation and urban transport)

As previously discussed there is a prediction of an almost doubling of the global p-km in urban transport in a business as usual scenario and a fifty percent increase in a scenario

(high ambition) meeting the Paris Agreement on Climate Change. Urban transport, motorisation, and use of the private car are therefore very important sectors to tackle to get on a pathway to decarbonisation. Figure 8 shows the larger proportion of emissions predicted in Asia, particularly India and China, compared to other continents due to ongoing urbanisation. In India and China alone mobility demand will increase by around 7000 billion p-km from 2015 to 2050 and therefore represent a third of the global p-km travelled.

*Figure 8: Projected urban mobility shares by world regional, 2015 - 2050*




Source: ITF 2019

ITF sees a potential for reducing car-use and increasing public transport and shared modes. A continuous investment in public transport is seen as key for enabling the efficient movement of more people in cities. However, as COVID-19 has shown, there is a need to reflect on the level of comfort (enabling physical distancing) and the funding model of public transport. In some countries like China public transport is part of the national transport funding which allows affordable fares and access for most people in cities. A model where public transport is relying on the private sector is more vulnerable to events such as COVID-19 with many bus drivers and other informal transport modes (e.g. Jipnees) going out of business.

Another key element on a pathway the decarbonisation for cities and tackling motorisation is the provision of shared modes. Figure 9 below shows the wide range of opportunities which are all in place in many of the Asian countries.

*Figure 9: The evolving urban pasenger mobility landscape*

| Travel modes | Mobility applications | Service models | Operational models | Business models |
|---|---|---|---|---|
| Self-owned car/bike/other | Business-to-consumer sharing apps | Ownership | Station-based roundtrip | Business-to-consumer services |
| Taxi | Mobility tracker apps | Membership-based service models | Station-based one-way | Government-to-consumer services |
| Rental car | Peer-to-peer sharing apps | Non-membership service models | Free-floating one-way | Business-to-government services |
| Public transport | Public transport apps | Peer-to-peer service models | | Business-to-business services |
| Bikesharing | Real-time information apps | For-hire service models | | Peer-to-peer mobility marketplace |
| Carsharing | Ridesourcing apps | Public transport services | | Fractional ownership |
| Microtransit | Taxi e-hail apps | | | |
| Rickshaws | Trip aggregator apps | | | |
| Personal vehicle sharing | | | | |
| Ride-sharing | | | | |
| Ridesourcing | | | | |
| Micromobility sharing | | | | |
| Scooter sharing | | | | |
| Shuttles | | | | |

Source: ITF 2019

To make best use of these new mobility options, it is crucial to integrate the services under one platform – often also referred to as "Mobility-as-a-Service" (MaaS). MaaS can be defined as a concept to:

- Integrate modes;
- Manage through one platform;
- Involve multiple actors from public and private sector;
- Make use of technology (website, app);
- Utilise user centric/demand orientation (Reference).

Such an integration is a vital element to improve the efficiency of these services. Local and national governments have to set the regulatory and institutional framework to manage such services. The interaction of shared mobility with electric mobility can even increase the $CO_2$ reduction potential through the penetration of services at lower costs.

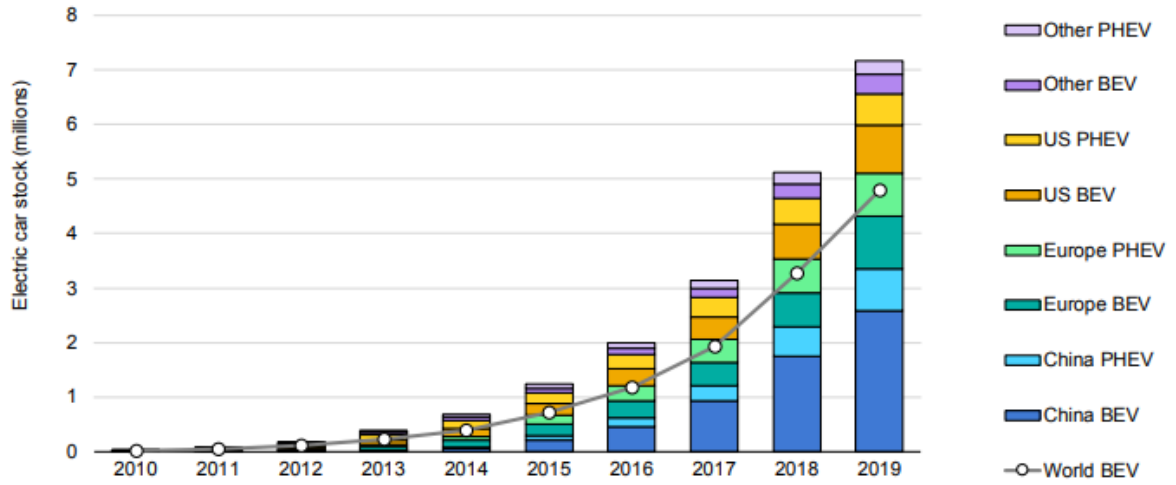
### 2.3.5 Electrification (Improve - Freight, Motorisation, Urban Transport)

As described in the opening chapter the electrification of transport is a vital element of a future pathway to decarbonisation.

Most prospects for electrification are currently in the field of passenger transport, in particular two-wheelers, three wheelers and electric cars.

Most often electrification is discussed from a passenger car perspective.

*Figure 10: Global electric car stock 2010-2019*




Source: IEA 2020b

Despite the substantial annual growth (See Figure 10), electric cars are still a niche market with substantial needs such as charging stations, diversity of models and price competitiveness. To enhance the market there are a growing number of countries setting targets for electric passenger vehicles manufacturing.

