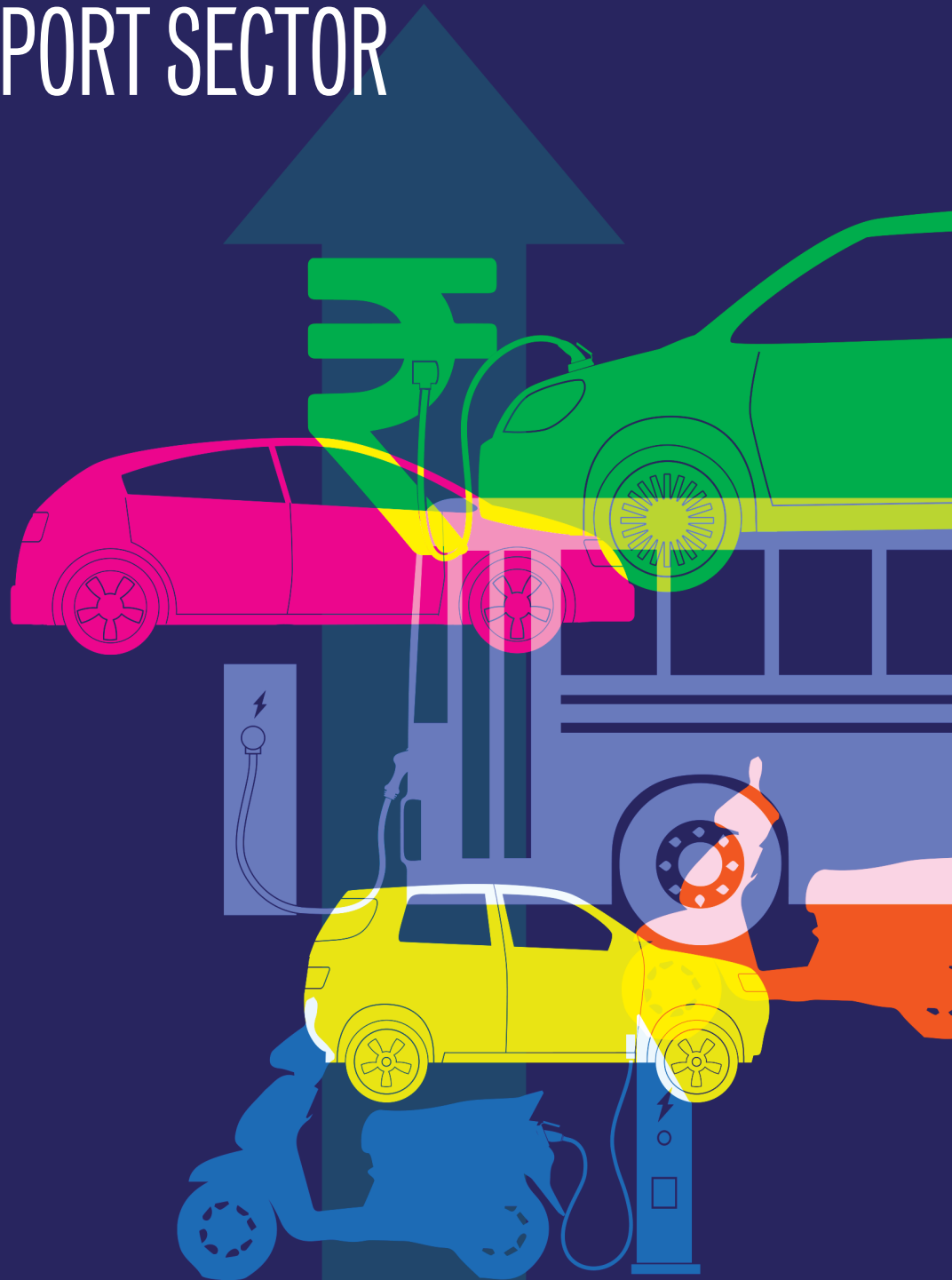


PANDEMIC AND A CASE FOR GREEN RECOVERY

LESSONS FROM THE TRANSPORT SECTOR



PANDEMIC AND A CASE FOR GREEN RECOVERY

LESSONS FROM THE TRANSPORT SECTOR



Authors: Anumita Roychowdhury, Shubham Srivastava, Shantanu Gupta, and Swagata Dey

Contributors: Sayan Roy and Anannya Das

Editor: Akshat Jain

Cover: Ajit Bajaj

Production: Rakesh Shrivastava and Gundhar Das

MacArthur Foundation

We are grateful to MacArthur Foundation for support.

Citation: Anumita Roychowdhury, Shubham Srivastava et al, 2020, *Pandemic and a Case for Green Recovery: Lessons from the transport sector*, Centre for Science and Environment, New Delhi



© 2020 Centre for Science and Environment

Material from this publication can be used, but with acknowledgement.

Published by
Centre for Science and Environment
41, Tughlakabad Institutional Area
New Delhi 110 062
Phones: 91-11-40616000
Fax: 91-11-29955879
E-mail: cse@cseindia.org
Website: www.cseindia.org

CONTENTS

Why this spotlight on green recovery?	9
SECTION 1: COVID-19 and the electric vehicle programme	21
SECTION 2: COVID-19 and recovering bus transport	37
<i>Annexure 1</i>	47
<i>Endnotes</i>	49
<i>Bibliography</i>	50
<i>References</i>	53

LIST OF ABBREVIATIONS

APSRTC	Andhra Pradesh State Road Transport Corporation
BMTC	Bangalore Metropolitan Transport Corporation
DTC	Delhi Transport Corporation
HD-BRTS	Hubli-Dharwad Bus Rapid Transit System
HRTC	Himachal Pradesh State Road Transport Corporation
JKSRTC	Jammu and Kashmir State Road Transport Corporation
KnSRTC	Karnataka State Road Transport Corporation
KSRTC	Kerala State Road Transport Corporation
KTCL	Kadamba Transport Corporation Limited
LTA	Land Transport Authority
MSRTC	Maharashtra State Road Transport Corporation
MTA	Metropolitan Transit Agency
NBSTC	North Bengal State Transport Corporation
NE-KnSRTC	North-Eastern Karnataka State Transport Corporation
NW-KnSRTC	North Western Karnataka Road Transport Corporation
OSRTC	Odisha State Road Transport Corporation
PRTC	Pepsu Road Transport Corporation
PUNBUS	Punjab State Bus Stand Management Company
SBSTC	South Bengal State Transport Corporation
STM	Montreal Transit Corporation
TFL	Transport for London
UPSRTC	Uttar Pradesh State Road Transport Corporation
UTC	Uttarakhand Transport Corporation
WBSTC	West Bengal State Transport Corporation

WHY THIS SPOTLIGHT ON GREEN RECOVERY?

The unprecedented health shock from the COVID-19 pandemic has destabilized the world economy, affecting both big and small economies, which have nosedived. Industrial activity and trade are at an abysmal low, and gross domestic product (GDP) of countries including India is falling through successive quarters. There have been several analyses of economic shock from the pandemic, such as from Bloomberg¹ and Morgan Stanley.² The conversation among economists has already shifted from ‘how bad’ to ‘how long’ it is going to be.

Governments have rushed in with economic recovery packages. The Government of India has announced a slew of packages estimated to be about 10 per cent of India’s GDP. These are designed to provide relief to low-income classes, liquidity and credit support measures for manufacturing and other sectors, and targeted sectoral reforms for increasing investments.

While there is a lot of debate on the adequacy and effectiveness of the economic packages, there is not enough conversation on the ability of the recovery packages to drive investment and growth to build environmental resilience for green recovery. This is central to the recovery process today as environmental and health crises have shown that economies can go into deeper shock if these indicators are not integrated. This pandemic itself is an evidence of how recurrence of zoonotic diseases, linked with the degradation of forests and increased exposures to the wild, can destabilize the economy and livelihood.

This policy brief has specifically examined the importance of linking economic recovery with the transportation sector, including electric mobility, to demonstrate what is at stake. However, before the deep dive analysis of this sector is presented, it may be useful to put a spotlight on the urgent need for green recovery.

1. CONSIDER ENVIRONMENTAL BOUNDARIES OF ECONOMIC RECOVERY

There is enough evidence on the vulnerability of economies to pollution crisis, climate change, and extreme weather events. Even before the pandemic, studies had shown the vulnerability of the Indian economy to environmental risk. A 2018 World Bank study ‘South Asia’s Hotspot’ has estimated that changed weather events due to climate change could cost India 2.8 per cent of its GDP and depress the living standards of nearly half the country’s population by 2050.³ Similarly, a 2020 McKinsey study on climate risk and responses has stated that with heat and temperature rise, outdoor labour productivity will be deeply impacted reducing effective working hours outdoors. By 2030, several such changes in India can cost between 2.5 to 4.5 per cent of the GDP annually.⁴ A 2013 World Bank study had already shown that air pollution costs three per cent of the GDP in India. The Asian Development Bank (ADB) had projected in 2014 that the Indian economy could contract by 8.7 per cent by the year 2100.

This pandemic has only reinforced this reality and made the case for environmentally sensitive economic recovery more compelling. This humanitarian crisis has strongly demonstrated how widespread economic

destabilization is possible if health and environmental boundaries of development are not considered. One just has to consider the implications of 1.2 million premature deaths annually due to air pollution related diseases or of expected temperature rise of 4.4 degree Celsius by the end of the century to fully understand the urgency of the issue in India.⁵ This needs explicit acknowledgement when the terms of economic policies are defined. It is important to assess how taxes and pricing instruments can operate in a revenue neutral manner to meet environmental goals.

In India, the economic packages announced by the central government do not provide a roadmap towards a green revival of the economy. With the economy reopening, emissions are expected to rebound. The magnitude of the rebound will depend upon speed of recovery and extent of consumer demand. This could lead to a massive spike in emissions. Historically, these ‘retaliatory emissions’ were observed after the 2008 global financial crisis. They are already now being observed globally as air pollution has increased from pre-pandemic levels. Indian cities have shown an increase in ambient concentration of particulate matter (PM) and nitrogen dioxide (NO₂) with the unlocking of the lockdown. Stimulus packages need to be tailored to have concurrent benefits of environmental safeguards and sustainable development goals.

Ensuring such co-benefit of green stimulus is important not only to stimulate short and long-term benefits including job creation and investment in sectors but also to contain and prevent lock in of environmentally harmful economic activities and emissions. In a post-COVID world, it is not a matter of choice but necessity to link economic recovery with pollution and carbon mitigation, prevention of ecosystem degradation, and disaster preparedness. This needs a firm timeline for accelerated adoption of clean technology, sustainable production and consumption, and inclusive growth. It is necessary to push for greening of infrastructure, greening of financial sector (green bonds, clean energy bonds, clean and renewable fuel transition), clean manufacturing and zero emissions transition in automotive sector.

This is particularly important now as India has already set targets in different sectors for clean production and lowering of emissions. For instance, the National Clean Air Programme (NCAP) has asked for 20–30 per cent reduction in particulate pollution in polluted cities by 2024. The dedicated funding of the urban local bodies (ULBs) and state pollution control boards (SPCBs) for air pollution control in million plus cities—about Rs 4,400 crore—as recommended by the 15th Finance Commission and sanctioned under the budget of 2020–21, seeks five per cent reduction in particulate pollution annually over a period of five years. Accordingly, cities have prepared multi-sector action plans encompassing vehicles, industries, power plants, and management of all waste streams. They need to perform against the sectoral targets and the new emissions regulations put in place. Some of these sectoral targets, including renewable energy targets, are further reinforced by India’s commitment under National Determined Commitment for climate mitigation and state level climate action plans.

The challenge is to stay on track and find innovative methods for infusing more resources to maintain and enhance the level of ambition and performance in each sector despite the economic crisis. Delays in meeting environmental and health benchmarks will not only lock in more emissions and ill health at an enormous cost to the economy but also affect the competitive edge of Indian industry in the global market that will pursue higher level of environmental ambition in the coming decades.

Yet, there is already evidence of delays and slippages across sectors in India. In the automotive sector, the automobile industry is reported to have asked for a delay of one year in the implementation of Corporate Fuel Consumption Standards for passenger cars that are scheduled for implementation in 2022–23.⁶ Pressure has also built up in the Supreme Court to get permission to continue to sell Bharat Stage (BS) IV vehicles for some more time despite the nation-wide introduction of BS VI vehicles in April 2020. New emissions standards for off-road vehicles are being delayed. There is also no clarity about the one time release of the second tranche of support for electric vehicles under the current Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME) II programme or the design of the next phase of this programme that is coming to an end in 2022.

Similarly, the manufacturing sector—including the big, medium, and small units—has to improve its environmental performance to meet the NCAP target for pollution reduction and additional nationally determined commitment (NDC) targets to reduce carbon intensity. The power sector in particular is mandated to meet the multi-pollutant new standards by 2022. But, there have already been delays. A new study from the Centre for Science and Environment (CSE) has shown that about 70 per cent of the power plants in the country are not in a position to meet the standards by 2022. Even though the new economic recovery package for the sector has extended support to the cash strapped distribution companies (DISCOMS), this support is not linked to DISCOM reforms to make them solvent to enable more fund flow in the sector which would enable a quicker technology transition and make the installation of emissions control systems for the control of nitrogen oxides (NO_x) and sulphur dioxide (SO₂) more bankable.

On the contrary, there are additional worries that some of the steps taken to support the energy sector through the recovery packages can undo past gains and worsen the pollution trend. For instance, the package calls for private investments and ease of doing business in the coal sector. This is expected to bring cheap and low-quality coal in the market and increase industrial consumption of coal especially in the small and medium-scale units, thus undoing previous pollution control efforts. It will be harder for the small and medium-scale units to install emissions control systems for control of particulate and gaseous emissions from coal burning. In fact, India has already set in motion the process of discouraging other dirty industrial fuels like petcoke and furnace oil. This sector now requires a massive clean fuel transition through competitively priced natural gas, an issue that has not yet been addressed. The overall GST rate on coal makes it cheaper than natural gas that attracts state taxes. No part of the collected GST is used for development of cleaner energy alternatives. Natural gas—that is outside the orbit of the GST to enable state governments to earn revenue—is less competitive. Therefore, at this stage there is no clarity about the possibility of any green recovery at the central level.

State governments that are already cash strapped have made limited interventions. There is barely any instance of support for revival of systems that have bearing on environmental quality. Targeted and well-designed bailout or revival packages linked with performance and associated reforms in the sectors are needed in the post-COVID world.

2. GLOBAL TREND TOWARDS GREEN RECOVERY

Globally, the agenda of environmental fiscal reform during the pandemic has drawn some attention. Despite the economic downturn, several governments

of dominant markets have largely stayed on course, with some deviation and variation, to support the ongoing initiatives. They have come up with targeted bailout packages for different sectors that have a bearing on environmental performance.

One crucial example is that of the European Green Deal. All 27 member countries and the European Commission (EC) have created policy directives with a roadmap to make EU carbon neutral by 2050. This encompasses clean energy, sustainable industry, sustainable mobility, sustainable agriculture, a cleaner building sector, elimination of pollution, and biodiversity conservation. Launched towards the end of 2019, the Green Deal includes a framework of regulation and legislation, and incentives to increase investments from both the government and private sectors.⁷ Prior to the COVID-19 pandemic, the deal had proposed revising vehicle taxation and introducing more stringent air pollutant emissions standards for combustion-engine vehicles; renovating the building sector including green buildings; creating and supporting a circular economy for resource intensive industrial sectors such as textiles, construction, electronics, and plastics; creating comprehensive charging infrastructure for electric vehicles; and developing sustainable alternate fuels.

Even as the European Commission is reviewing its 2020 work programme in the light of the coronavirus crisis, its climate policies are expected to remain broadly on track. The elements of the deal getting the green nod include 2030 Climate Target Plan and Renewed Sustainable Finance Strategy that will also contribute to the economic recovery from the COVID-19 crisis. Climate Target Plan will determine the level of ambition in the sustainable and smart mobility programme and other programmes to follow.⁸

However, some delays have been announced, and some provisions and targets have been objected to. The concrete outcome and procedure will also be influenced by the further course of the pandemic. Officially, at least, the Commission is sticking to the Deal, even if some aspects will be delayed. The Green Deal Recovery Package in EU includes near term policies that will act as an economic stimulus and lead to a zero carbon economy by 2050. The recovery package includes⁹, among others, grants and loan guarantees for promotion, purchase and deployment of electric vehicles, co-financing of national renewable tenders¹⁰, funding of clean energy transition (clean hydrogen, batteries, carbon capture, and storage and sustainable energy infrastructure), grants and loan guarantees for building renovations and rooftop solar PV installation, push for clean transportation including electric vehicles, and public investment for recovery of the transport sector including cleaner and more sustainable mobility. There might be delays in the revision of carbon dioxide (CO₂) standards. The drafted climate law, escalating the ambition to reduce CO₂ by 2030, is at stake as some member states are rejecting tougher targets.

3. WHY INDIA CANNOT IGNORE GREEN RECOVERY?

It is important for India to follow this rapidly changing global landscape and its implications for the global market. A lot is expected to change in the next decade. If India neglects to understand the nature and scope of this change and does not leverage COVID-related economic recovery to stay on course for green recovery, it could be economically disruptive even for the industry. In fact, we have seen in the past how a flawed fuel pricing policy (of keeping diesel fuel prices much cheaper than petrol) skewed consumer demand for diesel cars. In disregard for environmental and health concern around diesel emissions,

the automobile industry had expanded its diesel production massively only to cut it down in subsequent years when the fuel price differential narrowed down, environmental action against diesel cars ramped up in Delhi and NCR, and substantial cost hikes happened with the transition to Bharat Stage VI emissions standards in 2020. All this certainly created business risk.

Clearly, business risk from environmental and health impacts cannot be disregarded. Going forward, an environmental roadmap will have to be part of the business plan of the industry, irrespective of the pandemic induced crisis. This will require fiscal support and reform-based recovery.

4. CASE STUDY: ECONOMIC RECOVERY AND TRANSPORT SECTOR

To illustrate what may go wrong if India neglects green recovery, deep dive analyses of two specific aspects of COVID-19 related impact in the transportation sector have been carried out. These include electric vehicle transition and recovery, and augmentation of public transport, both of which have been deeply impacted by the pandemic and lockdown. It is important to be aware of the pandemic related disruption in these two areas and implications for their future trajectories by observing the global learning curve and understanding the role of fiscal support and other critical reforms to improve overall economic efficiency and performance.

The key highlights of the two case studies are presented in this summary section.

4.1. Case 1: Pandemic and electric vehicles in India—key summary highlights

Despite the economic crisis, India has stayed on course to meet the deadline for BS VI emissions standards for all internal combustion (IC) engines in April 2020. While BS VI regulatory reforms related to real world emissions performance and in-service compliance requirement will continue, India has to prepare for the next big transition to zero emissions electric mobility to meet the clean air and low carbon mobility targets in urban India.

It is therefore important to understand the impact of the pandemic on electric vehicle trajectory locally and globally. CSE's analysis of the VAHAN database, of the Ministry of Road Transport and Highways (MoRTH), on vehicle registrations shows a slump in sales. The pandemic has hit at a time when India's electric vehicle programme is not designed for scale and rapid expansion in India. Policies have not yet been adopted for long-term commitment with firm targets and the mandate is not adequately supported by incentives and regulations like stringent fuel efficiency standards that require expansion of zero emissions vehicles. The only central policy is the FAME incentive scheme that is also coming to an end in 2022.

Some state governments—about ten of them—have moved forward to adopt their respective electric vehicle programmes. In fact, Delhi has recently notified its policy with the ambition of 25 per cent electrification of new fleet by 2024. However, this roadmap needs immediate planning for the next phase to maintain continuity with long-term commitment to instil confidence in the industry and the consumers.

4.1.1. Global electric vehicle market and pandemic

COVID-19 hit when climate and energy policies were in the middle of gaining momentum around the world, especially the electric vehicle adoption programmes. It is important to note that despite the overall slump in the vehicle

market, electric vehicle sales have remained quite robust in major markets. Due to the pandemic, electric vehicle sales in the first quarter of 2020 reduced in China, USA, and the top five EU markets¹ by 23 per cent. But the global plug in hybrid (PHEV) sales increased by four per cent even after a bad quarter in China due to very strong growth in the EU countries (+149 per cent). It seems the sale of electric vehicles was not impacted as badly as that of conventional vehicles during the pandemic.

In fact, while the overall sales of internal combustion powered vehicles reduced across Europe by 52 per cent in March 2020 compared to March 2019, the electric vehicle market share increased overall, managing to reach an all-time high market share of 10 per cent (average for all manufacturers) by March 2020.¹¹ This is the result of the long-term policies like provision of fiscal incentives and adoption of stronger regulations for improved fuel efficiency and reduced CO₂ emissions. In the US, slow down did not deter California from adopting the first ever regulation for zero-emission trucks.¹²

Governments around the world—EU, California, China—have not slackened their support for zero emissions target during the pandemic. These regions have set targets to move towards net zero vision in the time frame of 2040 to 2050. In several countries/cities targets are also being set to phase out internal combustion engines in the same time horizon. If the pandemic does not delay this process, the global vehicles market will transform significantly in the coming decades. India cannot stay out of this race.