For example, China as a global market leader has heavily subsidized the purchase of electric cars purposefully designed to be closely linked to technological metrics and performance indicators across EV models. Such performance indicators or metrics include mileage per single charge, battery energy density, system energy efficiency and charging speed. As a result, the industry is incentivized to upgrade its technology while keeping affordability in check. In the past several years, we have seen widespread innovation and technology advancement across China's entire EV supply chain, from lithium mining and processing (such as Tianqi and Gangfeng), battery manufacturing (CATL), to car manufacturing (BYD and NIO). This gives rise to the emergence of a considerably competitive industrial cluster for EVs. At the same time the government had set a zero emissions vehicle mandate, requiring each Chinese vehicle manufacturer and importer to make or import at least 12% of their total sales in 2020. For companies not meeting the target it is possible to purchase credits from companies that over-supply. Furthermore, subsidies, particularly for longer range vehicles, are provided (up to 3,600USD).

India launched its National Electric Mobility Mission Plan, which includes a target of 7 million hybrid and electric vehicles by 2020, and also implemented the Faster Adoption and Manufacturing of Electric Vehicles in India Phase II (FAME Phase II) scheme, which includes a USD 1.4 billion budget over three years to reduce the purchase price of hybrids and EVs through rebates (Jagran 2020).

Most prospects for electrification are currently in the field of passenger transport, in particular two-wheelers, three wheelers and electric cars. Parts of Asia like Vietnam, China and India have a long tradition in the use of two wheelers. For example, 70% of India's p-km is carried out by two and three wheelers. With already more than 250 million electric two wheelers on the road in Asia, with China as a market leader, it is the fastest growing EV market in the world (Zhecheng (2018).

Heavy duty vehicles, representing globally 40% of the energy demand and $CO_2$ emissions, are just at the beginning of electrification. The larger vehicles and the longer ranges make it challenging for cost alternative options to diesel (ITF 2018). At the moment, despite some initial prototypes, experts do not see a market for long haul vehicles before 2030. However, for smaller scale urban delivery vehicles, there are already vehicles on the market. For example, the so called Streetscooter in Germany, which was produced by the DHL although the 11,000 vehicles had substantial technical problems which led to closing its production. (Sueddeutsche Zeitung 2020).

Therefore, an electrification of the fleet with the use of renewable energy is a key element on the pathway to full decarbonisation of the sector. IEA assumes, in order to achieve net zero global emissions in 2050, a number of more drastic additional measures would need to be taken over the next ten years. For example, to reduce emissions by 40 per cent by 2030, almost 75 per cent of global electricity generation would have to come from low-emission sources by 2030 and more than 50 per cent of passenger cars sold worldwide would have to be electric in 2030 (IEA 2020). With currently only 2.5% of the current car sold, there is a continuous growth needed as we have seen in the last decade (see Figure 10). With China as a global leader in car sales and production, it could help to drive the Asian market in the future.

While there is growing evidence that electric vehicles have a lower carbon footprint independent of the source of energy, to reduce global transport emissions by 70 to 75% the resource of the electricity needs to come from renewable energy sources. In 2017 95.9% of global energy needs were met by oil and petroleum and only a small percentage were covered by biofuels (3 %) and renewable electricity (REN-21 2020).
So far globally only one country (Austria) combines a renewable energy target with a transport target. They established a quota system for renewable energy sources used in transport. This scheme obliges companies importing or producing petrol or diesel to ensure that renewables make up a defined percentage of their annual fuel sales (RES Legal nd)
To progress towards decarbonisation a stronger link between transport and energy policy needs to be established.

# Chapter 3: Asian NDC submission: Strength and weaknesses

A key part of the Paris Agreement on Climate Change is the so-called Nationally Determined Contributions (NDCs). Each national government is required to share their effort to reduce national emissions and adapt to the impacts of climate change (UNFCCC, n.d.). The first NDCs (so called INDCs – Intended Nationally Determined Contribution) were expected to be submitted by 2015. Subsequent NDCs are expected to be submitted every five years and so this year (2020) the first new submissions are expected. With the COP26 hosted by the UK government to be postponed by a year to 2021, it is expected that some countries will delay their submission despite no official communication on that matter.

Another important element of the Paris Agreement and the future pathway of decarbonisation are the so-called Long-Term Strategies (LTS). Article 4, paragraph 19 of the Paris Agreement requires all countries to formulate and communicate long-term greenhouse gas emission development strategies in addition to the regular NDC reporting. It was agreed among the countries to submit their LTS by 2020. By end of October 2020, 19 countries had submitted their LTS. Out of those nineteen submissions two were from Asia (Japan and Singapore).

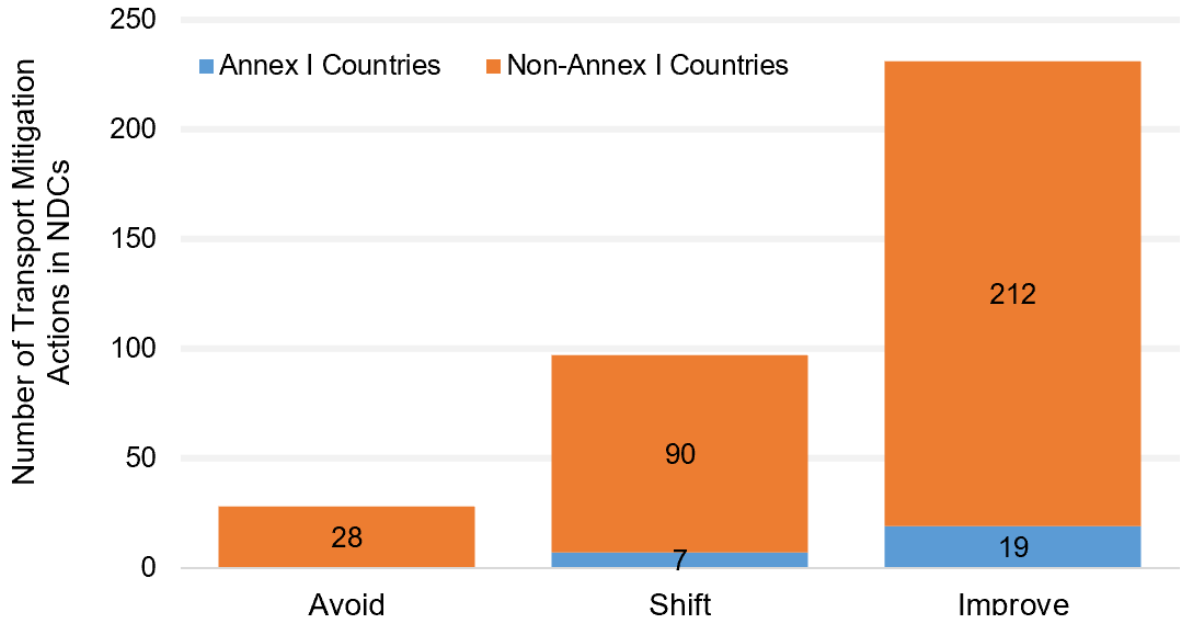
This chapter gives an overview of the current Asian NDC and LTS submissions related to transport and shares good practices on climate mitigation and adaptation actions.

## 3.1 Review of (I)NDC submissions 2015

Though sectors like the transport sector are crucial for achieving the climate goals, there is no binding requirement to list and cover the sector in the NDC. In fact, some countries report their transport activity under energy. Furthermore, while there is a request to provide a dedicated reduction target, there is no need to set sectoral targets. Despite this, transport as a major emitter of $CO_2$ emissions was referred to in the first (I)NDC submission by 76% of 165 countries (GIZ 2018). Though it was seen as positive that transport played a role and was widely recognised, several short comings were observed in general as well as for the Asian countries (See also Figure 11 and Figure 12Figure 12) (GIZ 2018, ITF 2018, SLOCAT 2016):

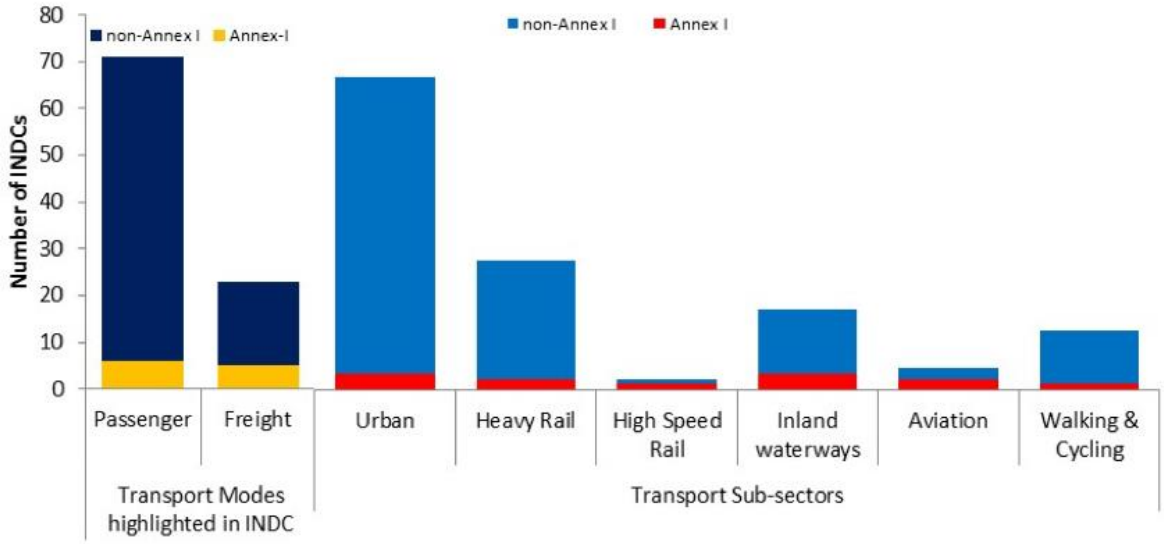
- Insufficient level of ambition in general as well as in the transport sector to meet Paris Agreement;
- Only 8% of the NDCs proposed a transport sector emission target;
- Lack of attention to Avoid and Shift policies - the majority (65%) of the 356 proposed measures in NDCs represent “Improve” strategies;
- Imbalance between passenger and freight transport - only 21 NDCS planned specific actions on freight vs over 70 with planned actions on passenger transport.
- Substantial amount of urban transport measures but only a small number considering walking and cycling.
- Only a few (I)NDCs covered climate adaptation.

*Figure 11: Number of Transport Mitigation Actions in NDCs attributed to Avoid-Shift-Improve*




Source: SLOCAT 2018

*Figure 12: NDC Transport Analysis: Urban/Freight and Specific sub-sectors*




Source: SLOCAT 2018

There were some Asian countries in 2015/2016 which submitted balanced and ambitious NDCs. For example, Japan, Bangladesh and Brunei were setting up targets and included a broad variety of policy actions as discussed below.