Moreover, Italy, Spain, France, and Germany are designing fiscal stimulus packages and scrappage schemes for the auto industry. The Italian Parliament has approved a package of incentives to encourage sales of fuel-efficient combustion engine cars as well as electric and hybrid vehicles. This will also go as an incentive for vehicle owners who will scrap their 10-year-old vehicle.¹³ Overall Europe is not deviating from the e-mobility track.

In other major markets like China, programmes to support electric vehicles and other new energy vehicles have continued despite the COVID crisis. China has released a Notice on Optimizing Fiscal Subsidies for Promoting New Energy Vehicles that include battery electric vehicles, plug-in hybrid electric vehicles, and fuel cell electric vehicles. This will come into effect from July 2020. Subsidies have been extended for two years, until 2022, to stimulate the automobile market. But they have also tightened the technical criteria for qualification. The subsidy size has been phased down. Vehicles must meet minimum technical and performance requirements to qualify.¹⁴

On the other hand, the pandemic has catalyzed several other changes especially in the area of mobility. Lifestyle changes and maximization of digital platforms to transform workplaces to be more virtual and the need for contact free travel have led to sizeable interventions to scale up the infrastructure for walking and cycling that may define the policy approaches in post-COVID times.

Several European cities are now setting targets to phase out internal combustion engines altogether. These approaches can have disruptive impacts on global markets. Several countries in Europe, involving at least 30 cities, have the policy intent to phase out internal combustion engine powered passenger cars over the next 10–20 year time horizon. Norway targets to phase out IC engine

powered passenger cars by 2025. Denmark set a 2030 target to stop sales of new gasoline and diesel cars. Iceland will bar these vehicles after 2030. The Netherlands has set 2030 as its target. Slovenia plans phased-in approach over 2025–2030. Sweden will study the feasibility of banning new gasoline and diesel car sales starting in 2030. United Kingdom will accelerate phase-out around 2035 to 2040. France and Spain have set 2040 as their target.¹⁵ All these will accelerate electric mobility transition dramatically.

Accordingly, plans, programmes, and incentives are being worked out to scale up electric vehicles. In response, the major auto companies are changing their product portfolio rapidly. Volkswagen Group, PSA Group, Renault Group, Hyundai Motor Group, BMW Group, Daimler, Ford, Fiat Chrysler Automobiles Group, Toyota Group, and Volvo Car Group have announced plans to increase the sales share or the number of electric-vehicle models.¹⁶

The vehicles market is expected to see a massive change with shrinking of IC engines and expansion of electric vehicles as zero carbon and clean vehicle roadmaps accelerate globally.

4.1.2. Risks of slowing down in India

India has just about caught up with the basic Euro VI emissions standards and this is an important step forward. But India cannot lose the race on zero emissions targets. Even though several policy intents have been announced to achieve zero emissions, including the industry professed target of 30–40 per cent reduction in emissions by the end of the decade, the reality is far from that.

There is a danger if India abstains from accelerating the process. For a long time India has maintained at least a 10–15 years time lag with the technology roadmap for internal combustion engines in the major global markets. Now when the major markets are moving quickly towards electric mobility, the increasing gap with that trajectory in the coming decades can deeply affect the industry's competitiveness.

This is clearly illustrated in the fleet-wide average of CO₂ emissions from cars—also an indicator of fuel efficiency of vehicles as CO₂ emissions depend on amount of fuel burnt—in Europe and India. It may be noted that these standards—if sufficiently stringent—will require a rapid expansion of electric vehicles fleet wide.

This is the reason why for the carbon neutral vision for 2050 EU has adopted more aggressive CO₂ emissions standards for cars. The review by International Council on Clean Transportation (ICCT) has shown that in 2018–19, the fleet-wide corporate average fuel consumption for passenger cars (a proxy for CO₂ emissions) in India was 122 g/km. CO₂ emission for manufacturers published by EU every year show that in 2019 the average NEDC emission for new passenger vehicles was 122.4 g/km¹⁷—nearly the same as India.

This is now set to change significantly from this year onwards as Europe is now mandated to implement much tighter fleet-wide CO₂ emissions standards of 95 g/km, which will be further lowered to 75 g/km subsequently. This will have a dramatic impact on the technology trajectory, especially in catalyzing the shift towards electric vehicles. This widening of the gap has implications for Indian industry. India therefore needs to work with the combined strategy of tighter

fuel efficiency standards and zero emissions mandate supported by incentives to accelerate the change.

4.1.3. Leverage economic recovery to push EVs

At this stage it is not clear if the Government of India will design any specific recovery package for the automobile industry. There is also no clarity about how the next steps in electric mobility will be addressed. However, early signs in the Indian auto market in July show that auto sales are recovering. According to the market reports, the sales are down by only one per cent and are nearly back to the pre-COVID times. Auto majors have seen quite a substantive recovery—with some reporting over 40 per cent higher sales compared to last July. Therefore, if any support to the industry is contemplated either in the form of a scrappage stimulus or tax support, that needs to be linked with conditional changes within a time frame.

The pandemic related recovery has to ensure that the current policy framework stays on track and there is green recovery funding attached to FAME II and the Battery Mission. Firmer steps are needed to create a zero emissions mandate for time bound targets and transition. This needs to be supported by a well-designed incentive programme to address the upfront cost and total cost of ownership, and cost parity between electric vehicles and IC engines for deeper market penetration by 2030.

India needs to hasten implementation of FAME II and simultaneously frame strategies for post-FAME II programme with higher level of ambition. This will require regulatory support in the form of zero emissions mandate to at least achieve the industry professed target of 30–40 per cent electric vehicle sales by 2030. This is needed as a step for higher level of ambition of complete transition in the subsequent decade. This requires vehicle segment-wise strategy with appropriate accelerators. Already, market forecast has shown that two-wheelers and three-wheelers are the immediate contenders for rapid electrification if the market witnesses adequate product diversity and infrastructure support. It will be easier to design incentive programmes for these segments to cushion the upfront cost and reduce total cost of ownership of the two-wheelers. Simultaneously, strategies have to be developed—both fiscal and non-fiscal—for the car segment and other commercial vehicles.

The e-bus transport revival needs to be designed at scale. Direct incentives to public fleet operators will induce demand for commercial fleet and reduce burden due to already lost revenues during the lockdown. Low-interest loans and public co-funding will sustain the operators and manufacturers' confidence for their green targets. Post-pandemic public transport will require fiscal support and reforms for augmentation of bus services and overall solvency. Currently, policies are inadequate and do not support the ambition of e-buses. There is need for constructive agenda and fiscal strategy for mass electrification of travel trips.

Strengthen supportive regulations to drive electric vehicles

Tighten fuel efficiency standards: To accelerate electric vehicle roadmap, immediate steps are needed to tighten fuel efficiency standards for targeted vehicles segments—passenger cars, two-wheelers, and commercial vehicles (medium and heavy duty). Tighter standards along with effective credit for electric vehicles can accelerate market growth. Currently, the corporate average fuel consumption standards for passenger cars that are underway, and those scheduled for introduction in 2022, are very weak. These are not strong

enough to require electric vehicles in the fleet. One of the reasons why Europe has seen fleet transformation to the level of EV being 10 per cent of the new cars sales is the tighter CO₂ standards and the prospect of further tightening. European countries such as Germany and France (and soon Spain) have already earmarked direct purchase incentives for EV consumers for keeping up with the low-carbon transition.

Scrappage policy linked to reforms: Other regulatory actions linked with recovery, like the scrappage policy, also need to be linked with the criteria of pollution and carbon reduction. Removal of polluting guzzlers from the road can help stimulate the market as well as provide emissions benefits. But to maximize the potential of this programme to reduce emissions requires more explicit link with conditional introduction of electric vehicles. Scrappage policies after the 2008–09 global financial crisis have taught us that unless these programmes are linked with an environmental control criterion, the emissions impact can be short-lived. One such example is from Germany, where the scrappage programme reduced greenhouse gas emissions by a mere four per cent, which also stagnated in the long run.¹⁸ ICCT assessment shows that if a similar scrappage programme is linked with only electric vehicles, Germany can potentially reduce emissions by 62 per cent.¹⁹ The incentive amount can have levels based on the specifications of the new vehicle that will be purchased.

The Government of India has been working on a scrappage policy for some time. Its elements are still not in the public domain. It is not yet clear if the government will provide direct monetary incentives. It is quite likely that the government may fix the age cap of vehicles and increase the re-registration fees and expect the industry to incentivize the replacement process. Nonetheless, a good scrappage programme needs to be linked with emissions and fuel efficiency criteria and purchase of new electric vehicles. Proper policy design is needed to prevent rebound effects.²⁰ For example, the scrappage payments should not be aimed to encourage the purchase of more cars, but rather shift the demand to low-emission vehicles. Currently, no EV centric policies have been announced in India in response to COVID-19. Such programmes can be supported by localization of R&D and manufacturing.

State level policy to create bottom up pressure: To accelerate the national roadmap state level action is necessary to create local mandates, incentives, and infrastructure. As of now about ten state governments have issued their respective electric vehicle policies with varying scope and focus. The most recent is the notification of Electric Vehicle Policy by the Delhi government to achieve the target of 25 per cent electrification of new vehicle fleet by 2024. Within three years, 25 per cent of all new vehicle registrations will be battery-operated electric vehicles. This is expected to transform the market from the current level of electrification. According to the VAHAN database of the Ministry of Road Transport and Highways, electric vehicles were only 3.2 per cent of the new vehicles registered in Delhi in 2019–20.

This step in Delhi can also have a national spin-off. According to the last available Road Transport Year Book of the Ministry of Road Transport and Highways in 2016–17, Delhi is ninth among all states and top among all cities in terms of cumulative vehicle registrations. The proposed 25 per cent transformation of Delhi's new vehicle market can catalyze electric vehicle production and bring more product diversity. State-level action is critical to achieve nation-wide scale.

Recovery packages cost a large sum of money for governments. Therefore, stimulus packages should have defined objectives within the macro economy, local labour markets, and the environment. Accordingly, regular monitoring and evaluation of such policies is needed to assess the delivery on the intended benefits.

4.2. Case 2: Pandemic and bus transport—key summary highlights

Yet another sector that requires immediate attention is public transport, especially bus transport that according to the Census of 2011 met 45 per cent of travel demand in India. COVID-19 pandemic has deeply affected public transport. A survey conducted by the International Association of Public Transport (UITP) of 14 State Road Transport Undertakings (SRTUs) shows that 81 per cent of the operators have reported no ridership at all during the lockdown phases, while others have reported 90 per cent reduction in ridership from the pre-COVID level.²¹ Ridership of SRTUs in Maharashtra, Karnataka, Kerala, Delhi, and Hubli-Dharwad Bus Rapid Transit System (HD-BRTS) are still below 90 per cent.

Recovery of ridership is expected to be slow due to fear of contagion. A CSE survey of middle to high income groups in Delhi and NCR has shown that preference for public transport is likely to reduce by 27 per cent within the six months of the lockdown.²² Apart from the steep loss in ridership, additional burden of safety protocols, hygiene and sanitation, and social distancing requirements have added to the cost of operation. For example, Bus Operators Corporation of India (BOCI) has estimated that an additional cost of Rs 17 lakh (including capital and operational expenditure including cost of additional manpower engagement) is required for 100 buses per month only to meet the requirements of safety protocols.

This has serious implications at a time when India needs urgent scaling up of clean and low carbon transportation systems. Already, there is a huge deficit in bus transport. Currently, urban India has 48,000 buses, but according to an estimate by GIZ, based on the guidelines of the Union Ministry of Housing and Urban Affairs (MoHUA), 188,500 buses are needed to properly fulfil consumer demand.²³ The pandemic is cutting down the existing capacity by more than half.

SRTUs are already burdened with accumulated financial losses. The aggregated net losses of SRTUs between the years 2010 and 2016 have escalated by 48 per cent—from Rs 5,899 crore to Rs 11,350 crore. The GIZ estimates further show that the traffic revenue will be reduced by 48 per cent in 2020–21 due to the pandemic. This will increase the annual viability gap funding requirement by 69 per cent for bus transport agencies in India. This results in poor bankability of the state transport corporations, limited revenue sources with urban local bodies, and disproportionate share of transport-related funding going to road infrastructure, which further aggravates the challenge.²⁴ A strategy for revival and reforms is sorely needed.

Immediate economic stimulus package can help to revive bus transport and offset pandemic related financial crisis but this needs to be linked with deeper reforms and financial instruments for long-term economic sustainability.

Buses victims of skewed taxation: As per the seventh schedule of the Constitution of India, the taxes on passenger vehicles are levied by the central and state governments for resource mobilization such as meeting the cost of

road construction and its maintenance. The basis of computing tax varies from state to state. SRTUs have to pay numerous taxes, of which motor vehicle (MV) tax, including road and passenger tax, and GST on vehicle purchase are important.

The cumulative impact of all these taxes imposes an additional burden on the cost of operation of buses. In addition to taxes, interests are applied to each cost component including taxes. Once payments of these taxes gets delayed, the interest on them also increases proportionately, which further escalates the overall tax burden. While there were 13 SRTUs that were making a profit before paying taxes, after paying taxes only seven SRTUs could make a profit. The present paradigm to treat buses as a commercial entity needs to change. Association of State Road Transport Undertakings (ASRTU) has demanded reduction of road tax to two per cent of the revenues earned.²⁵

Buses taxed higher than cars: Cars pay lifetime road tax once whereas buses pay road tax on a yearly/quarterly basis. A comparison between the annual road tax burden on a bus versus car shows that buses pay more than cars. For example, in the case of Ahmadabad, Mumbai, Bangalore, and Pune, the taxation regime is so skewed against the bus system that the annual road tax paid by city buses is even more than 20 times the maximum road tax paid by a car. This makes per kilometre travel cost by two-wheelers cheaper than buses and creates perverse incentives for personal vehicles. Tax systems have to be rationalized to reduce multiple tax burdens on buses. Motor vehicle taxation has to be rationalized to address tax differential between buses and cars.

Hike in fares will increase journey cost of commuters: To offset the massive financial losses, several bus operators have hiked fares. For example, Dehradun city bus service and Bangalore Metropolitan Transport Corporation have increased fares. Haryana cabinet has given nod to hike in bus fares for Haryana Roadways buses.²⁶ Such increases can also raise equity concerns as the burden might fall disproportionately higher on the lower income groups. These also increase the overall journey cost for people.

Need fiscal stimulus for bus transport: While several countries globally have already come up with country-wide financial support for public transport, India is yet to respond. So far, at the state government level, only Odisha and Karnataka governments have exempted road tax for state-wide passenger buses for three months. All planned investments are on hold.

Without fiscal support public transport reform will slow down: There are serious fears that all new investments needed to modernize the bus system, improve service level for wide geographical and population coverage in cities, upgrade IT-based passenger information system, etc. will get stalled if a fiscal strategy is not immediately available. Already, the Delhi government is likely to delay the procurement of additional buses this year to achieve a target of 11,000 buses.²⁷ Also, the contract and deployment of 1000 electric buses under the FAME II scheme is at risk. Therefore, to address economic sustainability of bus transport, reforms have to be accelerated in the sector. It has been more than a decade since the National Urban Transport Policy (NUTP), 2006, provided for levy of dedicated taxes to be credited for an urban transport fund, which would be used exclusively to meet urban transport needs within the states.²⁸ Even though only a few states such as Rajasthan and Karnataka have done that so far, this strategy needs to be further developed.

Tap into the global learning curve: Globally, governments have started to frame support policies for public transport. Hong Kong has taken the lead with the most elaborate package to support both bus operators and commuters. Transport for London (TFL) and Metropolitan Transport Authority (MTA) in New York have provided support to their respective bus systems. England, United States, Germany, Hong Kong, and New Zealand have come up with direct financial support whereas Singapore, China, Kazakhstan, and Turkey have come up with indirect financial support such as tax rebates.

India cannot delay fiscal bailout and sector reforms for long-term financial sustainability of bus transport. Both clean air action under the NCAP and climate action under the NDC are riding on an aggressive public transport strategy. A massive turnaround is needed in this sector to scale up modern and convenient public transport for effective modal shift to contain motorization. It is also important to note that the electric bus programme, which is the new generation intervention for zero emission trajectory, also requires deep sector reforms, especially fiscal reforms for long-term sustainability of the programme. This trajectory will have to be defined and implemented right now.

This assessment thus focuses on understanding the pandemic related disruption in two critical areas of the transportation sector—electric mobility and bus transport—to understand the nature of disruption and identify the roadmap for recovery and scale of change.

SECTION 1: COVID-19 AND THE ELECTRIC VEHICLE PROGRAMME

There is deep interest in the fate of the electric mobility programme in India today. This is the new generation technology roadmap for zero emissions that is needed within a quicker time frame to meet the air quality targets and low carbon ambition. It may be noted that the clean air action plans that are evolving under the National Clean Air Programme have included electric vehicles and the electric mobility programme to meet clean air targets. This is also part of the carbon reduction ambition. But there are worries that the pandemic will derail the next steps and delay the transition. This is also the reason why it is important to understand the impact of the pandemic on the sector and identify the strategies that can help to create a robust roadmap with clear long-term targets and commitment to build confidence in the market.

1. ELECTRIC VEHICLE PROGRAMME IN PRE-COVID PERIOD

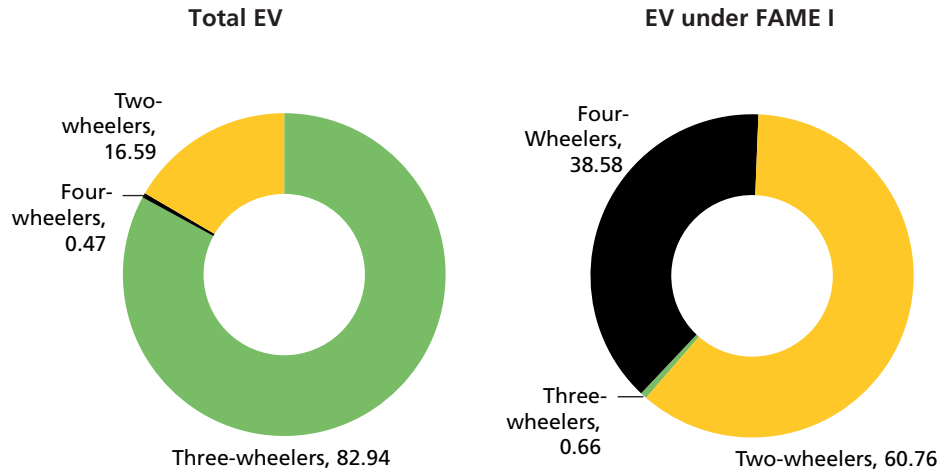
The electric vehicle programme in India has pre-COVID roots but it is not designed for scale and rapid expansion. It does not have long-term targets or a mandate. It is also not adequately supported by a well-designed incentive programme at the central and state level and it does not have effective fuel efficiency standards for vehicles that require zero emissions.

This is evident in the trajectory so far. The first ever plan for the electrification of vehicles in India was launched in 2013 as National Electric Mobility Mission Plan (NEMMP) 2020, which envisioned 6–7 million electric vehicles on Indian roads by 2020 and achieving prowess in the manufacture of EVs. Under NEMMP, a national scheme called the FAME scheme was introduced in 2015 to incentivize and accelerate EV adoption. The first phase of FAME I ended in 2019 and the second phase of FAME II took off thereafter, and that is also coming to an end in 2022. There is no conversation yet on the next phase to maintain continuity with the long-term commitment to instil confidence in the industry and the consumers.

1.1. Legacy of FAME I: A small beginning

FAME I was a small beginning that had earmarked Rs 895 crore for direct purchase incentives, support for R&D, and support for infrastructure development for the EV ecosystem. FAME I aimed at incentivizing all vehicle segments but was largely focused on passenger vehicles. As of FY 2018–19, India registered a sales figure of 7.59 lakh electric vehicles.²⁹ Out of these, 1.26 lakh (16.59 per cent) vehicles were two-wheelers, 6.3 lakh (82.94 per cent) were three-wheelers and 3,600 (0.47 per cent) were electric passenger four-wheelers.³⁰ Passenger vehicles (two-wheelers and four-wheelers) mostly benefitted from this scheme (see *Graph 1: Comparison of the percentage of total vehicles sold and vehicles sold under FAME I in 2019*). However, flawed design of FAME I that had allowed incentives for mild diesel hybrid cars hogged nearly 60 per cent of the incentives. This weakened the impact of the programme considerably and slowed down and impeded penetration of fully battery-operated vehicles. In the face of strong criticism this practice was discontinued under FAME II.

Graph 1: Comparison of the percentage of total vehicles sold and vehicles sold under FAME I in 2019



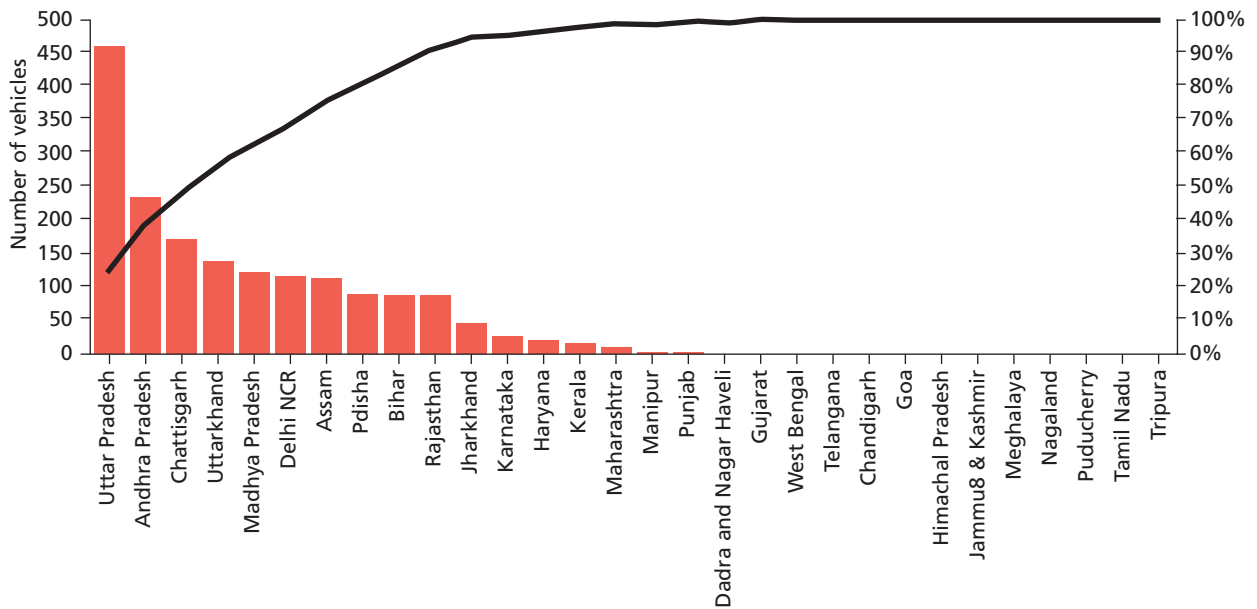
Source: PwC 2019, *Towards e-mobility—putting the consumer at the wheel*

E-rickshaws—special challenge: The electric vehicle market in India is currently dominated by three-wheelers, mostly e-rickshaws in the unorganized sector; their market accounts for nearly 83 per cent of electric vehicles in India. Roughly 11,000 e-rickshaws are registered in India every month. The number of original equipment manufacturers (OEMs) and models registered under the FAME scheme for three-wheelers are very low. A very small proportion of the electric three-wheeler segment has utilized the incentives under FAME. In FY 19, out of total vehicles purchased under FAME I, only 0.66 per cent was three-wheelers.

The low acquisition costs and low life cycle costs are largely because of the nature of operations in the unorganized sector (vehicles without licenses and irregular fares, etc.). The unorganized sector also imports complete knock-down (CKD) kits for e-rickshaws from China for their operations.³¹ Majority of the manufacturers of cheap electric rickshaws do not meet the official FAME scheme eligibility due to low-quality parts manufactured locally or imported from China as CKD kits.³² Before the second phase of FAME (FAME II), only four three-wheeler OEMs were registered under the incentive scheme.³³

FAME I was also not linked to performance requirement or battery quality. In 2018, the lead-acid batteries made up for more than 90 per cent of the sales in electric two-wheelers and three-wheelers.³⁴ The lead-acid batteries are cheaper than lithium-ion batteries, but they are heavier and less durable than Li-ion. They also lose a small amount of battery capacity after every full discharge. Therefore, the Government of India decided to withdraw support for lead-acid batteries for the last six months of FAME I as a way of disincentivizing these batteries.³⁵

State-wise progress was also very uneven. Uttar Pradesh, Andhra Pradesh, Chhattisgarh, Uttarakhand, Madhya Pradesh, Delhi/NCR, Assam, and Odisha contributed about 80 per cent of the electric three-wheeler sales in India under FAME I (see *Graph 2: State-wise electric three-wheeler sales under FAME I in India*).

Graph 2: State-wise electric three-wheeler sales under FAME I in India

Source: PwC 2019, towards e-mobility—putting the consumer at the wheel

E-buses under FAME I: FAME I represented a very small beginning for e-buses. It outlined a budget of Rs 390 crore for purchasing 390 buses that was sanctioned for 11 cities in India. This number was increased to 425 buses by the end of the scheme period.³⁶ But not all these procurements were finalized. Adoption of electric buses was very slow due to the high acquisition costs and lack of charging infrastructure. When FAME was introduced in 2015, the electric vehicle technology was still at a very nascent stage and there were other technical constraints as well. Due to the lack of fast chargers, state transport corporations, while catering to the high travel demand in Indian cities, were constrained to adopt e-mobility. In 2015, product diversity of OEMs was very limited. This meant limited number of models for public operators. Batteries could account for up to 50 per cent³⁷ of the cost of an electric vehicle. The possibilities of battery overheating, corroding of battery capacity, and voiding of warranties provided by OEMs were additional concerns.

Nonetheless, globally, as the electric vehicle technology advanced and supply chains developed, battery packs also measured significant decrements in their prices. Between 2015 and 2018, an average 22 per cent drop per kWh price was observed each year.³⁸ The battery range also improved and so did the number of players in the manufacturing sector. Indian cities started with pilot tests for running electric buses on specific routes, and this was followed by procurement of electric buses in 2017.

According to the Ministry of Heavy Industries and Public Enterprises (MoHIPE), a total of 417 electric buses are currently in use on the Indian roads out of the sanctioned 425.³⁹ The process started with Himachal Pradesh that was the first to begin with an electric public transport fleet of 25 buses, supplied by PMI Foton, on the Manali–Rohtang stretch in 2017. Brihanmumbai Electric Supply & Transport Undertaking (BEST) Mumbai was one of the early adopters, procuring six buses from Olectra-BYD (then Goldstone-BYD) for pilot tests in 2017⁴⁰; BEST later proceeded to procure 40 more buses under FAME I from the same supplier, of which 32 buses have already been delivered and are

operational. BEST later proceeded to procure 10 more buses to be added to its fleet in 2019 from the same supplier.⁴¹ In 2019, Kolkata added 80 electric buses from Tata Motors into operation on 12 routes.⁴² Olectra-BYD was the first manufacturer crossing the 100-number mark, reaching 108 operational buses in India after delivering 40 new buses to the Telangana State Road Transport Corporation in 2019.

In terms of upfront vehicle costs, electric buses have a much higher acquisition cost. However, the operation and maintenance costs of an electric bus are much less, and therefore in the long run the total cost of ownership (TCO) for an electric bus is expected to be lower. According to a study conducted by Bloomberg NEF⁴³, even with the most expensive charging options, an electric bus with 110 kWh battery reaches a similar TCO as a diesel bus if it runs an average of 60,000 km per year. That is as less as 170 km per day. Therefore, the conversion of the public bus fleets into electric is an excellent approach to achieve electrification. Realizing these benefits, FAME scheme was launched to make the procurement of electric buses easier and more attractive for operators across India. But the bus sector did not progress that much under FAME I.

1.2. FAME II before the pandemic

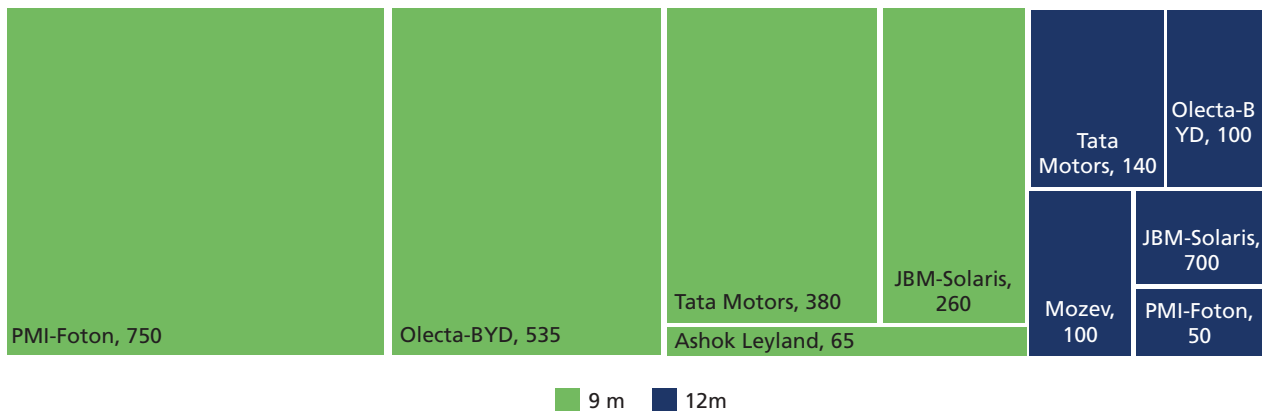
After FAME I ended on 31 March 2019, FAME II started with tenure until 2022. India is in the middle of implementing FAME II and the intrusion of the pandemic has now raised concerns around its final stage and post-FAME II strategy.

FAME II has earmarked Rs 10,000 crore for demand incentives and charging infrastructure and for the committed expenditure of FAME I after 31 March 2019. FAME II represents a strategic shift with a key focus on electrification of buses, two-wheelers, and three-wheelers. About Rs 1000 crore is reserved for charging infrastructure. Under FAME II, the link between electrification and public transport became more explicit. This is an important strategy to make mass travel trips zero emissions.

About 41 per cent (Rs 3,545 crore) of the total purchase incentives under FAME II is allocated to e-buses. In response to the invitation of Expression of Interest (EOI) by the Department of Heavy Industries (DHI), proposals for 14,988 electric buses were received. DHI has sanctioned 5,595 buses based on the priorities and resources available. A total of 5,095 buses in 22 states (64 cities) were allocated for intra-city operations and 400 buses were sanctioned for intercity operations to eight state transport corporations across India. Another 100 buses were sanctioned to Delhi Metro Rail Corporation (DMRC) for last-mile connectivity (see *Annexure 1* for the full list).

Before the COVID-19 crisis escalated in March and India went into lockdown, the progress made under FAME II was substantial. Under FAME II, the DHI has already approved the procurement of 2,450 buses. Out of the 22 states, 13 states (30 cities) have closed their tendering for 2,270 buses for intra-city operations and four state transport corporations have finalized 180 buses for intercity operations. BEST in Mumbai with 300 buses, Janmarg in Ahmedabad with another 300 buses, and Uttar Pradesh (11 cities) with 600 buses will own about 50 per cent of the buses sanctioned so far.⁴⁴

Under the FAME II incentive, PMI-Foton has received the maximum supply orders which include 750 nine-metre buses and 50 twelve-metre buses. Out of the 750 nine-metre PMI-Foton buses, Uttar Pradesh alone has ordered 600. Tata

Graph 3: FAME II bus suppliers under finalized tenders across India

Source: UITP 2020, analysis of FAME II tenders across the country

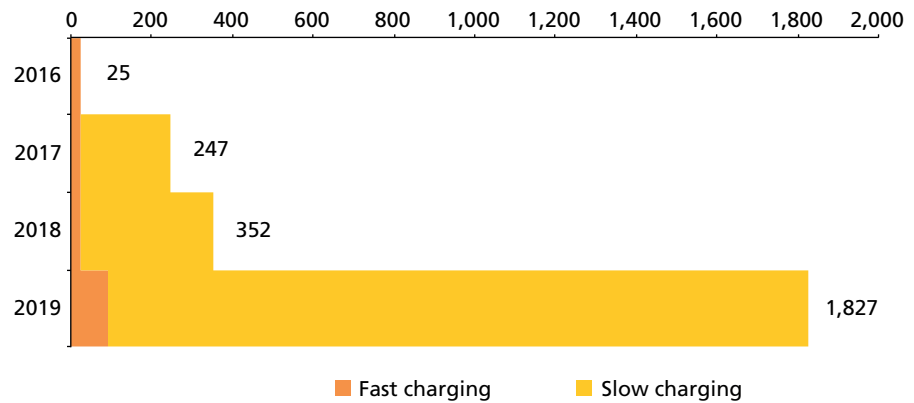
Motors will supply 420 buses to BEST (300 buses) and Ahmedabad (120 buses). Olectra-BYD has landed the second largest order after PMI-Foton for 535 nine-metre buses and 100 twelve-metre buses (see *Graph 3: FAME II bus suppliers under finalized tenders across India*).

Adequate information on the performance of the current fleet of e-buses in cities is not yet available in the public domain. The basis for procurement as recommended by DHI was Gross Cost Contract, and the selection criterion was the least cost per km operation. Over 80 per cent (1,900 buses) of the buses which were procured under the scheme were nine-metre buses although the cost per km for nine-metre and twelve-metre buses was very similar; Rs 63.3 and Rs 69 per km⁴⁵ respectively. The revenue potential of the two categories and payback potential, in the long run, is expected to vary, depending on the consumer demand and supporting infrastructure.

Supportive electric charging infrastructure has just started to expand. Electric Vehicle Charging Infrastructure (EVCI) is a combination of Electric Vehicle Supply Equipment (EVSE) and Electric Vehicle Charging Stations (EVCS). EVCI lies at the heart of any electric vehicle ecosystem. Apart from improving the driving range of vehicles, charging infrastructure availability also plays a crucial role in reducing range anxiety and building consumer trust; so much so that the demand for electric vehicles (overall adoption) is directly linked to the availability of publicly accessible charging infrastructure.⁴⁶ In 2019, India's ratio of charging points to electric vehicles was 1:41; in Norway, the ratio was 1:20 and in China, it was 1:8.⁴⁷

To improve the condition of EVCS availability in India, the FAME II scheme has sanctioned 2,636 charging stations across 62 cities in 24 states/UTs. Out of these, 1,633 stations will be fast-charging stations while 1,003 will be slow charging stations. According to IEA, India had a total of 1,827 charging stations in 2019, after the instalment of 66 new fast-charging stations and 1,384 slow charging stations in 2019. The growth in the number of stations seems promising, increasing from just 25 stations in 2016 to 1800+ in 2019⁴⁸ (see *Graph 4: Number of publicly accessible chargers (slow and fast) in India 2016–19*). But this is certainly not enough to support scale.

Graph 4: Number of publicly accessible chargers (slow and fast) in India 2016–19



Source: International Energy Agency, 2020, *Global EV Outlook 2020*

This quick sketch of FAME I and FAME II just before the pandemic had set in shows that even though the programme had started to expand, it was not designed to achieve scale and deeper penetration. India is halfway through the implementation of FAME II and the questions have emerged related to the final implementation of FAME II on time and the next level of transition.

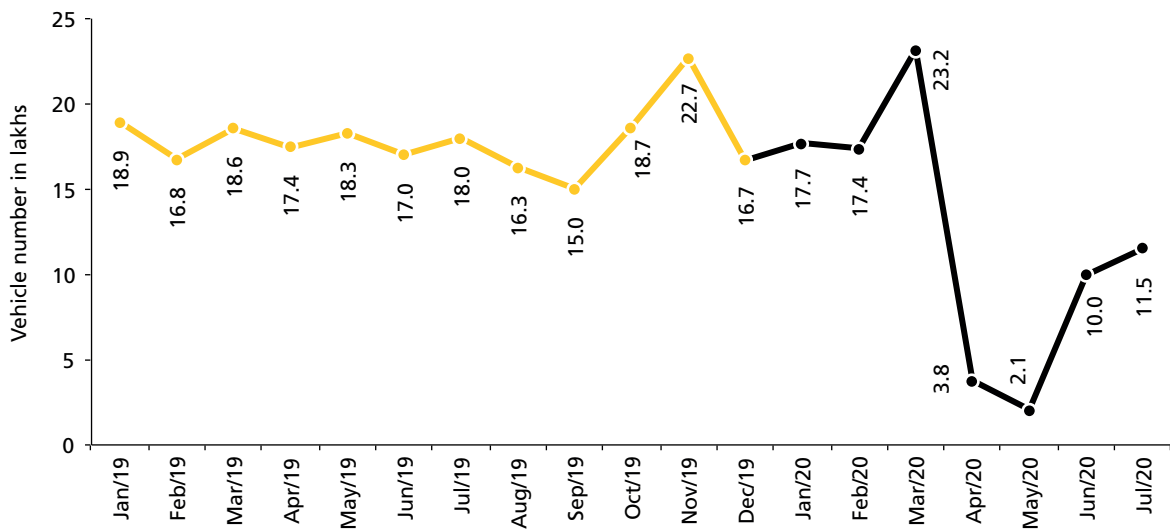
2. IMPACT OF COVID-19 ON EV REGISTRATIONS IN 2020

As expected, the impact of COVID-19 pandemic on the overall vehicle sales, and particularly on electric vehicle sales, was dramatic. After COVID-19 cases started escalating dramatically in March, India went into one of the world’s harshest lockdowns for 21 days starting 24 March. The lockdown was eventually extended four times, lasting for 75 days in total. On 08 June, most of the movement restrictions were lifted. During this period, the demand for new vehicles dipped down to unprecedented levels.

CSE has analyzed the VAHAN database of the Ministry of Road Transport and Highways on vehicle registration. This shows that the automobile industry in India was already in a slump with 5.52 per cent lower registration in 2019 as compared to 2018. Also, to facilitate a smooth transition to the BS VI technology, auto makers had reduced their network stocks and were focusing on sales of leftover BS IV assets by March 2020.⁴⁹ This is why we see a drop in registration numbers at the end of 2019 and beginning of 2020. Just when the numbers were showing signs of improvement, the unprecedented COVID-19 pandemic hit the industry. April recorded a drop of 83 per cent in the registrations, from 23.2 lakh in March to just 3.8 lakh (see *Graph 5: Trend of total vehicle registrations in India from 01 Jan 2019 to 31 July 2020*). However, the numbers recovered quickly in June, crossing the 11-lakh mark at the end of July.⁵⁰

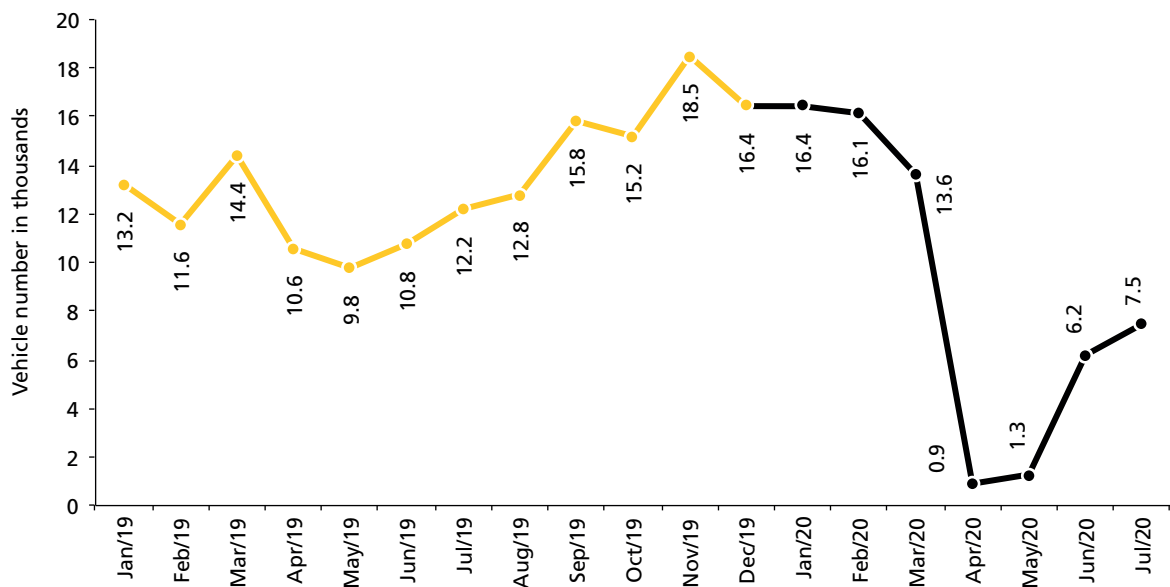
EV registrations dipped by 26.5 per cent between March and April 2019 due to the revised FAME II eligibility criteria for availing incentives, which took effect starting in April. Since then, the trend was pretty much positive for the rest of the year, recovering by 74 per cent between April and November; however, sales started dropping again in December due to the BS VI preparations. During the lockdown, registrations dipped in April but started increasing again in June and showed a sevenfold increase in July compared to April although the overall numbers were still about 50 per cent of the March registrations. (see *Graph 6:*