In these three NDCs, different ways of target setting could be observed. An absolute target like in the case of Japan and a reduction targets based on a Business-As-Usual (BAU) scenario like in the case of Bangladesh, are two robust ways to announce their sectoral

ambition. The case of Brunei provides for the first NDC submission a good practice example of specific sub-targets which allows a detail monitoring of specific policy measures suggested. Among those case studies, no reference to adaptation was made.
All three countries paid in their first NDC submission particular attention to a wide range of policies to tackle urban transport through public transport and rail construction.

- Bangladesh:
  - Target: reduce transport emission by 24% below 2030 BAU
  - Action: Modal shift to rail through construction of metro systems and bus rapid transit systems, reduce congestion through efficient road infrastructure
- Brunei:
  - Target: to reduce $CO_2$ from morning peak hour vehicle use by 40% by 2035
  - Action: Increase public transport share to 22% by 2035 by developing BRT systems, implementation of integrated walking and cycling networks, parking policies and land management
- Japan:
  - Target: 27% below 2013 or 163 MT by 2030
  - Action: Improve fuel efficiency, public transport promotion, modal shift to railway, car-sharing, ITS and various other

With more information and guidance available than in 2015, there is hope that the submissions in 2020 will be more ambitious, provide targets and cover a wider range of transport solutions.

### 3.2 Review of Asian submissions (NDC 2020 and LTS 2020)

By the end of October 2020 only fifteen countries had submitted a revised 2020 NDC with five from Asia (Japan, Singapore, Thailand, Mongolia and Vietnam).[1] One hundred and three countries have stated their intention to enhance their ambition or action in an NDC by the end of 2020. Among those in Asia making this pledge are China, Bangladesh, Cambodia, Nepal, Pakistan and Afghanistan (WRI nd).

Of the five Asian countries which have shared an updated NDC submission, Japan has kept the first (I)NDC as an Annex and not changed their level of ambition. All all other countries, however, enhanced their climate targets.

At the same time Japan and Singapore are the only Asian countries' to have submitted their LTS as of October 2020. Thailand made reference in their updated NDC submission that the government is currently working on the LTS to submit before end of the 2020 (See Table X).

Table X provides an overview of the main documents from the Asian region countries which were submitted to the UNFCCC Interim NDC registry by November 6th 2020, the Communication of long-term strategy and transport related policies referenced in the (I)NDCs and LTS. The column of transport related policies provides the reference document (either first (NDC 2015/2016), updated NDC (NDC 2020) or LTS), where it was mentioned.

[1] For actual information see: UNFCCC's NDC registry: https://www4.unfccc.int/sites/ndcstaging/Pages/LatestSubmissions.aspx

*Table 2: Overview of NDC and LTS country submissions (as of November 7th, 2020)*

| Country | Type of submission (NDC) | Long Term Strategy | Transport related policies referenced* |
|---|---|---|---|
| Japan | Updated First NDC | YES | Plan for Global Warming Countermeasures (2016) (NDC 2020); |
| Mongolia | Updated First NDC | NO | |
| Singapore | Updated First NDC | YES | Chartering Singapore's Low-Carbon and Climate Resilience Future.(2020)<br>Singapore's Climate Action Plan: Take Action Today, For a Carbon-Efficient Singapore (2016)(LTS, NDC2020) |
| Thailand | Updated First NDC | In preparation | Environmentally Sustainable Transport System Plan B.E. 2556–2573 (2013-2030)(INDC 2015) |
| Vietnam | Updated First NDC | NO | |

*Labelled by source as either (I)NDC (2015/2016); NDC 2020 or LTS
Source: Own. Based on country submissions to UNFCCC NDC registry and country policy documents LTS: https://unfccc.int/process/the-paris-agreement/long-term-strategies

As discussed in the global overview of NDC submissions in the former sub-chapter, many first NDCs submitted to the UNFCCC in 2015 and 2016 contained only limited strategies on transport action. Two exceptions to this in Asia were Thailand and Vietnam which had already developed their transport strategies before the NDC submission and were therefore able to share more details. Countries like Japan and Singapore created detailed transport policies after the initial submission and integrated those into their climate policy documents. Both countries benefited from the Bangkok Declaration on Environmental Sustainable Transport approved by the EST Forum hosted by UNCRD. For example, Thailand's Transport Masterplan used the Avoid-Shift and Improve (A-S-I) Framework in their annual country report under the declaration as well as in a policy document referred to in the first NDC.

With the latest LTS and NDC submissions and the related policies, Japan and Singapore created a long-term vision. This in turn provided a clear delivery pathway to move transport policies on a decarbonisation pathway aligned with the Paris Agreement with the objective towards net zero carbon in the second half of the century. Both countries created an integrated strategy, covering A-S-I policies.

As the overviews in Table 3 show, the latest submissions and their related transport policies cover a wider spectrum of policy measures than the first round of NDC submissions. For example neither Japan nor Singapore included any avoid strategies in the first submission but have now included such policies in the 2020 submission.

*Table 3 NDC and LTS country submissions and related transport policies by Avoid (A)-Shift (S) and Improve (I) (as of November 7th, 2020)*

| Country | Strategy (NDC 2016) | Strategy (NDC 2020) | LTS 2019/2020 |
|---|---|---|---|
| Japan | S-I | A-S-I | A-S-I |
| Mongolia | I | I | Not submitted |
| Singapore | S-I | A-S-I | A-S-I |
| Thailand | A-S-I | A-S-I | Not submitted |
| Vietnam | S-I | S-I | Not submitted |

In the following paragraphs some key observations and good examples will be shared within the context of the A-S-I Framework.