Graph 5: Trend of total vehicle registrations in India from 01 Jan 2019 to 31 July 2020



Source: MoRTH 2020, VAHAN dashboard

Graph 6: Trend of total electric vehicle registrations in India from 01 Jan 2019 to 31 July 2020

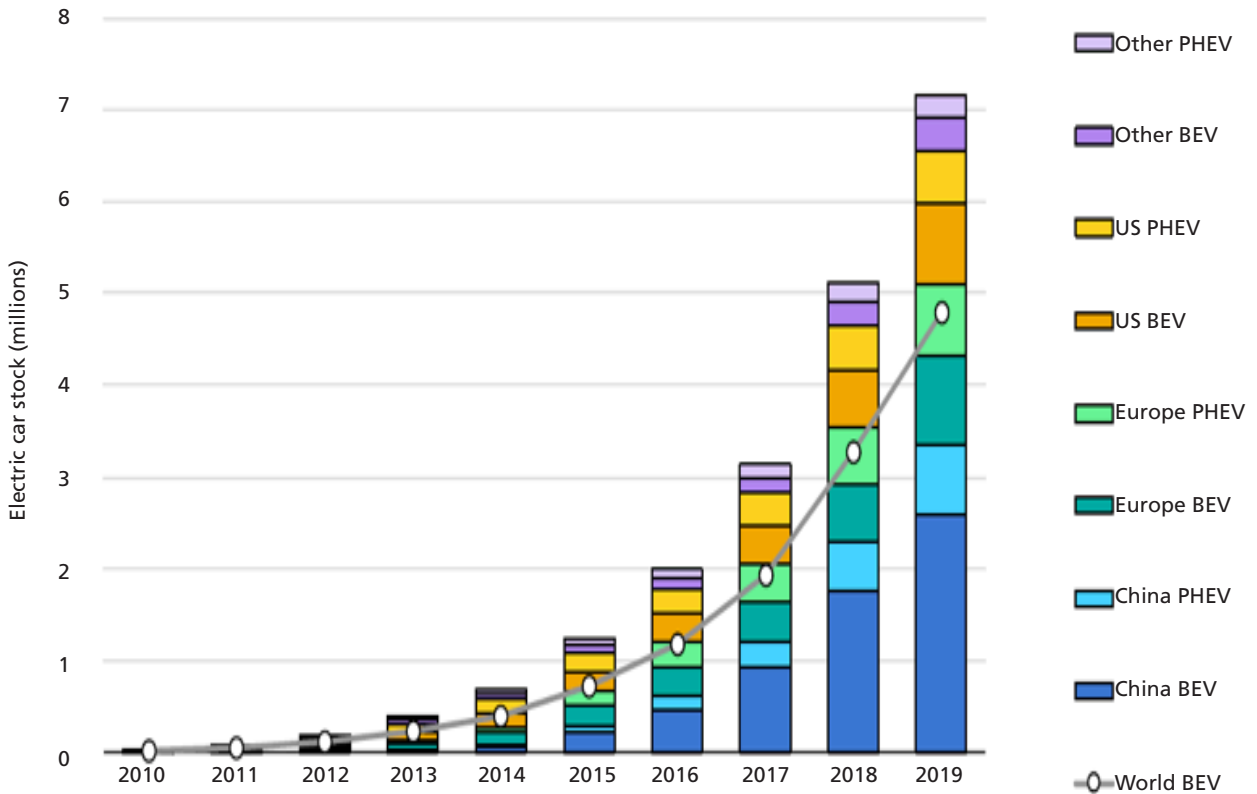


Source: MoRTH 2020, VAHAN dashboard

Trend of total electric vehicle registrations in India from 01 Jan 2019 to 31 July 2020). Electric three-wheelers, that form a major portion of the electric vehicles registered in India, set the overall trend.

The critical question is, how will India revive the e-vehicle market? A few market forecasts have been reported. The market forecast by Frost & Sullivan suggests that e-rickshaw numbers will reach 10 lakh units by 2025, and electric

Graph 7: Trend of global electric car stock 2010–19



Source: International Energy Agency, 2020, *Global EV Outlook 2020*

two-wheelers will reach 30 lakh units in sales volume.⁵¹ This indicates that electric three-wheelers and electric two-wheelers will be the escalators and will lead the electric mobility goals for India in the short to medium-term. While these segments need to be targeted for scale in the shorter time horizon, it is also important to adopt strategies for other vehicle segments to achieve scale.

3. GLOBAL ELECTRIC VEHICLE MARKET BEFORE THE PANDEMIC

The big economies like EU, China, and the US are leading the electric vehicle transition. The information available from the International Energy Agency (IEA) shows how these markets have gradually built up over the last decade. The global uptake of electric vehicles overall was slow in the first few years of the last decade (see *Graph 7: Trend of global car stock 2010–19*). In 2010, only 17,000 electric cars were registered around the world, and a handful of countries could count more than 1,000 cars on their roads. However, the numbers soared in the last five years, making the electric car stock cross the seven million mark in 2019, concentrated mostly in China, EU, and USA.⁵²

The Chinese electric vehicle stock represented 47 per cent of the total global EV car stock in 2019. Europe is right behind with 25 per cent and USA with 15 per cent of the global stock. Among the 25 citiesⁱⁱ identified⁵³ by the ICCT as the top EV markets in the world, 13 cities are in China.

Table 1: Review of global ZEV sales and stock targets and status

Country		Target	Current status
China		25% NEVs (PHEV, BEV, FCEV) sales by 2025	4.7% (1.2 million) NEVs out of total 25.7 million sales in 2019
European Union		13 million ZEV sales by 2025	4.6 million EVs (market share 3% of total) in 2019
TOPEV MARKETS IN EU IN 2019	Norway	100% ZEV sales by 2025	55.9% (i.e. 79,640) EVs (both PHEV and BEV) out of new registrations in 2019
	Sweden	No new sales of ICEs after 2030	6.9% PHEV; 4.3% BEV out of total 356 thousand new registrations in 2019
	Germany	7–10 million BEV, FCEV vehicle stock by 2030; 100% passenger vehicles sales to be ZEV by 2050	1.25% PHEV; 1.7% BEV out of total 3.6 million new registrations in 2019
	Denmark	1 million EV stock by 2030 No new ICE sales after 2030 100% ZEV sales by 2035	1.7% PHEV; 2.4% BEV out of total 225 thousand new registrations in 2019
	France	500,000 PHEVs and 660,000 BEVs vehicle stock by 2023; 1.8 million PHEVs and 3 million BEVs vehicle stock by 2028	0.8% PHEV; 1.9% BEV out of total 2.2 million new registrations in 2019
United Kingdom		50–70% EV sales by 2030; No ICE sales after 2035	1.5% PHEV; 1.6% BEV out of total 2.2 million new registrations in 2019
United States of America		3.3 million ZEVs (PHEV, BEV, FCEV) in 11 states* by 2025; All passenger vehicles ZEV in 10 states** by 2050	1.3 million stock of electric vehicles in 2019 EV share sales 2% of the total vehicle sales of 1.7 million in 2019
Japan		30–40% HEV, 20–30% BEV and PHEV, 3% FCEV sales by 2030; 100% sales of HEV, BEV, PHEV, FCEV by 2050	0.8% (43,867 units) new registrations market share in 2019

Note: PHEV—Plug-in Hybrid Electric Vehicles; BEV—Battery Electric Vehicle; EV or Electric Vehicle = PHEV + BEV; NEV = New Energy Vehicles (Chinese term for EVs); HEV—Hybrid Electric Vehicles (does not have an electric motor like PHEVs); FCEV—Fuel Cell Electric Vehicle; ZEV—Zero Emission Vehicle

*California, Colorado, Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont

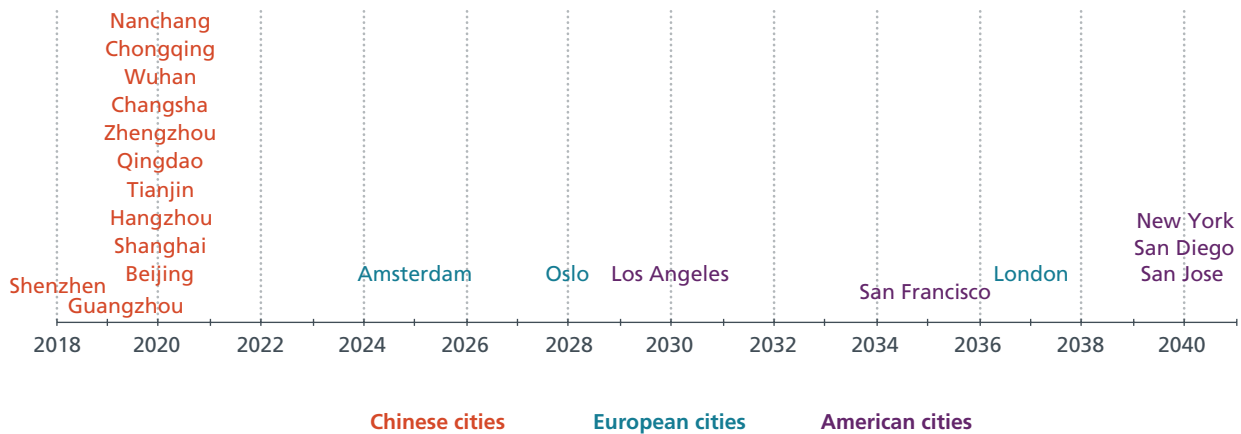
**California, Connecticut, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, Vermont, and Washington

Source: IEA⁵⁴; EEI⁵⁵; EERE⁵⁶; ACEA^{57,58}; EV-Sales Blog⁵⁹

Some of the factors that contributed to this trend are the growing level of ambition that led to a combination of strategies across geographies, including effective incentive programmes, targets and mandate, and tighter fuel economy standards for vehicles that sent a strong signal to the industry. This also built consumer confidence. Even disincentives for conventional internal combustion engines emerged (see *Table 1: Review of global ZEV sales and stock targets and status*).

Cities in China and Europe also aimed for electric bus fleet and are working on fixed deadlines (see *Graph 8: Target years for 100 per cent conversion of bus fleet to electric*). China is currently leading in the numbers game, owning 95 per cent of the global fleet in 2019.⁶⁰ Cities such as Shenzhen and Guangzhou have already completed their target for 100 per cent electric bus fleets by 2019. In 2019, Europe registered 1,900 new buses, bringing the total stock of e-buses to 4,500 plying in Netherlands, UK, Germany, and France. By 2020, 10 per cent

Graph 8: Target years for 100 per cent conversion of bus fleet to electric



Source: ICCT 2019, *Electric Vehicle Capitals—showing the path to a mainstream market*

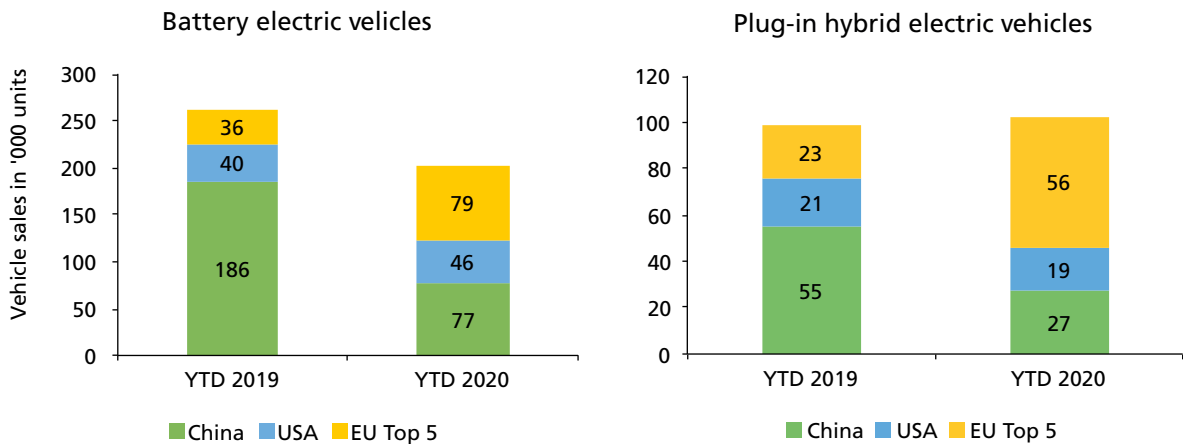
of the bus fleet in Netherlands was already electric. The country is the leading market for electric buses in Europe.⁶¹ US has a stock of 2,555 buses with 500 registrations in 2019 alone.⁶² European and American cities are planning the transition in the time frame of 2030–40. As part of achieving electric mobility targets, strategies for electrification of city bus fleets have caught political attention. Apart from the reduced emissions, electric buses also run on smaller operations and maintenance costs. E-buses can also help improve service level benchmarks—for example, they can be paired with software add-ons (such as cloud-based scheduling systems, telematics linked with chargers, etc.) and provide better route planning options and more efficient charging infrastructure investment planning.

In the para transit segment, electric three-wheelers are attractive to developing economies due to their competitive purchase costs relative to ICE counterparts; their low operation and maintenance costs also make them a cheap source of transportation. The electric three-wheeler market is largely concentrated in China, with a stock 50 million units recorded in 2019.⁶³

4. IMPACT OF COVID-19 ON GLOBAL EV MARKET

Overall, battery electric vehicle sales in the first quarter of 2020 reduced in China, USA, and the top five EU markets by 23 per cent due to the stalled Chinese EV market (-58 per cent). But the global PHEV sales increased by four per cent even after a bad quarter in China due to very strong growth in the EU countries (+149 per cent) (see *Graph 9: BEV and PHEV sales among the biggest EV markets in Q1 2020*).⁶⁴ It seems that electric vehicles were not impacted as badly as conventional vehicles during the pandemic.

Further comparison of 2019 and 2020, based on reports of International Energy Agency, suggests that the overall global car sales were reduced by about nine million between January and April in 2020.⁶⁵ The overall sales of passenger vehicles are also expected to drop by 18 per cent this year due to the outbreak.⁶⁶ However, some countries, which recovered more quickly than others, are seeing improvement in their sales numbers. South Korea, which was one of the first countries to successfully contain the pandemic, was able to rebound its sales figures in March and April. China also saw an increase in car sales as people came out of lockdown starting the first week of April.⁶⁷

Graph 9: BEV and PHEV sales among the biggest EV markets in Q1 2020

Source: PwC, 2020, e-mobility sales review Q2 2020

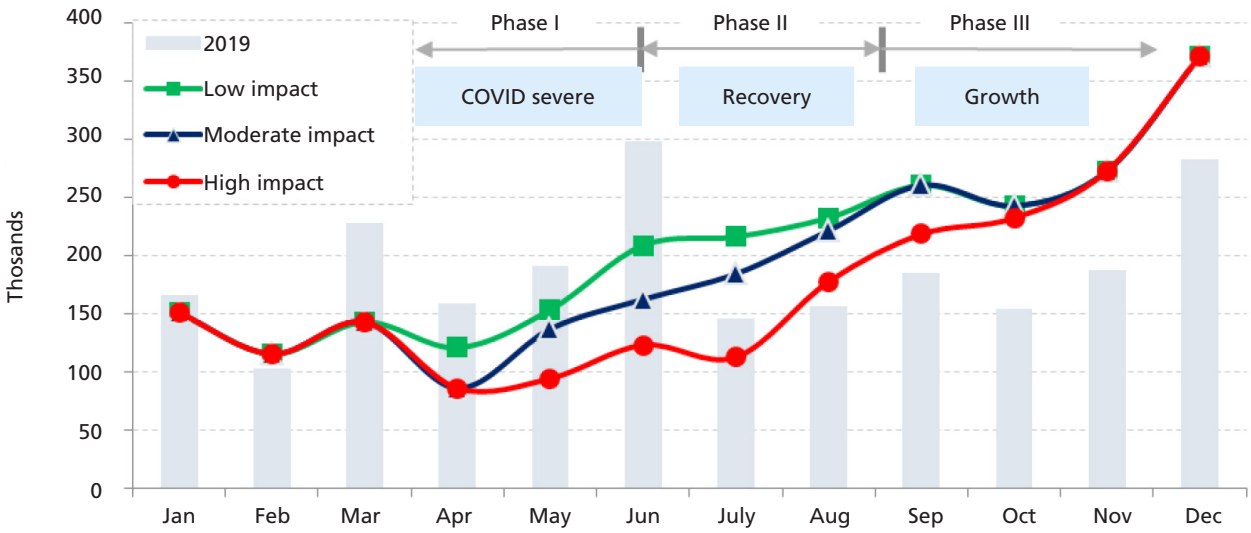
Notable trend in Europe: It is however important to take note of the trend in electric vehicle sales in Europe. The European Union has been one of the market leaders since the very beginning due to its strong fiscal and non-fiscal initiatives. It is notable that even during the pandemic, the sales of electric vehicles in the EU were robust and the EU remained a strong contender in the race to electrification. While the overall sales of vehicles reduced across Europe by 52 per cent in March 2020 compared to March 2019, the electric vehicle market share increased overall, managing to reach an all-time high market share of 10 per cent (average for all manufacturers) by March 2020. The Year-to-Date (till March) share was seven per cent in 2020, which is twice as high as it was in 2019.⁶⁸ This is the result of increased EV purchase incentives in Germany, France, and an upcoming response package for Spain favouring EVs.⁶⁹

In the US, the EV sales numbers did not change as much as the other markets. The US market is much smaller than the markets of EU and China. PHEV sales in America decreased by eight per cent while the sales of battery operated electric vehicles increased by 15 per cent. Despite the downturn and the pandemic, California adopted the first ever regulation in the world for promoting sales of zero-emission trucks.⁷⁰

According to the Frost & Sullivan market research, the impact on total EV sales is expected to be quite positive and incremental. The demand is eventually expected to grow. This prediction can also be backed by the fact that global electric vehicle sales numbers have only shown a mild decrease in the first quarter of 2020 as compared to 2019. In the low impact scenario, a rise in 10.3 per cent in the sales numbers is expected in 2019–20. If the impact is moderate, a rise of 4.1 per cent is still expected. In a severe impact scenario, only a seven per cent decrease in global sales is expected (see *Graph 10: Scenario comparison—Impact of COVID-19 on global EV sales 2019–20*).

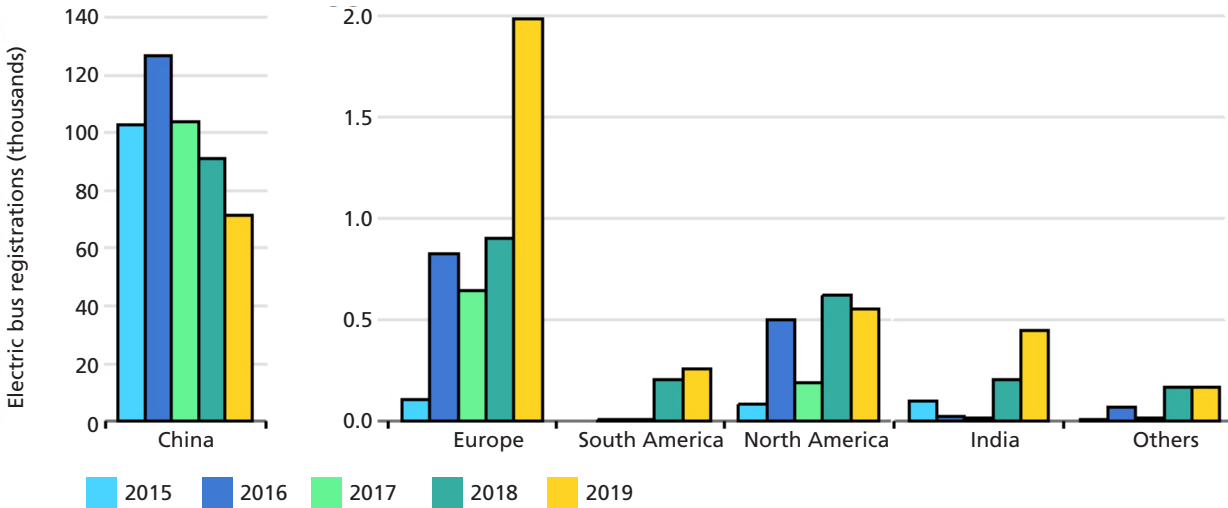
In China, when the sales of electric vehicles including e-buses dipped due to the pandemic, the Chinese government extended their new energy vehicle program (incentive programme for electric vehicles and others) for another two years till 2022 with a similar approach of cutbacks planned every year, starting 10 per cent this year. This does not apply to e-buses but only to passenger cars.

Graph 10: Scenario comparison—Impact of COVID-19 on global EV sales 2019–20



Source: Frost & Sullivan 2020, post-COVID future of electric vehicles, global and India

Graph 11: New e-bus registrations in different countries between 2015 and 2019



Source: International Energy Agency, 2020, Global EV Outlook 2020

In the case of e-buses, since 2016 and even before the pandemic, the number of new registrations of electric buses was decreasing due to the reduction in purchase incentives as per the government’s plan to phase out the incentives completely by 2020. But in Europe, e-bus trend was robust in 2019 (see *Graph 11: New e-bus registrations in different countries between 2015 and 2019*). The e-bus programme in different geographies needs to be watched.