Avoid Strategies

Thailand was the only country which already included plans to "avoid" transport in their 2013 strategy by developing an integrated strategy between land-use and transport in some of their major cities. Japan highlights in their LTS the establishment of a Mobility-As-A-Service (MAAS) as a major strategy to reduce carbon emissions. Meanwhile, Singapore created its vision towards a 20-minute township and a 45-minute city, envisioning access to amenities and education within 20 minutes and access to work within 45 minutes. This approach is to improve access to meet all human needs, from going to work, to access health care and education and leisure. Figure 13 visualizes the idea. Singapore is the only country to restrict motorisation and set ambitious goals for mode share to limit the use of cars to one of 10 trips.

*Figure 13: Visualisation of Singapore's Avoid Strategy (20 Minute Towns and 45 Minute City)*


Source: Prime Ministers Office Singapore (2020)

Shift Strategies

Investment in bus and rail based public transport is a major strategy in all five submissions accept Mongolia. Singapore stands out with a focus on walking, cycling and public transport within its LTS. An overarching target of 80% mode share provided by walking, cycling and public transport is setting very ambitious plans for the future. To achieve those targets they plan to increase the cycling infrastructure from 355 km in 2015 to 700 km by 2030 (in NDC 2020) and 1000 km by 2040 as well as establish dedicated policies improving walkability in the city. For example, in 2016 Singapore's Urban Redevelopment Authority started to require private developers to consider the safety, convenience and accessibility needs of pedestrians and cyclists in their development plans.

In Vietnam, the existing North-South railway line will be upgraded while more surveys will be conducted to find feasible plans for a high-speed railway line.

Thailand's plan includes extensions of mass rapid transit lines, construction of double-track railways and improvement of bus transit in the Bangkok Metro area.

Several countries cover not only passenger transport, but also freight as a key source of $CO_2$ emission as discussed in Chapter 2. For example, Thailand, in its Environmentally Sustainable Transport Plan, proposes ambitious actions to promote road-to-rail modal shift for freight. Japan highlights the importance of rail freight as well as improving logistic efficiency. Mongolia highlights in its revised NDC submission this year a plan to shift the coal export transportation from "auto transportation" to rail transport.

Improve Strategies

Improving fuel and vehicle efficiency as well as electrification are key strategies in the five Asian countries which have already submitted their updated NDC.

In Thailand, a vehicle tax scheme based on $CO_2$ emissions was approved and became effective at the beginning of 2016 after the first NDC.

In Vietnam there is a plan to encourage buses and taxis to use compressed natural gas and liquefied petroleum gas (LPG); implement management solutions for fuel quality, set emissions standards; and improve vehicle maintenance.

The electrification of the passenger car fleet is in the heart of Japan's, Singapore's, Vietnam's and Thailand's strategy. Singapore aims to phase out internal combustion engine vehicles by 2040, and have all vehicles running on cleaner energy. In addition, they plan for all new public bus purchases to be cleaner energy buses, including fully electric or hybrid models. To encourage take-up of cleaner vehicles, new electric vehicle (EV) purchases will receive rebates for a three-year period from January 2021.

In Japan electric cars already comprise 30% of car sales during 2020. They are paying particular attention in their long term strategy to “well to wheel” emissions. In other words, to ensure reduction of $CO_2$ emissions during the processes of producing gasoline and electricity. In their long-term strategy, they aim to reduce GHG emissions per vehicle by 80% compared to 2010 and ultimately want to reach a zero-emission target in the second half of the century.

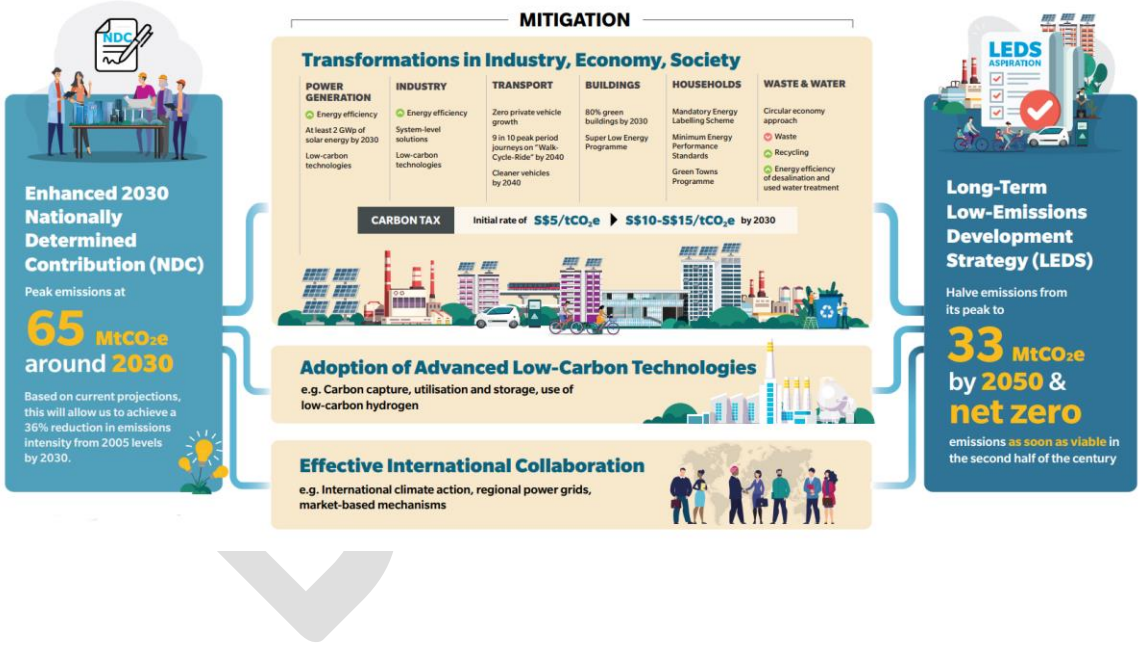
## 3.3 Further observations

While all countries included adaptation as a major part of the updated NDC submission, there was almost no reference to transport specific challenges.