Overall, there are worries that even if policy decisions are targeted towards maintaining financial support for electric vehicle adoption and the production is replenished, there are still other factors that may impede the trend. They

could be relaxation in fuel efficiency standards that can reduce pressure on OEMs, or change in consumer behaviour (ex. buying cheaper ICE vehicles to avoid public transport), or maybe even a second wave of the outbreak. This makes policy design even more important.

5. LEVERAGING OPPORTUNITIES FOR ELECTRIC VEHICLES POST-COVID

The COVID-19 pandemic hit at a time when climate and energy policies were in the middle of gaining momentum around the world, especially the electric vehicle adoption programmes. Due to COVID-19, the global supply chains have been affected; it has hit the R&D inventories and the component supply markets, leaving the auto industry vulnerable to a supply shock. Subsequently, movement restrictions have dipped consumer demands and this is delaying vehicle purchase decisions.

This therefore requires explicit linking of the economic recovery with climate and clean air goals and leveraging policies to reverse the trend. The economic recovery plans need to be the opportunity to enable this transition. In fact, the environmental clean-up that different geographies have experienced due to slower economy needs to be sustained with well thought out policies. In China, the first nation to be hit, the emissions fell by about 25 per cent and nitrogen dioxide pollution reduced by over 40 per cent due to lesser cars.⁷¹ The number of days with 'good quality air' increased by 11.4 per cent compared to the same duration last year.⁷² In the UK, NO₂ dropped by as much as 60 per cent. New York and other areas in north-eastern USA saw 30 per cent reduction in NO₂ levels compared to monthly averages between 2015 and 2019.⁷³

There are global examples of continued support to the electric vehicle programme despite the downturn and disruption. Despite the pandemic, Green Deal in Europe has not deviated from its 2050 climate goal and the support for the electric vehicle programme as well as the tighter norms for fleet-wide carbon dioxide emissions. This is expected to accelerate the electric mobility transition in Europe. Similarly, China has renewed its support.

6. LEARNING FROM PAST SLOWDOWNS

There are examples to show how economic recovery from the past economic slowdowns has helped to catalyze change towards new business models and technologies, and better policy for clean air and climate.⁷⁴ It is possible to see a faster shift to decentralized global supply chains with institutional arrangements among corporations changing. Green investments for recovery can achieve short-term priorities of both economic growth and environmental benefits.

The recovery after the global financial crisis of 2008–09 is an example. Studies are comparing the COVID crisis with the global financial crisis of 2008–09. There is a difference though. The global financial crisis of 2008–09 was a financial shock that affected the demand side of the economy. COVID-19 has affected both the demand and supply sides. Green policies that were employed after the global financial crisis of 2008–09 taught a few lessons. Stimulus packages can deliver on clean air and climate goals while accelerating economic and job recovery. This has been noticed in investment in renewable energy that boosted jobs in the short run.⁷⁵ A study found that the production tax credit for renewable energy in the US generated 39,100 jobs in the initial year and reduced CO₂ emissions by 728 kilo tonnes annually during the 2012–20 period. The investment tax credit generated 33,300 jobs in the initial year and reduced CO₂ emissions by an amount of 213 kilo tonnes annually.⁷⁶ Similarly, green

infrastructure projects (incentives for energy efficiency in buildings, clean energy infrastructure, etc.) can have similar effects on the market by creating jobs as well as reducing costs of clean energy transition in the long run. A study has estimated that an investment of one billion USD into smart metering of households, for example, provided jobs for 40,000 people in the first year and saved 207 kilo tonnes of CO₂ from being emitted.⁷⁷

The Car Allowance Rebate System (CARS) scrappage policy in the US pushed 500,000 car sales during the programme period, providing rebates for 680,000 vehicles⁷⁸ and reducing CO₂ emissions by 9–28.2 million tonnes. The scrappage payments can be designed to discourage purchase of more internal combustion engine powered cars and increase demand for low-emission and zero emissions vehicles.⁷⁹

Moreover, beyond the uncertainty of whether there will be a second wave of infections, the EV industry can benefit from the behavioural changes, depending on how well fiscal policies can leverage them as advantages for the growth of the EV industry.

Currently, no EV centric policies have been announced in India in response to COVID-19. Learning from global experience can help to design a focused recovery plan that can stimulate the EV market.

7. LEVERAGE RECOVERY TO PUSH EVS

Early signs in the Indian market in July show that auto sales are recovering well. According to market reports, the sales are down by only one per cent and are nearly back to the pre-COVID times. Auto majors have seen quite a substantive recovery—with some reporting over 40 per cent higher sales compared to last July. Therefore, if any support to the industry is contemplated either in the form of a scrappage stimulus or tax support, that needs to be linked with conditional changes within a time frame.

India needs to link post pandemic recovery with firm roadmap for electrification: The pandemic related recovery has to ensure that while the current policy framework stays on track, there is green recovery funding attached to FAME II and the Battery Mission. Firmer steps are needed to create a zero emissions mandate for time bound targets and transition. This needs to be supported by a well-designed incentive programme to address the upfront cost and total cost of ownership to bring cost parity between electric vehicles and IC engines for deeper market penetration by 2030.

India needs to hasten implementation of FAME II and simultaneously frame strategies for post-FAME II programme with higher level of ambition. This will require regulatory support in the form of zero emissions mandate to at least achieve the industry professed target of 30–40 per cent electric vehicle sales by 2030. This is needed as a step for higher level of ambition in the subsequent decade. This requires vehicle segment-wise strategy with appropriate accelerators. Already, market forecast has shown that two-wheelers and three-wheelers are the immediate contenders for rapid electrification if the market witnesses adequate product diversity and infrastructure support. It will be easier to design incentive programmes for these segments to cushion the upfront cost and reduce total cost of ownership of the two-wheelers. Simultaneously develop strategies—both fiscal and non-fiscal—for the car segment and other commercial vehicles.

The bus transport revival needs to be designed at scale for electric buses. Direct incentives to public fleet operators will induce demand for commercial fleet and reduce burden due to already lost revenues during the lockdowns. Low-interest loans and public co-funding will sustain the operators and manufacturers' confidence to achieve their green targets. Post-pandemic public transport will require fiscal support and reforms for augmentation of bus services and overall solvency. Currently, policies are inadequate and do not support the ambition of e-buses. There is need for a constructive agenda and fiscal strategy for mass electrification of travel trips.

Strengthen supportive regulations to drive EVs—fuel economy standards and scrappage policy: To accelerate electric vehicle roadmap, immediate steps are needed to tighten fuel efficiency standards for targeted vehicles segment—passenger cars, two-wheelers, and commercial vehicles (medium and heavy duty). Tighter standards along with effective credit for electric vehicles can accelerate the market demand and supply. Currently, the corporate average fuel consumption standards for passenger cars that are underway and those scheduled for introduction in 2022 are very weak. These are not strong enough to require electric vehicles in the fleet. One of the reasons why Europe has seen such a fleet transformation, to the level of EV being 10 per cent of the new cars sales, is the tighter CO₂ standards and the prospect of further tightening. European countries such as Germany and France (and soon Spain) have already earmarked direct purchase incentives for EV consumers for keeping up with the low-carbon transition.

It is important to reiterate here that the average fleet-wide CO₂ emissions levels that are directly linked with the fuel efficiency levels of vehicles were nearly similar in India and Europe—in the range of 122 g/km in 2018–19. While the new European standard is being tightened to 95 g/km this year onwards, India is aiming for a much more lenient norm of 113 g/km in 2022–23. These regulations must be tightened to encourage manufacturers to produce and sell more electric vehicles. If India does not tighten the requirement of EV transition, the gap between India and major global markets will widen and will hurt the industry in the long run.

Fuel economy regulations in the US may not be as effective in driving the electric vehicle market as in Europe. The US Environmental Protection Agency (USEPA) has taken a very controversial decision to roll back the fuel efficiency standards. This decision is expected to lead to a billion more tonnes of CO₂ being released over the lifetime of vehicles.⁸⁰

Other regulatory actions linked with recovery, like the scrappage policy, also need to be linked with the criteria of pollution and carbon reduction. Removal of polluting guzzlers from the road can help stimulate the market as well as provide emissions benefits. But to maximize the potential of this programme to reduce emissions requires more explicit links with conditional introduction of electric vehicles. Scrappage policies after the 2008–09 global financial crisis have taught us that unless these programmes are not linked with an environmental control criterion, the emissions impact can be short-lived.

One such example is from Germany, where the scrappage program reduced greenhouse gas emissions by a mere four per cent, which also stagnated in the long run.⁸¹ ICCT assessment shows that if a similar scrappage programme is linked with only electric vehicles, Germany can potentially reduce emissions by

62 per cent.⁸² The incentive amount can have levels based on the specifications of the new vehicles that will be purchased.

The Government of India has been working on a scrappage policy for some time. Its elements are still not in the public domain. It is not yet clear if the government will provide direct monetary incentives. It is quite likely that the government may fix the age cap of vehicles and increase the re-registration fees and expect the industry to incentivize the replacement process. Nonetheless, a good scrappage programme needs to be linked with emissions and fuel efficiency criteria and purchase of new electric vehicles. Proper policy design is needed to prevent rebound effects.⁸³ For example, the scrappage payments should not be aimed at encouraging the purchase of more cars, but rather shift the demand to low-emission vehicles. Currently, no EV centric policies have been announced in India in response to COVID-19. Such programmes can be supported by localization of R&D and manufacturing.

Recovery packages cost a large sum of money for governments. Therefore, stimulus packages should have defined objectives within the larger macro-economy, local labour markets, and the environment. Accordingly, regular monitoring and evaluation of such policies is needed to assess delivery of the intended benefits.

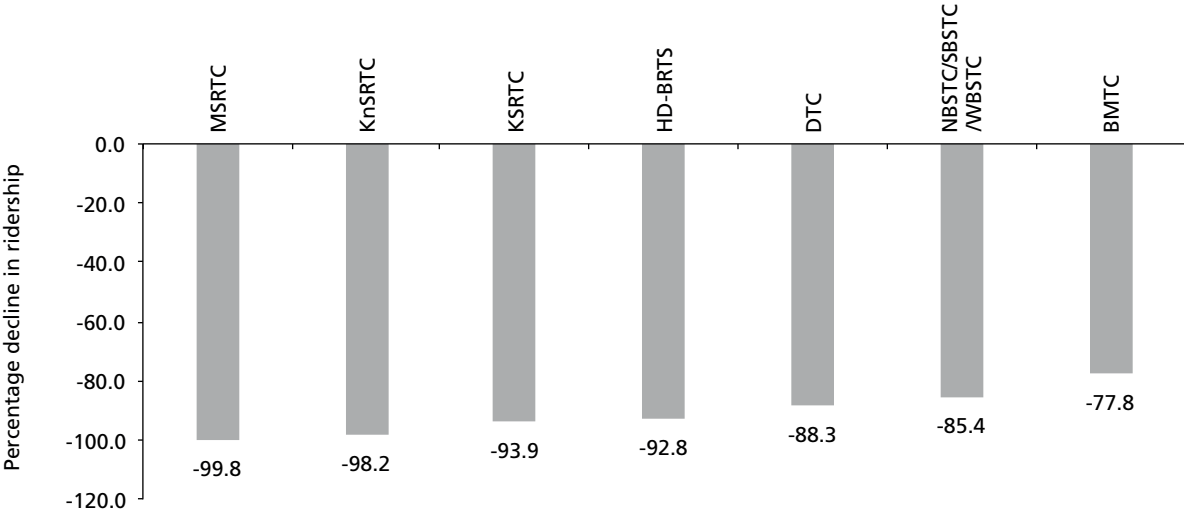
SECTION 2: COVID-19 AND RECOVERING BUS TRANSPORT

Yet another area of strategic intervention in the post-pandemic transport sector is that of bus transport—the prime mover in Indian cities. While metro services have remained shut, buses have maintained a minimal service for essential service workers during the lockdown phases. As per a survey conducted by the International Association of Transport of 14 State Road Transport Undertakings in India, 81 per cent of the operators have reported no ridership at all, while others have witnessed a 90 per cent reduction in ridership compared to the pre-COVID scenario.⁸⁴

It is anticipated that as services resume slowly, the ridership will not come back to the pre-lockdown levels quickly as social distancing norms that require lower occupancy are in place. Also, the fear of contagion has weakened the confidence of users. A survey of middle to high income groups in Delhi and NCR conducted by CSE has shown that preference for riding on public transport is likely to reduce by 27 per cent within the six months of the lockdown.⁸⁵ Ridership of Maharashtra State Road Transport Corporation (MSRTC), Karnataka State Road Transport Corporation (KnsRTC), Kerala State Road Transport Corporation (KSRTC), Delhi Transport Corporation (DTC) and Hubli-Dharwad Bus Rapid Transit System (HD-BRTS) is still below 90 per cent (see *Graph 12: Percentage decline in bus ridership post lockdown phase 3*).

Safety protocols including hygiene and sanitation, social distancing norms, new scheduling practices, route rationalization, modifications in vehicle design, and staff management have also affected ridership. These requirements also add to

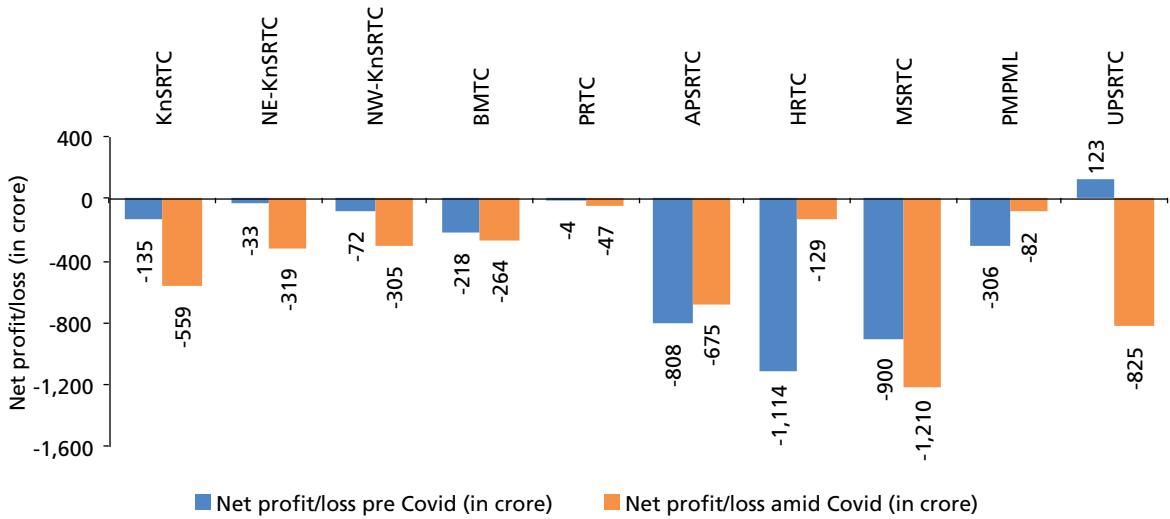
Graph 12: Percentage decline in bus ridership post lockdown phase 3



Note: For comparison and estimation, pre-lockdown ridership of KSRTC, NBSTC, SBSTC, and WBSTC has been taken for the year 2015–16 and rest for the year 2018–19. Full forms of SRTUs are provided in the abbreviation list.

Source: CSE compilation

Graph 13: Net profit/loss incurred pre and amid COVID



Note: For estimation, net profit/loss for Karnataka SRTU has been taken for the year 2018–19 and rest for the year 2017–18. Full forms of SRTUs are provided in the abbreviation list.

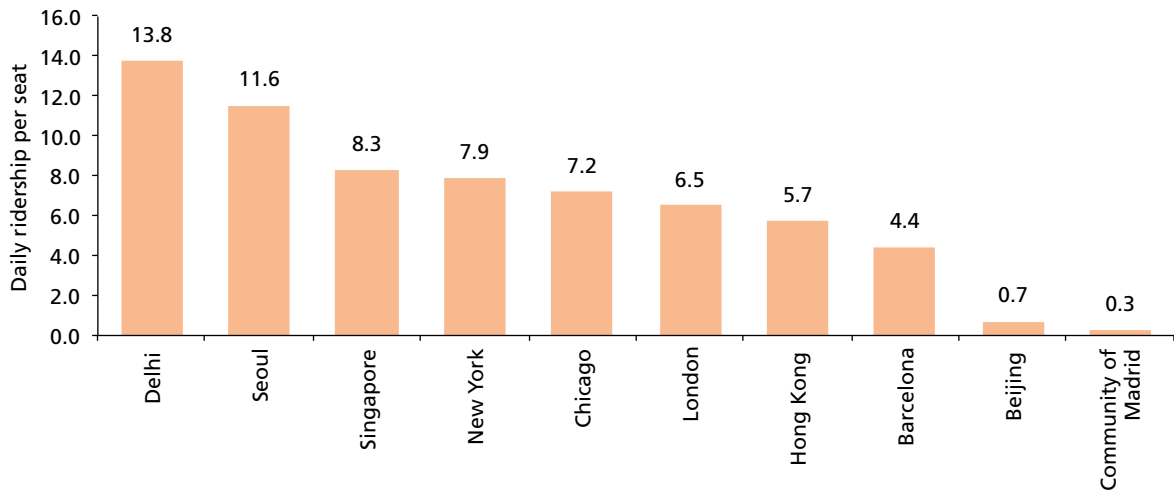
Source: CSE compilation

the cost of operation. For example, estimation of the Bus Operators Corporation of India shows an additional Rs 17 lakh (including capital and operational expenditure including cost of additional manpower engagement) is required for 100 buses per month only to meet the requirements of safety protocols. Thus, the combination of mounting cost for practicing safety protocols along with payment of fixed costs, and declining fare box revenue has led to huge financial losses of SRTUs.

Amid lockdown, the MSRTC has suffered a loss of Rs 1,210 crore followed by Uttar Pradesh State Road Transport Corporation (UPSRTC) which has suffered a loss of Rs 825 crore and Andhra Pradesh State Road Transport Corporation (APSRTC) which has suffered a loss of Rs 675.4 crore. A comparison of net loss/profit pre and amid COVID shows that Karnataka State Road Transport Corporation, North Eastern Karnataka State Road Transport Corporation (NE-KnSRTC), North-Western Karnataka State Road Transport Corporation (NW-KnSRTC), Pepsu Road Transport Corporation (PRTC), and UPSRTC have suffered 75 per cent more losses amid lockdown compared to the previous financial years (see *Graph 13: Net profit/loss incurred pre and amid COVID*).

The bigger challenge is that bus operations will not only have to tide over the immediate crisis, but also need strategies for augmentation and strengthening of public transport services across cities. As per the Census of India 2011, around 45 per cent of the motorized urban work trips are carried by buses. The National Sample Survey Office (NSSO) Annual Survey of 2014–15 shows that buses along with trams are the most preferred mode of transport accounting for 58 per cent of the household expenditure for transportation.⁸⁶

Yet there is a huge deficit in bus transport. Currently, urban India has 48,000 buses but according to the estimates provided by GIZ based on the guidelines of the Union Ministry of Housing and Urban Affairs, 188,500 buses are needed.⁸⁷ There is already a legacy of deficit while the pandemic is cutting down the

Graph 14: Cross city comparison of daily bus ridership per seat per day

Source: COVID-19: How to balance people's safety and mobility, Down to Earth

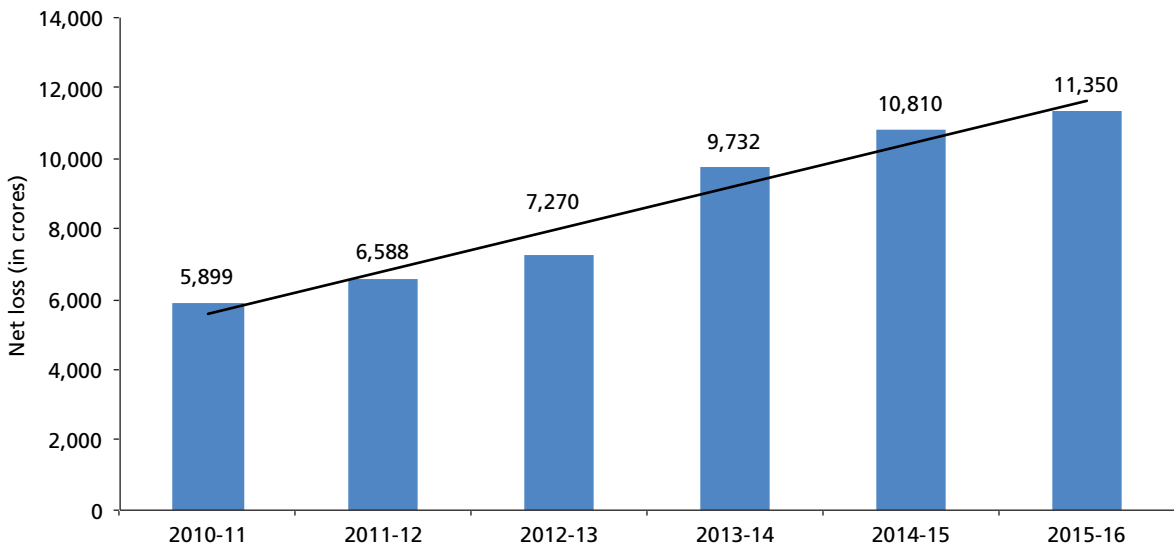
capacity by more than half. In any case, the extent of bus supply per thousand population in India (i.e. 1 bus per thousand people) is already very low compared to other countries, namely Korea (17 buses per thousand people), Indonesia (10 buses per thousand people), Russia (6 buses per thousand people), and others.⁸⁸

The existing numbers are also declining due to ageing of the bus fleet. Out of the total 17.6 lakh⁸⁹ registered buses in India, SRTUs operate 1.58 lakh buses for inter and intra-state/city movement. The bus fleet between the years 2010–16 came down by 12 per cent resulting in overcrowding. The average daily ridership per bus seat in Delhi (i.e. 14) is highest when compared to other cities of countries highly affected by Covid-19, namely Seoul (12), Singapore (8), New York (8), and others (see *Graph 14: Cross city comparison of daily bus ridership per seat per day*). This indicates a trend towards overcrowding which makes buses more unattractive especially during the pandemic. Bus service augmentation is important to address this concern.