Japan, Singapore, Thailand and Vietnam carried out detailed stakeholder processes described in the updated NDCs. Japan ensured a full alignment of sector policies with the NDC by including all ministries in the process.

Singapore, paid particular attention to public awareness including creating a very visual Long Term Strategy document (see Figure 14).

*Figure 14 Singapore’s Long Term Climate Strategy*




Source: Prime Ministers Office, Singapore (2020)

## 3.4. Lessons learned for other Asian countries and future NDCs and LTSs

The analysis of the initial 2020 submissions to the UNFCCC showed the substantial improvement of the NDCs though not all countries improved their submission to the same extent. Building on the identified and summarised shortfalls of the process in 2015 in chapter 3.1 eight lessons can be learned for other Asian countries for transport:

1. Align LTS with NDC submission. Create a long term vision aligning with shorter term policies.
2. Set specific transport related target and sub-goals.
3. Create detail policies which are part of the NDCs and align with the goals.
4. Balance the transport decarbonising strategy to use AVOID, SHIFT and IMPROVE measures.
5. Identify specific challenges for the transport sector and create a transport related strategy for resilience.
6. Coordinate and formulate the NDC including all ministries
7. Ensure the NDC is well communicated to the general public as well as all stakeholder groups
8. Ensure transport related policies are linked with other policies (e.g. energy)

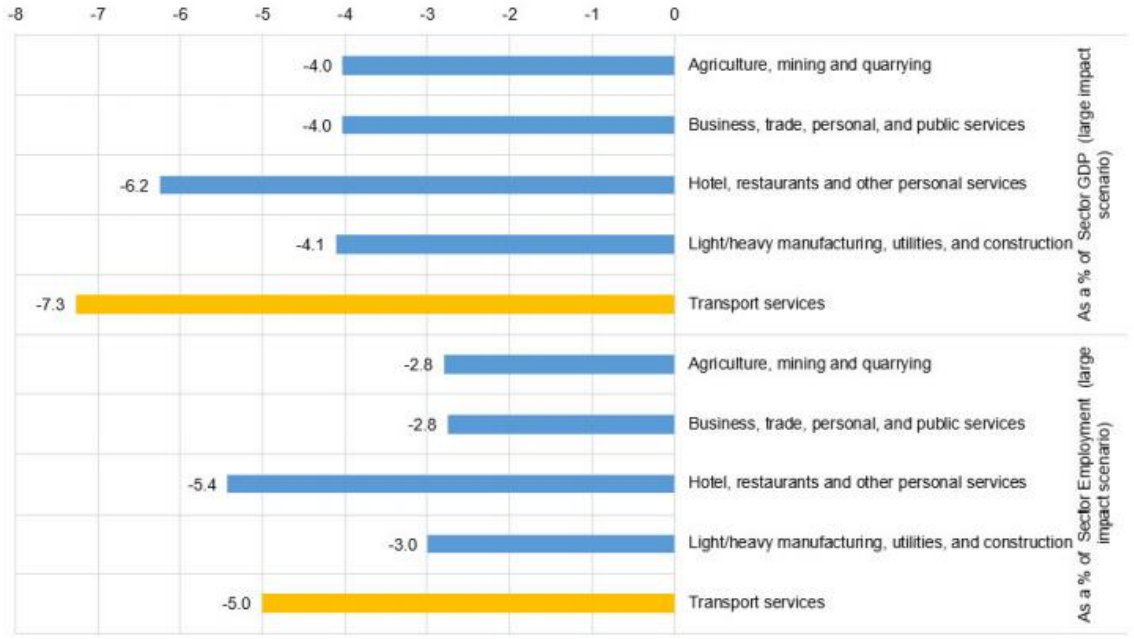
## Chapter 4: Build back better – Strategies for tackling climate change and COVID-19

The current pandemic, as discussed in Chapter 1.2 and 2.2, has had enormous impact on the global economy as well as the transport sector. According to the UN's trade and development agency (UNCTAD) the slowdown in the global economy caused by COVID-19 is likely to cost at least 1 trillion USD with many countries in the world facing a recession (UNCTAD 2020). Many countries are currently investing in their economy with recovery packages to boost their national economy and try to reduce the unemployment rate and avoid business closures. The International Monetary Fund (IMF) and many other international organisations are highlighting that the economic crisis caused by the pandemic and the climate crisis should be tackled together (IMF 2020). "Build back better" is becoming a slogan for a green recovery.

As the transport sector is a substantial part of the global economy, this chapter looks into current recovery programs in Asia and how to align a COVID-19 response with acting on the climate crisis.

According to the ADB (2020) the transport sector is particularly vulnerable (see Figure 15). ADB assumes, that an economic slowdown caused through COVID-19 could further challenge the transport infrastructure, services, investment and innovation and technologies among different modes.

*Figure 15: COVID-19 Gross Domestic Product and Employment Impact of COVID-19 by Economic Sector in ADB Members*




Source: ADB 2020

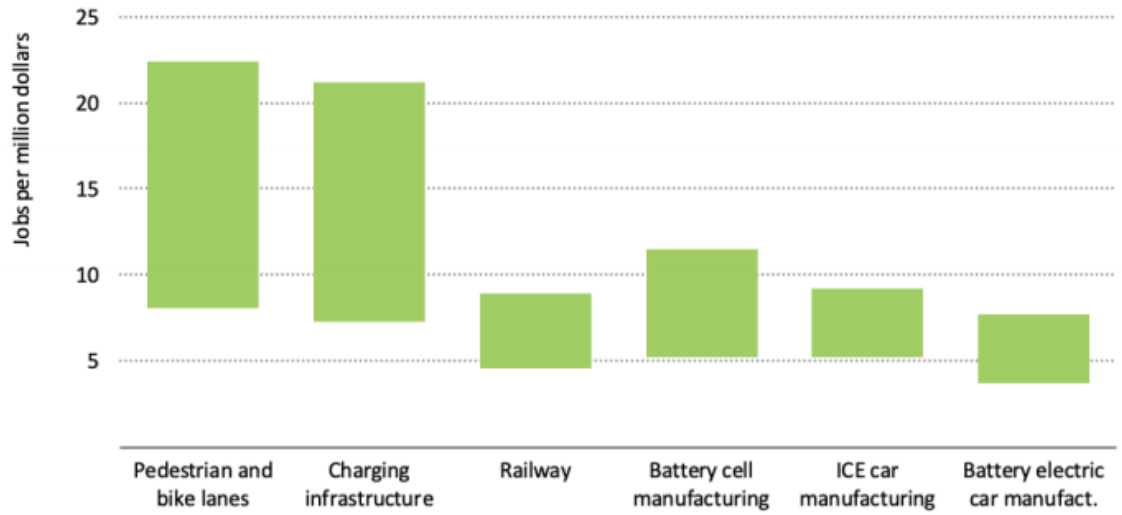
The Coalition for Urban Transition (CUT) lists 10 policy options aligning economic programs for tackling the economic impact of the pandemic and enhancing action to tackle climate change through clean mobility in their policy paper (CUT 2020). These are:

- Developing a public transport masterplan.
- Setting targets for public transport modal split.
- Giving public transport subsidies to retain quality of service levels.
- Making transit-oriented development an urban design requirement.
- Assigning dedicated bus and high occupancy vehicle lanes.
- Road pricing and parking fees to discourage private vehicle use, as well as to help make up for fare shortfalls for public transport.
- Amending parking requirements to stipulate maximum rather than minimum amount of parking to be provided.
- Differentiated parking fees, distinguishing between clean vehicles and fossil fuel-powered vehicles.
- Setting ambitious EV deployment targets.
- Investing in EV infrastructure.
- Phase-out date (2030) for fossil fuel-powered vehicles.

These ten policies align with the main policy instruments identified in Chapter 2 to decarbonise transport, in particular the investment in public transport and electric vehicles.

The IEA (2020) in their special report on sustainable recovery flags the employer multiplier highlighting the employment effect in the different transport employment sectors. The data, as presented in Figure 16, shows that jobs per unit of investment are particularly high with investments in walking and cycling and electric vehicle charging facilities.

*Figure 16: Employment Multipliers for Investment in the Transport Sector*




Source: IEA 2020

To better understand the current governmental responses within the transport sector in Asia and its alignment with the climate crisis, a review of the data collected through the *Platform for Redesign 2020 - Online Platform for Sustainable and Resilient Recovery from COVID-19*[2] and examples of transport related stimulus measures published by the ADB (2020) was carried out for this paper.

The Platform for Redesign is an initiative led by the Ministry of Environment (MOE) Japan supported by the UNFCCC and is a hub showcasing information on policies and actions taken by national government. By November 7th 2020, 72 countries were part of the platform with 17 countries from Asia. Seven out of 17 Asian countries action in the transport sector were listed and summarised in Table 4Table 1. The following Asian countries are part of the platform but have no entry for the transport sector: Bhutan, Bangladesh, Cambodia, Laos, Mongolia,Myanmar,Nepal, Republic of Korea, Singapore, Thailand.

*Table 4: Policies, measures and action on climate change and environmental protection in the context of COVID-19 recovery (based on Platform for Redesign and ADB 2020)*

| **Country** | **Action** |
|---|---|
| Afghanistan | Improving Kabul City Transport System |
| Bhutan | The fiscal stimulus includes the implementation of an economic contingency plan aimed at helping different sectors, including farm road infrastructure construction. |
| China | • Integrated development planning of higher quality transportation in the Yangtze River Delta |

[2] https://platform2020redesign.org/

| | |
|---|---|
| | • Promoting electric vehicles in rural areas<br>• Catalogue of new energy vehicle models for energy saving use vehicle and vessel tax reduction and exemption<br>• Announcement on relevant policies for exemption of vehicle purchase tax for new energy vehicles<br>• Program encouraging civilians to use more public transportation and bicycles instead of personal vehicles or taxis (Green travel plan)<br>• Rewards program facilitating the phase-out of high emission diesel vehicles in Greater Beijing Area |
| Indonesia | • Biofuel for transportation<br>• Improvement of energy efficiency (including transportation system)<br>• Potential of e-vehicle development |
| Japan | Initiatives toward Zero Emission Shipping |
| Nepal | Investment for electric transportation in Nepal, thereby significantly reducing greenhouse gas (GHG) emissions from the transport sector (E-Mobility). |
| Pakistan | National Electric Vehicle Policy: In order to mitigate the negative impacts of automobile sector on environment and giving a boost to the economy, Government of Pakistan has approved its National Electric Vehicle Policy targeting a 30% shift to electric by 2030. |
| The Philippines | • Implementation of the Public Utility Vehicle Modernization Program<br>• Opening of bike lanes in major thoroughfares (Metro Manila)<br>• The Department of Transportation is pushing for the passage of the Philippine Economic Stimulus Act of 2020 to provide immediate financial assistance to workers and businesses affected by the pandemic. |

Source: MOE Japan 2020.