The SRTUs are already burdened with the problem of mounting financial losses. Over the past few years, SRTUs have continuously been reeling under losses. The aggregated net losses of SRTUs between the years 2010 and 2016 have escalated by 48 per cent—from Rs 5,899 crore to Rs 11,350 crore (see *Graph 15: Net loss incurred by SRTUs in India*). During the financial year 2015–16, 40 out of the 47 SRTUs recorded a net loss; DTC's losses were the largest at Rs 3,441.1 crore, followed by BEST at Rs 1,061.9 crore, and KSRTC at Rs 738.8 crore.⁹⁰

The estimates available from GIZ show that while the overall cost incurred by SRTUs reduced by four per cent during the lockdown period in India, the traffic revenue will be reduced by 48 per cent due to pandemic in 2020–21. This will increase the annual viability gap funding requirement by 69 per cent for bus transport agencies in India. This assessment also states that poor bankability of the state transport corporations, limited revenue sources with urban local bodies, and disproportionate share of transport-related funding going to road infrastructure further aggravate the challenge.⁹¹

Graph 15: Net loss incurred by SRTUs in India



Source: Review of the performance of State Road Transport Undertaking in India (2010–16)

Need larger tax reforms for bus transport growth: This issue is not just about providing stimulus support to the bus sector for revival. In fact, such revival cannot work in isolation if the larger tax reforms are not carried out in the sector to reduce cost burden. The current paradigm to treat public transport as a commercial entity to impose taxes is one of the major reasons for the imbalance between assets and liabilities of SRTUs.

As per the seventh schedule of the Constitution of India, the taxes on passenger vehicles are levied by the central and state governments for resource mobilization such as meeting the cost of road construction and its maintenance. The basis of computing taxes varies from state to state. There is a multiplicity of taxes that also differ by modes.

For the purpose of operating buses, SRTUs have to carry out certain activities such as creation, purchase, and operation of properties. Several of these activities fall under the tax ambit of central and state governments of which MV tax including road and passenger tax, and GST on vehicle purchase and AC ticket sales are important. The basis of computing MV tax varies from state to state (see *Table 2: Basis of computing MV tax for buses vis-à-vis cars in different Indian states*).

The cumulative impact of all these taxes imposes an additional burden on the cost of operation of buses. During the financial year 2015–16, combined tax paid by SRTUs was six per cent of the total cost incurred. At the disaggregated level, it varied across SRTUs. In the case of MSRTC, UPSRTC, and PRTC, it constituted even more than 10 per cent of the total cost incurred (see *Graph 16: Tax as a percentage of cost incurred by SRTU*).⁹²

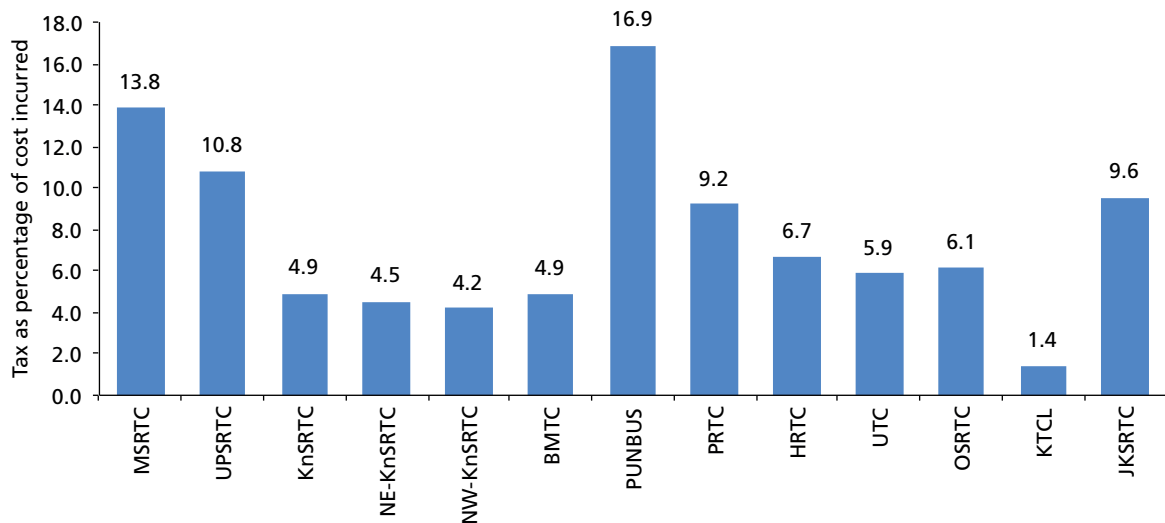
In addition to taxes, interests are applied to each cost component including taxes. Once payments of these taxes get delayed, the interest increases proportionately, which further escalates the overall tax burden. While there

Table 2: Basis of computing MV tax for buses vis-à-vis cars in different Indian states

State	Bus (stage carriage)	Car (petrol) (up to 8 lakhs)
Gujarat	Rs 3,000 per seat per annum (for first 20 seats) + Rs 3,600 per seat per annum for each additional seat	6 per cent of the vehicle cost
Maharashtra	Rs 71 per seat per annum + 3.5 per cent (non-AC) / 5.5 per cent (AC) of annual fare collected	11-13 per cent of the vehicle cost
Karnataka	Rs 900 per seat per quarter + 11 per cent cess on tax paid	14 per cent of the vehicle cost
Delhi	Rs 1,915 per annum for first 18 seats + Rs 280 per annum for each additional passenger (including seating and standing)	7 per cent of the vehicle cost
Haryana	Rs 200 per seat per annum	6 per cent of the vehicle cost
Tamil Nadu	Rs 400 per seat per quarter + 25 per cent surcharge on tax paid	10 per cent of the vehicle cost

Note: MV tax for car is applicable for lifetime of the vehicle

Source: Road Transport Year Book, 2016, Ministry of Road Transport and Highways

Graph 16: Tax as a percentage of cost incurred by SRTU

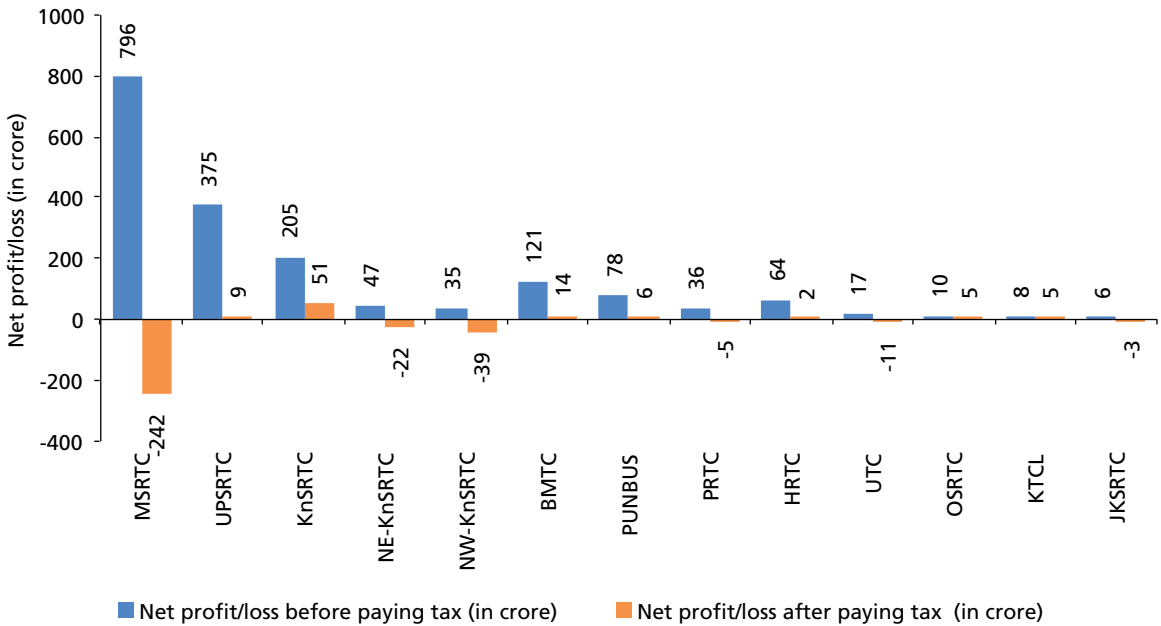
Note: Full forms of SRTUs are provided in the abbreviation list.

Source: Review of the performance of State Road Transport Undertaking in India (2015–16)

were 13 SRTUs that were making a profit before paying taxes, after paying taxes only seven SRTUs could make a profit. MSRTC, for instance, could have made a profit of Rs 796 crore; however, after paying tax of Rs 1038 crore which is 14 per cent of its total cost incurred, it suffered a loss (see *Graph 17: Net profit loss before and after paying taxes*).

Motor vehicle tax differential creates bias against buses: After the introduction of GST, VAT, and octroi at state level were abolished; but motor vehicle tax has continued which is an important source of state revenue. This is also skewed against buses and favours cars and two wheelers. Cars pay lifetime MV tax once whereas buses pay MV tax on a yearly/quarterly basis. A comparison between the annual MV tax burden on a bus versus car shows that buses pay more tax than cars. For example, in the case of Ahmadabad, Mumbai, Bangalore, and Pune, the taxation regime is so skewed against the bus system that the annual MV tax paid by city buses is more than 20 times

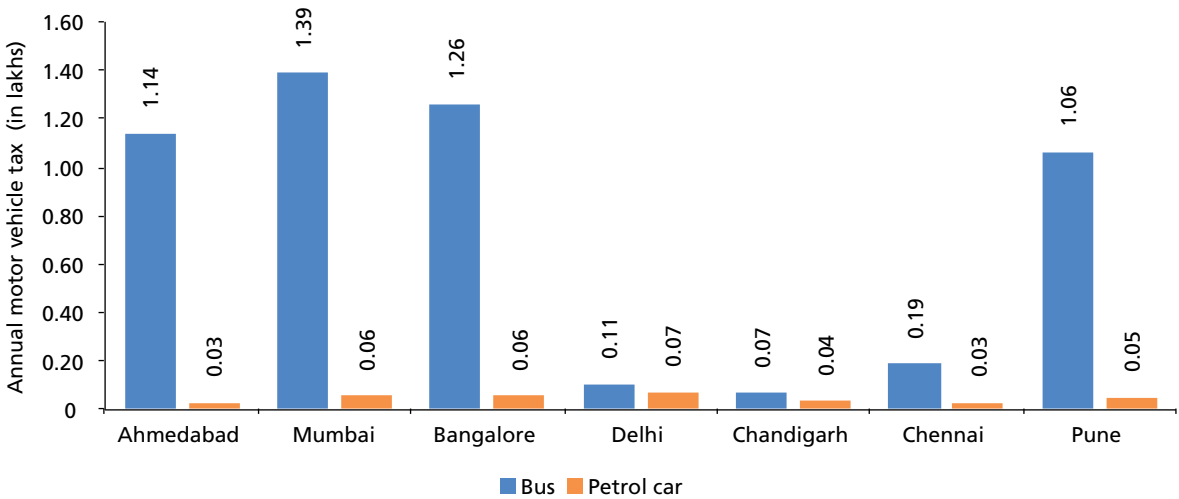
Graph 17: Net profit loss before and after paying taxes



Note: Full forms of SRTUs are provided in the abbreviation list.

Source: Review of the performance of State Road Transport Undertaking in India (2015–16)

Graph 18: Annual motor vehicle tax paid by bus vis-a-vis a petrol car



Note: Cost of a car is assumed as Rs 0.8 lakhs, lifetime as 15 years; Bus capacity is assumed as 35 seating and 15 standees. In case of Mumbai and Pune tax on car is calculated as 11 per cent of the vehicle cost.

Source: Estimation done by CSE as per tax structure provided by MoRTH

the maximum MV tax paid by a car (see *Graph 18: Annual motor vehicle tax paid by bus vis-a-vis a petrol car*).

Bus operators hiking bus fares: Under the current circumstances, several bus operators have hiked their fares. For example, Dehradun city bus service has

increased bus fares by 50 per cent.⁹³ Similarly, Bangalore Metropolitan SRTU has increased bus fares by 5–18 per cent.⁹⁴ Haryana cabinet has given nod to hike the bus fare by 15–20 paise per kilometre for ordinary Haryana Roadways buses.⁹⁵ Kerala government had agreed to a temporary increase in the bus ticket rate by 50 per cent; however, the decision was taken down as buses were permitted to carry passengers in all available seats.⁹⁶ If this trend continues without any government support, journey cost will increase making personal vehicles like two-wheelers more attractive and competitive.

Deduction in financial aid: As per the 2020-21 Budget, the Brihanmumbai Municipal Corporation (BMC) had proposed to provide financial aid of Rs 1,500 crore to BEST to deal with repayment of loans, procurement of new buses, implementation of Integrated Transport Management System (ITMS), etc. However, due to the loss of Rs 4,000 crore incurred by BMC in this year, it has proposed to cut down the proposed financial aid for BEST by Rs 300 crore this year.⁹⁷

Hindrance to planned investments for bus fleet augmentation: The bus fleet augmentation plans and service level improvement expected to happen this year may get impacted due to heavy losses incurred by the bus operators. Already, the Delhi government is likely to delay the procurement of additional buses this year to achieve a target of 11,000 buses.⁹⁸ Also, the contract and deployment of 1,000 electric buses under FAME II is at risk.

1. NEED SUPPORT TO REVIVE BUS TRANSPORT

Given the pandemic induced financial distress combined with the legacy burden of financial losses and the need for improving economic viability while meeting the safety and mobility requirement of people, a reform-based bailout package is needed. Clean air action and climate action plans in cities require massive augmentation of bus transport for clean and low carbon mobility. Several of these plans and also Master Plans or city mobility plans in cities like Delhi, Kolkata, and Pune have set a target of 80–90 per cent public transport ridership. This cannot be derailed. Without public transport, polluting and energy intensive motorization will continue to explode.

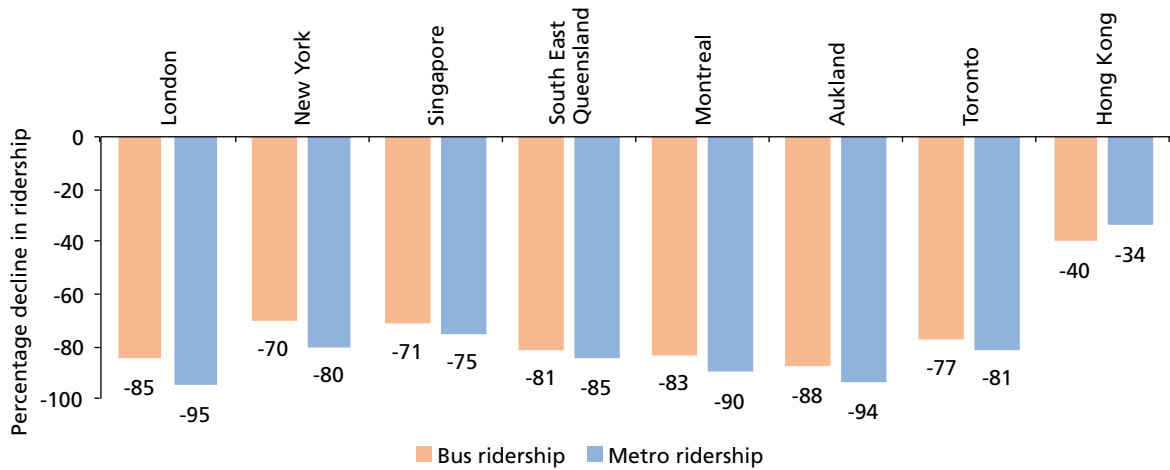
While several countries globally have already come up with financial support for public transport, India's response is still awaited. Transport sector support is not yet included in the economic recovery package. However, some state governments have taken a few steps. Odisha and Karnataka governments have exempted MV tax for state-wide passenger buses for three months.

The stimulus needs to address the financial crisis in the sector due to the pandemic, past accumulated losses, the additional cost required to practice safety protocols, expansion of fleet and improvement in bus service to avoid overcrowding, and installation of ITS system for improved operation to allow planned developments. This support must also be combined with tax reforms. During the 2008–09 recession, the Government of India had provided bus stimulus package that included grant assistance linked to City Mobility Plan and transport sector reforms including dedicated urban transport fund.

1.1. Global learning curve

Globally, several governments have announced bailout packages for public transport. During the lockdown phases, while Hong Kong kept running all trains and public transport as per the normal schedule without any disruption, several cities modified their operational schedules and brought down their

Graph 19: Ridership decline of bus and metro amid lockdown



Source: CSE compilation

operational levels. For example, Transport for London managed to operate a 60 per cent Tube service and 80 per cent of the bus service during the lockdown period to ensure the safe commuting of essential workers.⁹⁹ The Metropolitan Transport Authority, New York kept running bus service at 75 per cent of its typical capacity during usual days under the Essential Service Plan 18.¹⁰⁰ Major cities of Germany namely Berlin, Hamburg, and Munich eliminated the extra bus and train deployment during peak hours and adopted weekend timetable with 10-minute intervals instead of 5-minutes or lesser.

But all systems worldwide have experienced a sharp decline in ridership—by as much as 70–90 per cent. Hong Kong suffered the least. Metro systems suffered higher losses compared to buses (see *Graph 19: Ridership decline of bus and metro amid lockdown*).

Globally, governments are coming up with financial support for public transport including buses. England, United States, Germany, Hong Kong, and New Zealand have come up with direct financial support; whereas Singapore, China, Kazakhstan, and Turkey have come up with indirect financial support such as tax rebates (see *Table 4: Economic stimulus for reviving public transport*).

Past experience, especially during the 2009 economic recession, shows that South Korea¹⁰¹ came over the global financial crisis by creating a USD 60 billion Green stimulus that among other things focused on energy-efficient transport, rail, and vehicles. This was the highest ever that any country had spent on green infrastructure to revive the economy. This not only lowered the unemployment rate in Korea amongst other OECD countries but also revived the economy significantly. Another study¹⁰² on the great recession shows how investment in transport generates 31 per cent more jobs and supports the economy in a big way. In 2018, China’s central government had provided an amount equivalent to 150,000 US dollars per bus to revive Shenzhen city’s transport service and convert the entire fleet to an electric bus fleet.

The larger message from the global experience is that several countries have initiated longer-term financial reforms and adopted well-designed financial instruments that have made these systems more resilient. For instance, Hong Kong Metro otherwise runs on profit with an operating cost recovery ratio of 185 per cent; but between 2000 to 2012, 38 per cent of MTRCL's revenue came from property development, 28 per cent from commercial and property leases, and only 34 per cent from transit operations (fare boxes).¹⁰³ In Singapore's central business district, major arterials and expressways are all equipped with Electronic Road Pricing (ERP) and the system is said to be generating about 150 million Singapore Dollars annually which is used to construct, maintain, and improve roads and public transport in the city-state.¹⁰⁴ United States provides a fuel subsidy from existing fuel duties to transit operators in the form of the Bus Service Operators Grant to keep bus operating costs manageable.¹⁰⁵

India needs to design its own strategies not only for the immediate recovery of public transport systems but also to design financial instruments for the long-term economic resilience of these systems.