The increasing support for electric vehicles, as in Nepal, Pakistan and China, is one action area which can help to enhance the efforts already identified in several NDCS.
China decided to waive the vehicle purchase text for electric vehicles, plug-in hybrids and fuel cell vehicles from January 2021 to December 31, 2020 (Ministry of Finance, China 2020).

At the same time, so far only a few countries are providing substantial support for the public transport sector.

While the Platform for Redesign focuses on green recovery programs, the ADB has also collected information on transport stimuli responses, although these are not necessarily aligned with tackling climate change. For example, countries like the Republic of Korea, Singapore, Indonesia and Vietnam are providing stimulus packages for the aviation industry.

To move forward the ADB suggests as a result of their work collecting information on the COVID-19 responses the following rejuvenation measures shared in Table 5.

*Table 5: Rejuvenation measures by transport mode (ADB 2020)*

| Measures | Public Transit | Walking and Cycling | National Roads | Aviation | Freight and Logistics |
|---|---|---|---|---|---|
| Enhance long-term sustainability of services and assets | Develop financing structures for adjusted service plans catering to reduced post lockdown demand. | | Continue to improve road safety and road maintenance for all users. | Explore restructuring of aviation industry to share demand risks appropriately between the public and private sectors. | Restructure the logistics supply chain to enhance resilience. |
| Mainstream measures as part of overall pandemic-resilient response and operation plan | Mainstream contactless payment and systems. | Mainstream temporary measures to expand capacity for walking, cycling, and emergency services in future pandemic the response and operations plan. | Mainstream temporary traffic measures in road design standards to accommodate permanent or temporary increased capacity for nonmotorized transport or emergency lanes. | Mainstream contactless processes and systems for embarking and disembarking for international travel. | |
| Institute transformative change. | Integrate contactless payment with other e-payment platforms.<br><br>Explore Mobility as a Service (MaaS) | | | | Integrate digital platforms to facilitate ecommerce and urban logistics.<br>Explore "Mobility As A Service" for last mile delivery |

Source: ADB (2020), revised.

# Chapter 5: Conclusions and The Way Forward

This paper has demonstrated that the world is at a cross-road to tackle climate change, with the transport sector an inevitable part of a global response. The rapid responses to the pandemic have shown the enormous capacity of governments to respond to a global crisis. However, while the negative impacts of transport, like reduced GHG emissions, improved air quality and lower fatalities, reduced during the lock-down this was not sustainable due to the substantial impact of the lockdowns on the economy with many people losing their jobs.
In the future the climate crisis will have even more substantial impact on countries in the future as the growing number of climate related disasters are showing.
To reduce $CO_2$ emissions in the Asian region by 70 to 75% by 2050, enormous efforts and substantial changes in the sector have to be made. Paying attention to all aspects of transport is crucial. Trends in motorisation, growing freight volumes and urbanisation all need to be tackled at the same time. The need for policy solutions which tackles all these trends is crucial. The abolishment of fuel subsidies and the increase of fuel taxes and user chargers, the investment in alternative freight transport option on rail and shipping and accelerating the uptake of clean electric vehicles are key elements of a future transport transition. There is a growing attention to tackle urban transport issues through the improvement of walking, cycling and public transport, which need to be accelerated. At the same time, more attention needs to be paid to the freight sector to put in place policies to guarantee that renewable energy will be used in the transport sector thus following a decarbonisation pathway.

The initial NDC submission by some of the Asian countries show that some countries are heading in the direction with the formulation of more comprehensive strategies. Creating long-term strategies alongside the NDC formulation can help to set a long-term framework for the national economy as well as send clear messages to the population. There is also a need to set specific ambitious sectoral targets. For less developed countries in the region, further support through capacity building as well as investments towards a low-carbon transition might be needed.

In the current times where the pandemic has a major impact on the economy, national governments have the opportunity to adjust their policies and to build back better. For the transport sector this could be aligned with better climate friendly investments. For example, increasing the support in EV infrastructure will create jobs and build a foundation for cleaner and lower carbon transport.

As the paper is contributing to the 13th Environmental Sustainable Transport Forum, these last paragraphs will provide some ideas on how the EST Forum can support countries in their efforts to enhance climate action in transport and to response to the economic challenges of the pandemic.

Data collection
For almost ten years countries have been reporting on their actions on environmental sustainable transport. Institutions like the ADB are very active in collecting transport and climate related data in the region and their latest guidance provides a good overview on the transport related economic stimuli. Partnering with such institutions to improve data collection including COVID-19 responses presents a good opportunity for the EST secretariat and the member countries.

Good practice exchange: NDC/LTS

The EST Forum has for a long time been a place for countries to share their transport policies and good practices on environmental sustainable transport. With the upcoming dead-line for NDC and LTS submission to the UNFCCC, a separate workshop might support countries to improve their submissions and learn from others.

Good practice exchange: COVID-19 policy response

As described, Asian countries are challenged with the impact of the current pandemic. A workshop for senior officials in the Ministry of Finance, Ministry of Environment (often in charge of climate strategies) and Ministry of Transport could help to share experiences and discuss options for green recovery programs.

Future guidance

As the next NDC will be required in five years, a detailed analysis and a good practice guide might help countries at an early stage to improve their future processes and submission.

Capacity Building

The EST Forum with its international partners could become a focal point for coordinating capacity building programs in the region. Regionally relevant topics (e.g. NDC, LTS, COVID-19 response) could be identified during the Forum and capacity building workshops can carried out in between the annual Fora.

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