Table 4: Economic stimulus for reviving public transport

Public transport operator	Economic stimulus
England (Transport for London)	1.6 billion Pounds for Tube and bus service until September 2020
United States (Countrywide public transport)	25 billion USD
Germany (Countrywide public transport)	6 billion Euros
Hong Kong (Metropolitan Transit Corporation)	<p>Metropolitan Transit Corporation</p> <ul style="list-style-type: none"> • HK\$ 800 million for a 20 per cent fare reduction for six months from 01 July 2020 to 01 January 2021. <p>Red minibus owners</p> <ul style="list-style-type: none"> • A one-off subsidy of HK\$ 30,000 for the registered owners of each RMB except 1,030 drivers. <p>Red minibus drivers</p> <ul style="list-style-type: none"> • A monthly subsidy of HK\$ 6,000 for 6 months to each eligible active RMB driver. • A one-off subsidy of HK\$ 7,500 for each red minibus driver who cannot meet all the eligibility criteria of an active RMB driver. <p>Non-Franchised Bus (NFB)</p> <ul style="list-style-type: none"> • A one-off subsidy of HK\$ 30,000 for the registered owner of each NFB. • Reimbursement of 100 per cent of the actual repair and maintenance cost and insurance premium for 6 months for five franchised bus companies.
New Zealand (Countrywide transport services including public transport)	<ul style="list-style-type: none"> • NZ\$ 75 million under a transport economic stimulus package.
Singapore	<ul style="list-style-type: none"> • One year road tax rebate for private bus operators. • Six months fee waiver of parking charges for private bus operators at government-owned parking facilities.
China	<ul style="list-style-type: none"> • Value Added Tax exemption for public transport services.
Kazakhstan	<ul style="list-style-type: none"> • A 30-day extension to 30 April 2020 for the submission of vehicle tax. • An exemption from excise duty on exported petrol and diesel fuel until 31 December 2020.
Turkey	<ul style="list-style-type: none"> • Payments in April, May, and June related to withholding tax returns will be postponed for six months for companies operating in transportation.

Source: CSE compilation from multiple sources

1.2. Need immediate strategy to revive and support bus transport

India cannot delay fiscal bailout and sector reforms for long-term financial sustainability of bus transport. Both clean air action under the NCAP and climate action under NDC are riding on an aggressive public transport strategy. A massive turnaround is needed in this sector to scale up modern and convenient public transport for effective modal shift to contain motorization. Cities need to target at least 80 to 90 per cent public transport ridership by the middle of this decade.

It is also important to note that the electric bus programme, that is the new generation intervention for zero emissions trajectory, also requires deep sector reforms, especially fiscal reforms for long-term sustainability of the programme. This trajectory will have to be defined and implemented right now.

Need fiscal stimulus for bus transport: Immediate economic stimulus package can help to revive bus transport and offset pandemic related financial crisis. But this needs to be linked with deeper reforms and financial instruments for long-term economic sustainability.

Link recovery with tax reforms to reduce tax burden on bus transport: Rationalize tax system to reduce multiple tax burden on buses. Rationalize motor vehicle taxation to address tax differential between buses and cars.

For long-term sustainability of public transport system create and expand dedicated Urban Transport Fund: It has been more than a decade since the NUTP provided for the levy of dedicated taxes to be credited to an urban transport fund and used exclusively to meet urban transport needs within the states.¹⁰⁶ Only a few states such as Rajasthan and Karnataka have done that so far. This strategy needs to be further developed.

ANNEXURE 1

LIST OF CITIES AND NUMBER OF BUSES SANCTIONED UNDER FAME II

Sr. no.	State	Name of city/STUs	No. of e-buses allocated
A	Electric buses sanctioned for intra-city bus operations		
1	AP	Visakhapatnam	100
2		Vijayawada	50
3		Amravati	50
4		Tirupati	50
5		Kakinada	50
6	Assam	Guwahati	50
7		Silchar	25
8		Jorhat	25
9	Bihar	Patna	25
10	Chhattisgarh	Raipur	50
11	Dadar & Nagar Haveli	Dadar & Nagar Haveli (Silvasa)	25
12	Delhi	New Delhi (DTC)	300
13	Gujarat	Ahmedabad	300
14		Surat	150
15		Vadodara	50
16		Rajkot	50
17	Haryana	Gurugram	50
18	HP	Shimla	50
19		Hamirpur	50
20	J&K	Srinagar	100
21		Jammu	50
22	Karnataka	Bangalore	300
23		Hubli-Dharwad	50
24	Kerala	Thiruvananthapuram	100
25		Kochi	100
26		Kozhikode	50
27	MH	BEST Mumbai	300
28		Pune	150
29		Navi-Mumbai	100
30		Nagpur	100
31		Nashik	50
32		Solapur	25
33	MP	Bhopal	100
34		Indore	100
35		Gwalior	40
36		Jabalpur	50
37		Ujjain	50

Sr. no.	State	Name of city/STUs	No. of e-buses allocated
38	Odisha	Bhubaneswar	50
39	Rajasthan	Jaipur	100
40	Telangana	Hyderabad	300
41		Warangal	25
42	TN	Coimbatore	100
43		Tiruchirappalli	100
44		Madurai	100
45		Erode	50
46		Tiruppur	50
47		Salem	50
48		Vellore	50
49		Thanjavur	25
50	Tripura	Agartala	50
51	UK	Dehradun	30
52	UP	Lucknow	100
53		Agra	100
54		Kanpur	100
55		Prayagraj	50
56		Varanasi	50
57		Ghaziabad	50
58		Meerut	50
59		Bareilly	25
60		Moradabad	25
61		Aligarh	25
62		Jhansi	25
63	WB	Haldia	50
64		Kolkata New Town	50
	Sub-total		5095
B	Electric buses sanctioned for intercity bus operations		
1	Andhra Pradesh	Andhra Pradesh State Road Transport Corporation	50
2	Goa	Kadamba State Road Transport	50
3	Gujarat	Gujarat State Road Transport Corporation	50
4	Karnataka	Karnataka State Road Transport Corporation	50
5	Maharashtra	Maharashtra State Road Transport Corporation	50
6	Rajasthan	Rajasthan State Road Transport Corporation	50
7	Uttarakhand	Uttarakhand Transport Corporation, Dehradun	50
8	West Bengal	Transport Department, Govt. of West Bengal	50
	Sub-total		400
C	Electric buses sanctioned for last-mile connectivity		
1	NCR Delhi	Delhi Metro Rail Corporation	100
	Sub-total		100
	Grand Total		5595

ENDNOTES

- i. EU top 5: France, Germany, Spain, Italy and UK; YTD = Year to Date (Jan 2020 to March 2020)
- ii. Top 25 EV Markets: Shanghai, Beijing, Shenzhen, Hangzhou, Tianjin, Guangzhou, Qingdao, Zhengzhou, Changsha, Weifang, Nanchang, Chongqing, and Wuhan in China; Tokyo, Japan; Oslo and Bergen, Norway; Paris, France; London, United Kingdom; Amsterdam, the Netherlands; Stockholm, Sweden; and Los Angeles, San Francisco, San Jose, New York, and San Diego in the United States.

BIBLIOGRAPHY

Anon, 2020, “Kazakhstan COVID-19 Measures Include Tax Return Deadline Extensions, Deferrals, and Exemptions”, *Orbitax*. Accessed at: <https://www.orbitax.com/news/archive.php/Kazakhstan-COVID-19-Measures-I-41542> on 20 June 2020

Anon, 2020, “India’s fiscal response to Covid-19 inadequate compared to other countries, says industry body”, *Business Line*. Accessed at: <https://www.thehindubusinessline.com/economy/indias-fiscal-response-to-covid-19-inadequate-compared-to-other-countries-says-industry-body/article31268955>. ece on 20 June 2020

KPMG, 2020, “Government and institution measures in response to COVID-19”. Accessed at: <https://assets.kpmg/content/dam/kpmg/fr/pdf/covid-19/fr-20042020-DA-int.pdf> on 20 June 2020

Anon, 2020, “Delhi buses’ ridership reaches over 3.5 lakh”, *The Economic Times*. Accessed at: <https://auto.economictimes.indiatimes.com/news/commercial-vehicle/mhcv/delhi-buses-ridership-reaches-over-3-5-lakh/75902646> on 20 June 2020

Anon, 2020, “Coronavirus: Transport for London secures emergency £1.6bn bailout”, *BBC*. Accessed at: <https://www.bbc.com/news/uk-england-london-52670539> on 20 June 2020

Federal Transit Administration, 2020, “Coronavirus Aid, Relief, and Economic Security (CARES) Act”. Accessed at: <https://www.transit.dot.gov/cares-act> on 20 June 2020

Anon, 2020, “Relief for the public transport sector? German government provides 2.5 billion euros for public transport – up to 100 billion Europe-wide?”. Accessed at: <https://www.urban-transport-magazine.com/en/relief-for-the-public-transport-sector-german-government-provides-2-5-billion-euros-for-public-transport-up-to-100-billion-europe-wide/> on 20 June 2020

Bay of Plenty Regional Council TOI Moana, 2020, “\$755 million Transport Economic Stimulus Package proposed for Bay of Plenty”. Accessed at: <https://www.boprc.govt.nz/your-council/news/news-and-media-releases/media-releases-2020/may-2020/755-million-transport-economic-stimulus-package-proposed-for-bay-of-plenty> on 20 June 2020

Anon, 2020, “Odisha Govt Announces Exemption of Road Tax For 3 Months”. Accessed at: <https://odishanewsinsight.com/odisha/odisha-govt-announces-exemption-of-road-tax-for-3-months/> on 20 June 2020

Anil Kumar Sastry, 2020, “Government waives road tax for public transport vehicles”. Accessed at: <https://www.thehindu.com/news/cities/Mangalore/government-waives-road-taxfor-public-transport-vehicles/article31625304>. ece on 20 June 2020

Government of Delhi, 2020, “*Economic Survey of Delhi 2019-20*”. Accessed at: http://delhiplanning.nic.in/sites/default/files/Chapter%2012_0.pdf on 20 June 2020

Anon, 2020, “*Delhi’s transport network sputters back to life after reopening hiccups*”, Hindustan Times. Accessed at: <https://www.hindustantimes.com/delhi-news/delhi-s-transport-network-sputters-back-to-life/story-AHLcer8rCd8u28RAAt3RHxJ.html> on 20 June 2020

Christin Mathew Philip, 2019, “*Bengaluru: BMTC daily ridership drops to 36 lakh as commuters shift gears*”, Times of India. Accessed at: <https://timesofindia.indiatimes.com/city/bengaluru/as-commuters-shift-gears-bmtcs-daily-ridership-drops-to-36-lakh/articleshow/71238762.cms> on 20 June 2020

Anon, 2020, “*State allows night bus service*”, The Hindu. Accessed at: <https://www.thehindu.com/news/cities/bangalore/state-allows-night-bus-services/article31760972.ece> on 20 June 2020

KSRTC (Karnataka State Road Transport Corporation), 2019, “*Annual Administration Report 2018-19*”. Accessed at: https://static.abhibus.com/ks/pdf/2020/20200319160229-ADM_REPORT_KSRTC_English_2018_19_compressed.pdf on 20 June 2020

Anon, 2020, “*Karnataka Lockdown 4.0: KSRTC running 2,000 inter-district buses, call center announced*”, The Economic Times. Accessed at: <https://government.economictimes.indiatimes.com/news/governance/karnataka-lockdown-4-0-ksrtc-running-2000-inter-district-buses-call-center-announced/75843049> on 20 June 2020

Anon, 2018, “*Road- Map for Bus Fleet and Infrastructure Development for Maharashtra State Road Transport Corporation (MSRTC)*”. Accessed at: https://shaktifoundation.in/wp-content/uploads/2018/07/3.MSRTC-REPORT-_SGA.pdf on 20 June 2020

Anon, 2020, “*Over 11,000 travel by MSRTC buses after services restart*”, The Economic Times. Accessed at: <https://auto.economictimes.indiatimes.com/news/commercial-vehicle/mhcv/over-11000-travel-by-msrtc-buses-after-services-restart/75922506> on 20 June 2020

Nupur Gupta, 2020, “*India: New Bus Rapid Transit System makes travel faster, safer and more convenient in Hubballi-Dharwad*”. Accessed at: <https://blogs.worldbank.org/endpovertyinsouthasia/india-new-bus-rapid-transit-system-makes-travel-faster-safer-and-more> on 20 June 2020

ManjunathHegdeBomnalli, 2020, “*Chingari passenger rise by over 3 times in initial week*”. Accessed at: <https://www.deccanherald.com/state/karnataka-districts/chigari-passengers-rise-by-over-3-times-in-initial-week-848511.html> on 20 June 2020

Anon, 2020, “*KSRTC runs 1,428 services despite losses*”, The Hindu. Accessed at: <https://www.thehindu.com/news/national/kerala/ksrtc-runs-1428-services-despite-losses/article31644684.ece> on 20 June 2020

Anon, 2020, “72,000 People Carried by West Bengal Govt Buses During Covid-19 Lockdown, says Transport Minister”. Accessed at: <https://www.news18.com/news/india/72000-people-carried-by-west-bengal-govt-buses-during-covid-19-lockdown-says-transport-minister-2614403.html> on 20 June 2020

Anon, 2020, “Karnataka’s 4 road transport wings suffer Rs 816 crore corona loss”, The Economic Times. Accessed at: <https://auto.economictimes.indiatimes.com/news/commercial-vehicle/mhcv/karnatakas-4-road-transport-wings-suffer-rs-816-crore-corona-loss/75318232> on 20 June 2020

Navrajdeep Singh, 2020, “PRTC incurs Rs 36 crore loss during lockdown, stares at financial crisis”, Hindustan Times. Accessed at: <https://www.hindustantimes.com/chandigarh/prtc-incurs-rs-36-crore-loss-during-lockdown-stares-at-financial-crisis/story-Ejfr6uKjeGQWOMixYZ7T8O.html> on 20 June 2020

Rajulpudi Srinivas, 2020, “Andhra Pradesh RTC suffers 700 crore loss during lockdown”, The Hindu, Accessed at: <https://www.thehindu.com/news/national/andhra-pradesh/andhra-pradesh-rtc-suffers-700-crore-loss-during-lockdown/article31617498.ece> on 20 June 2020

Anon, 2020, “Himachal Pradesh lockdown: Public transport services to resume from 1 June”, liveMINT. Accessed at: <https://www.livemint.com/news/india/himachal-pradesh-lockdown-public-transport-services-to-resume-from-1-june-11590807305355.html> on 20 June 2020

Anon, 2020, “6,000 Crores Loss For ST Corporation”, Mumbai Live. Accessed at: <https://www.mumbailive.com/en/civic/coronavirus-live-updates-only-7-passengers-travel-in-msrtc-bus-due-to-lockdown-50356> on 20 June 2020

Anon, 2020, “PMPML incurs loss of 100 crore in 67 days”, Sakal Times. Accessed at: <https://www.sakaltimes.com/pune/pmpml-incurs-loss-rs-100-crore-67-days-50574> on 20 June 2020

REFERENCES

1. Reade Pickert, 2020. *US Recession model at 100% confirms downturn is already here*, Bloomberg. Accessed at: <https://www.bloomberg.com/graphics/us-economic-recession-tracker/> on 24 June 2020
2. Christopher Condon, 2020. *Morgan Stanley and Goldman Sachs declare global recession underway*, Fortune. Accessed at: <https://fortune.com/2020/03/17/morgan-stanley-and-goldman-sachs-declare-global-recession/> on 24 June 2020
3. Muthuskumara Mani et al, 2018. “South Asia’s Hotspots: The Impact of Temperature and Precipitation Changes on Living Standards”, The World Bank
4. Anon, 2020. Assessment of climate change over the Indian Region, India Environment Portal. Accessed at: <http://www.indiaenvironmentportal.org.in/content/467861/assessment-of-climate-change-over-the-indian-region/> on 24 June 2020
5. Ibid.
6. FE Bureau Updated: May 08 2020, Regulatory deadline: With no SC relief, auto industry appeals to Government, Express Drive. Accessed at: <https://www.financialexpress.com/auto/industry/regulatory-deadline-april-2020-with-no-sc-relief-auto-industry-appeals-to-government-bs6-bs4-cars-bikes/1952014/>
7. Anon, 2019. Annex to the communication from the commission to the European parliament, the European council, the council, the European economic and social committee and the committee of the regions - The European Green Deal, European Commission, Brussels. Accessed at: <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590732521013&uri=COM:2020:456:FIN> on 24 June 2020
8. Frédéric Simon, 2020. LEAKED: Full list of delayed European Green Deal initiatives, | EURACTIV.com. Accessed at: <https://www.euractiv.com/section/energy-environment/news/leaked-full-list-of-delayed-european-green-deal-initiatives/> on 20 April 2020
9. Anon, 2020. Communication from the commission to the European parliament, the European council, the council, the European economic and social committee and the committee of the regions - Europe’s Moment: Repair and prepare for next-generation, European Commission, Brussels. Accessed at <https://www.greentechmedia.com/articles/read/a-green-hydrogen-cfd-and-eu-wide-renewables-tenders-leak-lifts-lid-on-eus-green-deal> on 24 June 2020.

10. Ibid.
11. Anon, 2020. *Market Monitor: European Car Registrations: January–March 2020*, ICCT. Accessed at: <https://theicct.org/publications/market-monitor-european-pv-registrations-january-march-2020> on 24 June 2020.
12. Maxine Joselow, California passes historic clean truck rule, 26 June 2020. Accessed at: https://www.eenews.net/climatewire/2020/06/26/stories/1063454699?utm_medium=email&utm_source=eenews%3Aclimatewire&utm_campaign=edition%2BiZ%2B%2FftFV%2B2LxUffHtN5bxJQ%3D%3D
13. Reuters, 2020. Italy to introduce scrapping program to boost sales after coronavirus hit, 03 July 2020. Accessed at: <https://europe.autonews.com/automakers/italy-introduce-scrapping-program-boost-sales-after-coronavirus-hit>
14. International Council on Clean Transportation, 2020. China announced 2020–2022 subsidies for new energy vehicles, Policy Brief, USA
15. Sandra Wappelhorst, 2020. The end of the road? An overview of combustion-engine car phase-out announcements across Europe, Briefing. Accessed at: <https://theicct.org/publications/combustion-engine-car-phase-out-EU>
16. Ibid.
17. Anon, 2020. Monitoring of CO₂ emissions from passenger cars – Regulation (EU) 2019/631, European Environment Agency. Accessed at <https://www.eea.europa.eu/data-and-maps/data/co2-cars-emission-18> on 24 June 2020
18. Peter Mock et al, 2020. *Premiums for new car sales as a response to COVID-19 - The case of Germany*, ICCT. Accessed at: <https://theicct.org/blog/staff/premiums-new-car-sales-response-covid-19-case-germany> on 24 June 2020
19. Georg Bleker et al, 2020. *Green vehicle replacement programs as a response to the COVID-19 crisis: lessons learned from past programs and guidelines for the future*, ICCT. Accessed at: <https://theicct.org/publications/vehicle-replacement-programs-covid-19-may2020> on 24 June 2020
20. Ame Schweinfurth, 2009. *Car scrapping schemes: An effective economic rescue policy*, The Global Subsidies Initiative. Accessed at: https://www.iisd.org/gsi/sites/default/files/pb2_carscrap.pdf on 24 June 2020
21. UITP (International Association of Public Transport), 2020. “*Bus Operations in India: The Impact of COVID-19*”. Accessed at: <https://www.uitp.org/press/bus-operations-india-impact-covid-19> on 20 June 2020

22. Anon, 2020. “*Use of public transport likely to reduce for 6 months post-lockdown: CSE survey*”, The Economic Times. Accessed at: <https://economictimes.indiatimes.com/news/politics-and-nation/use-of-public-transport-likely-to-reduce-for-6-months-post-lockdown-cse-survey/articleshow/76087846.cms?from=mdr> on 20 June 2020
23. Laghu Parashar, 2020. Reinventing Public Transport and Mobility in the “NEW NORMAL”, GIZ, at Centre for Science and Environment Webinar, 25 May
24. Ibid.
25. UITP (International Association of Transport), “*Research paper on Motor Vehicle Tax in India*”. Accessed at: https://india.uitp.org/sites/default/files/documents/research-paper-on-motor-vehicles-tax-in-india_0.pdf on 20 June 2020
26. Anon, 2020. “*Haryana cabinet gives nod to hike in bus fares*”, Hindustan Times. Accessed at: <https://www.hindustantimes.com/chandigarh/haryana-cabinet-gives-nod-to-hike-in-bus-fares/story-OumT6PVOI1qMGZua5bZOqI.html#:~:text=As%20per%20the%20decision%2C%20the,travel%20of%20more%20than%20100km.> on 20 June 2020
27. Anon, 2020. “*Few buses in DTC fleet, fewer for public; no addition likely this year*”, Outlook. Accessed at: <https://www.outlookindia.com/newscroll/few-buses-in-dtc-fleet-fewer-for-public-no-addition-likely-this-year/1847674> on 20 June 2020
28. Anon, “*National Urban Transport Policy*”. Accessed at: <http://www.indiaenvironmentportal.org.in/files/TransportPolicy.pdf> on 20 June 2020
29. Anon, 2019. *Towards e-mobility: putting the consumer at the wheel*, PwC. Accessed at <https://www.pwc.in/assets/pdfs/industries/capital-projects-and-infrastructure-publications/towards-emobility.pdf> on 24 June 2020
30. Nilesh Wadhwa 2020. *EV sales in India cross 7.5 lakh mark in FY2019*, Autocar. Accessed at <https://www.autocarindia.com/car-news/ev-sales-in-india-cross-75-lakh-mark-in-fy2019-412542> on 24 June 2020
31. Shubhangi Bhatia, 2020. *What is driving electric three-wheelers to a competitive market in India*, ET Auto. Accessed at: <https://auto.economictimes.indiatimes.com/news/commercial-vehicle/lcv/what-is-driving-electric-three-wheelers-to-a-competitive-market-in-india/73261874> on 24 June 2020
32. Preeti Mehra 2020. *E-rickshaw is the low hanging fruit but a few sour spots remain*, Business Line. Accessed at: <https://www.thehindubusinessline.com/specials/clean-tech/e-rickshaw-is-the-low-hanging-fruit-but-a-few-sour-spots-remain/article30568018.ece> on 24 June 2020

33. Anon, 2019. *Towards e-mobility: putting the consumer at the wheel*, PwC. Accessed at: <https://www.pwc.in/assets/pdfs/industries/capital-projects-and-infrastructure-publications/towards-emobility.pdf> on 24 June 2020
34. Anon, 2018. *EV Sales*, SMEV. Accessed at: <https://www.smev.in/ev-sales> on 24 June 2020
35. Anon, 2018. *Government withdraws sops to conventional battery vehicles under FAME*, Times of India. Accessed at: <https://timesofindia.indiatimes.com/business/india-business/government-withdraws-sops-to-conventional-battery-vehicles-under-fame/articleshow/65982839.cms> on 24 June 2020
36. Uma Gupta, 2019. *FAME India so far*, PV Magazine. Accessed at: <https://www.pv-magazine-india.com/2019/12/03/fame-so-far/#:~:text=The%20government%20has%20supported%20425,commencing%20from%20April%201%2C%202019.> on 24 June 2020
37. Battery: We can change it to 40–50 per cent. Source: Nathaniel Bullard 2019. “*Electric car price tag shrinks along with battery cost*”, Bloomberg. Accessed at: <https://www.bloomberg.com/opinion/articles/2019-04-12/electric-vehicle-battery-shrinks-and-so-does-the-total-cost> on 12 August 2020
38. Logan Goldie-Scot, 2019. *A Behind the Scenes Take on Lithium-ion Battery Prices*, BloombergNEF. Accessed at: <https://about.bnef.com/blog/behind-scenes-take-lithium-ion-battery-prices/> on 24 June 2020
39. Anon, 2020. *Progress in the Sales of Hybrid/Electric Vehicles*, MoHIPE. Accessed at: <https://pib.gov.in/newsite/PrintRelease.aspx?relid=199182> on 24 June 2020
40. Anon, 2018. *BEST mumbai inducted fleet of electric buses*, UITP. Accessed at: <https://india.uitp.org/articles/best-mumbai-launched-electric-buses> on 24 June 2020
41. Anon, 2019. *BEST deploys 10 more Olectra-BYD electric buses*, ET Auto. Accessed at: <https://auto.economictimes.indiatimes.com/news/commercial-vehicle/mhcv/best-deploys-10-more-olectra-byd-electric-buses/71051091> on 24 June 2020
42. Anon, 2020. *Global EV Outlook 2020*, IEA. Accessed at: <https://www.iea.org/reports/global-ev-outlook-2020> on 24 June 2020
43. Anon, 2018. *Electric Buses in Cities: Driving Towards Cleaner Air and Lower CO₂*, Bloomberg NEF. Accessed at: <https://about.bnef.com/blog/electric-buses-cities-driving-towards-cleaner-air-lower-co2/> on 28 June 2020
44. Anon, 2020. *UITP India analysis of FAME II tenders across the country*, UITP. Accessed at: <https://india.uitp.org/uitp-india-analysis-fame-ii-tenders-across-country> on 24 June 2020

45. UITP Source: Anon, 2020. *UITP India analysis of FAME II tenders across the country*, UITP. Accessed at: <https://india.uitp.org/uitp-india-analysis-fame-ii-tenders-across-country> on 24 June 2020
46. N. Mohan, 2020. “India’s emerging Electric Vehicles Charging Infrastructure Outlook- Striding towards economies of scale”, *Innovating energy: Charging India’s e-mobility revolution*, EESL. Accessed at: https://www.eeslindia.org/content/dam/doiassets/eesl/pdf/newsletters/Newsletter2020/EESL_May_Newsletter.pdf on 24 June 2020
47. Anon, 2019. *Towards e-mobility: putting the consumer at the wheel*, PwC. Accessed at: <https://www.pwc.in/assets/pdfs/industries/capital-projects-and-infrastructure-publications/towards-emobility.pdf> on 24 June 2020
48. Anon, 2020. *Global EV Outlook 2020*, IEA. Accessed at: <https://www.iea.org/reports/global-ev-outlook-2020> on 24 June 2020
49. Deepanshu Taumar, 2020. *Most carmakers post decline in sales in Dec, Maruti Suzuki and M&M return to positive*, ET Auto, New Delhi. Accessed at: <https://auto.economictimes.indiatimes.com/news/passenger-vehicle/cars/majority-of-carmakers-post-decline-in-sales-in-dec-maruti-suzuki-and-mm-return-to-positive/73060838> on 24 June 2020
50. VAHAN Dashboard. Accessed at: <https://vahan.parivahan.gov.in/vahan4dashboard/> on 24 June 2020
51. Sarwant Singh, et al 2020. *Post-COVID future of electric vehicles global and India*, Frost & Sullivan. Accessed at: <https://auto.economictimes.indiatimes.com/etanalytics/reports/industry/post-covid-future-of-electric-vehicles-global-and-india/760> on 24 June 2020
52. Anon, 2020. *Global EV Outlook 2020*, IEA. Accessed at: <https://www.iea.org/reports/global-ev-outlook-2020> on 24 June 2020
53. Anon, 2019. *Electric Vehicle Capitals: showing the path to a mainstream market*, ICCT. Accessed at: <https://theicct.org/publications/ev-capitals-of-the-world-2019> on 24 June 2020
54. Anon, 2020. *Global EV Outlook 2020*, IEA. Accessed at: <https://www.iea.org/reports/global-ev-outlook-2020> on 24 June 2020
55. Anon, 2019. *Electric Vehicle Sales: Facts & Figures*, Edison Electric Institute. Accessed at: https://www.eei.org/issuesandpolicy/electrictransportation/Documents/FINAL_EV_Sales_Update_Oct2019.pdf on 24 June 2020
56. Anon, 2020. *US All electric vehicle sales level off in 2019*, Office of Energy Efficiency and Renewable Energy. Accessed at: <https://www.energy.gov/eere/vehicles/articles/fotw-1124-march-9-2020-us-all-electric-vehicle-sales-level-2019> on 24 June 2020

57. Anon, 2019. *Fuel types of new cars: petrol +11.9%, diesel -3.7%, electric +80.5% in fourth quarter of 2019*, ACEA. Accessed at: <https://www.acea.be/press-releases/article/fuel-types-of-new-cars-petrol-11.9-diesel-3.7-electric-81.3-in-fourth-quart> on 24 June 2020
58. Anon, 2019. *New Vehicle car registrations by fuel type in the European union*, ACEA.
59. José Pontes, 2020. *Japan December 2019, EV Sales*. Accessed at: <http://ev-sales.blogspot.com/2020/01/japan-december-2019.html> on 24 June 2020
60. Anon, 2019. *Electric Vehicle Capitals: showing the path to a mainstream market*, ICCT. Accessed at: <https://theicct.org/publications/ev-capitals-of-the-world-2019> on 24 June 2020
61. Anon, 2020. *Electric bus, main fleets and projects around the world*, Sustainable Bus. Accessed at: <https://www.sustainable-bus.com/electric-bus/electric-bus-public-transport-main-fleets-projects-around-world/>
62. Anon, 2020. *Global EV Outlook 2020*, IEA. Accessed at: <https://www.iea.org/reports/global-ev-outlook-2020> on 24 June 2020
63. Ibid.
64. Anon, 2020. *E-mobility sales Review Q2 2020*, PwC. Accessed at: <https://www.strategyand.pwc.com/de/de/studien/2020/e-mobility-sales-review-q1/e-mobility-sales-reviewq1.pdf> on 24 June 2020
65. Anon, 2020. *Global EV Outlook 2020*, IEA. Accessed at: <https://www.iea.org/reports/global-ev-outlook-2020> on 24 June 2020
66. Veronika Henze, 2020. *Electric Vehicle Sales to Fall 18% in 2020 but Long-term Prospects Remain Undimmed*, BloombergNEF. Accessed at: <https://about.bnef.com/blog/electric-vehicle-sales-to-fall-18-in-2020-but-long-term-prospects-remain-undimmed/> on 24 June 2020
67. Chris Bryant, 2020. *COVID impact: The hottest new car models will smell of disinfectant*, Economic Times. Accessed at: <https://economictimes.indiatimes.com/industry/auto/auto-news/covid-impactd-the-hottest-new-car-models-will-smell-of-disinfectant/articleshow/75219298.cms?from=mdr> on 24 June 2020
68. Anon, 2020. *Market Monitor: European Car Registrations: January–March 2020*, ICCT. Accessed at: <https://theicct.org/publications/market-monitor-european-pv-registrations-january-march-2020> on 24 June 2020
69. Peter Mock et al, 2020. *A fateful decision for Spain: Another COVID-19 recovery package supporting electric vehicle uptake*, ICCT. Accessed at: <https://theicct.org/blog/staff/spain-covid-19-recovery-package> on 24 June 2020

70. Maxine Joselow, California passes historic clean truck rule, June 26, 2020. Accessed at: https://www.eenewsnet/climatewire/2020/06/26/stories/1063454699?utm_medium=email&utm_source=eenews%3Aclimatewire&utm_campaign=edition%2BiZ%2B%2FftFV%2B2LxUfHtN5bxJQ%3D%3D
71. Paul Monks, 2020. *Here's how lockdowns have improved air quality around the world*, World Economic Forum. Accessed at: <https://www.weforum.org/agenda/2020/04/coronavirus-lockdowns-air-pollution> on 24 June 2020
72. Martha Henriques, 2020. *Will COVID have a lasting impact on the environment*, BBC Future. Accessed at: <https://www.bbc.com/future/article/20200326-covid-19-the-impact-of-coronavirus-on-the-environment> on 24 June 2020
73. Paul Monks, 2020. *Here's how lockdowns have improved air quality around the world*, World Economic Forum. Accessed at: <https://www.weforum.org/agenda/2020/04/coronavirus-lockdowns-air-pollution> on 24 June 2020
74. Philipp Carlsson-Szlezak et al, 2020. *What Coronavirus can mean for the global economy*, Harvard Business Review. Accessed at: <https://hbr.org/2020/03/what-coronavirus-could-mean-for-the-global-economy> on 24 June 2020
75. Cameron Hepburn et al, 2020. *Will COVID-19 fiscal recovery packages accelerate or retard progress on climate change*, Oxford Smith School of Enterprise and the Environment.
76. Shardul Agrawala et al, 2020. *What policies for greening the crisis response and economic recovery? Lessons learned from past green stimulus measures and implications for the COVID-19 crisis*, OECD Environment. Accessed at: <https://www.oecd.org/finance/what-policies-for-greening-the-crisis-response-and-economic-recovery-c50f186f-en.htm> on 24 June 2020
77. Ibid.
78. Georg Bleker et al, 2020. *Green vehicle replacement programs as a response to the COVID-19 crisis: lessons learned from past programs and guidelines for the future*, ICCT. Accessed at: <https://theicct.org/publications/vehicle-replacement-programs-covid-19-may2020> on 24 June 2020
79. Ame Schweinfurth, 2009. *Car scrapping schemes: An effective economic rescue policy*, The Global Subsidies Initiative. Accessed at: https://www.iisd.org/gsi/sites/default/files/pb2_carscrap.pdf on 24 June 2020
80. Coral Davenport, 2020. *U.S. to Announce Rollback of Auto Pollution Rules, a Key Effort to Fight Climate Change*, New York Times. Accessed at: <https://www.nytimes.com/2020/03/30/climate/trump-fuel-economy.html> on 24 June 2020

81. Peter Mock et al, 2020. *Premiums for new car sales as a response to COVID-19 - The case of Germany*, ICCT. Accessed at: <https://theicct.org/blog/staff/premiums-new-car-sales-response-covid-19-case-germany> on 24 June 2020
82. Georg Bleker et al, 2020. *Green vehicle replacement programs as a response to the COVID-19 crisis: lessons learned from past programs and guidelines for the future*, ICCT. Accessed at: <https://theicct.org/publications/vehicle-replacement-programs-covid-19-may2020> on 24 June 2020
83. Ame Schweinfurth 2009. *Car scrapping schemes: An effective economic rescue policy*, The Global Subsidies Initiative. Accessed at: https://www.iisd.org/gsi/sites/default/files/pb2_carscrap.pdf on 24 June 2020
84. UITP (International Association of Public Transport), 2020, “*Bus Operations in India: The Impact of COVID-19*”. Accessed at: <https://www.uitp.org/press/bus-operations-india-impact-covid-19> on 20 June 2020
85. Anon, 2020, “*Use of public transport likely to reduce for 6 months post-lockdown: CSE survey*”, The Economic Times. Accessed at: <https://economictimes.indiatimes.com/news/politics-and-nation/use-of-public-transport-likely-to-reduce-for-6-months-post-lockdown-cse-survey/articleshow/76087846.cms?from=mdr> on 20 June 2020
86. NSSO (National Sample Survey Office), Annual Survey 2014–15
87. Laghu Parashar, 2020, Reinventing Public Transport and Mobility in the “NEW NORMAL”, GIZ, at Centre for Science and Environment Webinar, 25 May
88. World Road Statistics 2018
89. MoRTH (Ministry of Road Transport and Highways), 2017, “*Road Transport Year Book 2016-17*”. Accessed at: <https://morth.nic.in/sites/default/files/Road%20Transport%20Year%20Book%202016-17.pdf> on 20 June 2020
90. MoRTH (Ministry of Road Transport and Highways), 2016, “*Review of the Performance of State Road Transport Undertakings (SRTUs) for 2015–2016*”. Accessed at: [http://www.indiaenvironmentportal.org.in/files/file/Review%20of%20the%20Performance%20of%20State%20Road%20Transport%20Undertakings%20\(SRTUs\)%20for%202015-2016.pdf](http://www.indiaenvironmentportal.org.in/files/file/Review%20of%20the%20Performance%20of%20State%20Road%20Transport%20Undertakings%20(SRTUs)%20for%202015-2016.pdf) on 20 June 2020
91. Laghu Parashar, 2020, Reinventing Public Transport and Mobility in the “NEW NORMAL”, GIZ, at Centre for Science and Environment, Webinar, 25 May
92. Ibid.

93. Anon, 2020. “*Uttarakhand Cabinet Meeting: Fares of Ordinary Buses Doubled*”, The Hawk. Accessed at: <http://www.thehawk.in/states/uttarakhand-news/uttarakhand-cabinet-meeting-fares-of-ordinary-buses-doubled-154597> on 20 June 2020
94. Anon, 2020. “*Lockdown losses: Bengaluru commuters to pay more for bus rides*”, The Federal. Accessed at: <https://thefederal.com/states/south/karnataka/lockdown-losses-bengaluru-commuters-to-pay-more-for-bus-rides/> on 20 June 2020
95. Anon, 2020. “*Haryana cabinet gives nod to hike in bus fares*”, Hindustan Times. Accessed at: <https://www.hindustantimes.com/chandigarh/haryana-cabinet-gives-nod-to-hike-in-bus-fares/story-OumT6PVOI1qMGZua5bZOqI.html#:~:text=As%20per%20the%20decision%2C%20the,travel%20of%20more%20than%20100km.> on 20 June 2020
96. Anon, 2020. “*Kerala High Court stays earlier order allowing bus operators to collect hiked fare amid lockdown*”, The Economic Times. Accessed at: <https://auto.economictimes.indiatimes.com/news/commercial-vehicle/mhcv/kerala-high-court-stays-earlier-order-allowing-bus-operators-to-collect-hiked-fare-amid-lockdown/76358574> on 20 June 2020
97. Laxman Singh, 2020. “*Facing drop in revenue, BMC slashes financial aid to BEST by Rs 300 crore*”, The Indian Express. Accessed at: [https://indianexpress.com/article/cities/mumbai/facing-drop-in-revenue-bmc-slashes-financial-aid-to-best-by-rs-300-crore-6536410/#:~:text=With%20a%20decrease%20in%20its,Supply%20and%20Transport-%20\(BEST\).&text=The%20decision%20was%20taken%20following,official%20from%20the%20finance%20department](https://indianexpress.com/article/cities/mumbai/facing-drop-in-revenue-bmc-slashes-financial-aid-to-best-by-rs-300-crore-6536410/#:~:text=With%20a%20decrease%20in%20its,Supply%20and%20Transport-%20(BEST).&text=The%20decision%20was%20taken%20following,official%20from%20the%20finance%20department) on 20 June 2020
98. Anon, 2020. “*Few buses in DTC fleet, fewer for public; no addition likely this year*”, Outlook. Accessed at: <https://www.outlookindia.com/newscroll/few-buses-in-dtc-fleet-fewer-for-public-no-addition-likely-this-year/1847674> on 20 June 2020
99. Mayor of London, 2020. “*Why doesn't TFL bring back 100 per cent of Tube Service*”. Accessed at: <https://www.london.gov.uk/coronavirus/coronavirus-covid-19-faqs/why-doesnt-tfl-bring-back-100-cent-tube-services> on 20 June 2020
100. Caroline Splvack, 2020. “*Here is how coronavirus pandemic is affecting public transit*”, Curbed New York. Accessed at: <https://ny.curbed.com/2020/3/24/21192454/coronavirus-nyc-transportation-subway-citi-bike-covid-19> on 20 June 2020
101. Anon, 2011. “*Green Stimulus Measures*”, International Labor Organization. Accessed at: https://www.ilo.org/wcmsp5/groups/public/--dgreports/---inst/documents/publication/wcms_194185.pdf on 20 June 2020

102. Anon, 2011. “*Recent Lessons from the Stimulus Transportation Funding and Job Creation, Smarth Growth America*”. Accessed at: <https://smartgrowthamerica.org/app/legacy/documents/lessons-from-the-stimulus.pdf> on 20 June 2020
103. Rohit Sharma, Peter Newman, 2017. “*Urban Rail and Sustainable Development Key Lessons from Hong Kong, New York, London and India for Emerging Cities*”, Elsevier B.V., Spain
104. ASA (Australian Railway Association), 2014. “*Innovative Funding and Financing for Public Transport, A review of alternative, sustainable funding and financing sources*”. Accessed at: [https://ara.net.au/sites/default/files/14-02-14%20REPORT-Innovative-Funding-and-Financing-for-Public-Transport-FINAL%20\(1\).pdf](https://ara.net.au/sites/default/files/14-02-14%20REPORT-Innovative-Funding-and-Financing-for-Public-Transport-FINAL%20(1).pdf) on 20 June 2020
105. Alope Mukherjee, 2017. “*Subsidizing Congestion? India’s Current Fiscal Policy for Public Buses and Private Vehicles*”. Accessed at: <https://wri-india.org/blog/subsidising-congestion-india%E2%80%99s-current-fiscal-policy-public-buses-and-private-vehicles> on 20 June 2020
106. Anon, “*National Urban Transport Policy*”. Accessed at: <http://www.indiaenvironmentportal.org.in/files/TransportPolicy.pdf> on 20 June 2020

To deal with the sharp economic downturn caused by the COVID-19 pandemic, the Government of India has announced a slew of packages estimated to be about ten per cent of India's GDP. While there is a lot of debate on the adequacy and effectiveness of the economic packages, there is not enough conversation on the ability of the recovery packages to drive investment and growth to build environmental resilience for green recovery.

Green recovery is central to the overall economic recovery process today as environmental and health crises have shown that economies can go into deeper shock if environmental indicators are not integrated. This policy brief has specifically examined the importance of linking economic recovery with the transportation sector, especially low carbon public transport and electric mobility, to demonstrate what is at stake.



Centre for Science and Environment
41, Tughlakabad Institutional Area,
New Delhi 110 062 Phones: 91-11-40616000
Fax: 91-11-29955879 E-mail: cse@cseindia.org
Website: www.cseindia.org