Decarbonizing transport in India Gerald Ollivier Lead Transport Specialist



Climate change is a global challenge that threatens sustainable development and puts at risk the prosperity and well-being of future generations.

As transport demand increases in India, due to population and economic growth, the need to provide sustainable and resilient transport services becomes more important than ever.

The transport sector is the fastest growing in terms of energy consumption

- Urbanization in SAR is on the rise, resulting in a larger problem from urban transport emissions.
- The challenge will be to curb \bullet emissions, while continuing to grow GDP.
- By 2050, global freight transport CO₂ \bullet emissions are expected to surpass emissions from passenger vehicles. Trucking is the dominant mode for providing freight services in SAR contributing up to 57 percent of transport-induced GHG emissions in countries like India.

Transport Emissions



Traffic Units (Tkm and Pkm) in Trillion (2020-ITF): 8.3 Trillion in Total

Pax Freight





Emissions in million tons of CO2 (2020-ITF): 280 MT in Total

Pax Freight Freight Pax HFT 2/3 W buses MFT air cars



A Massive Challenge Well Summarized by ICCT

- **Even high ambitions far from net** • zero
- Most models still show high GHG ٠ growth
- Systemic changes are required at scale •
- From a policy perspective: How to optimize resource use to drive impacts





Avoid & Shift:

Avoid strategies aim to reduce the number of kilometers travelled though more efficient urban growth, compact cities, and TOD

Support the development of safe, efficient, and accessible public transport systems that leverage **intermodal services and nonmotorized transport** that prevent a shift toward private modes.

URBAN TRANSPORT



Improve: Unlock eMobility business models in order to support rollout as technology matures. Expand access to finance.

Compact cities & Public Transport

- Urbanization in India is on the rise. Due to its high use of public transportation options and NMT, many Indian cities account for relatively low emissions per capita. However, these sustainable rates of modal share are beginning to shift.
- History shows that, once a city is built, it is nearly impossible to change its spatial organization for decades or even centuries and planning compact cities requires proactive planning.
- Therefore, key to sustainable and efficient growth of cities should be first focus on providing safe, reliable, intermodal public transport, to stop the loss of mode share -and when possible for drivers to leave their cars behind and turn to public transit



Land Use Planning Drives Efficiency: Case of Chongqing RAPIDFIRE MODELING AND ANALYSIS FLOW

SET STUDY AREA

Region / Subregional Areas or District



Source: Calthorpe Analytics for The World Bank



Integrated planning impact: Chongqing 2035 scenarios

PRIORITIZING BETTER JOBS/HOUSING BALANCE

- » High population growth (+5.8 m urban population and +4.6 m jobs)
- » Scenario analysis on compact/TOD growth versus large block growth
- High Walkability **>>**

SUPPORTING COMPACT, WALKABLE MIXED-USE DEVELOPMENT



REDUCTION IN GREEN FIELD LAND CONSUMED BY 195 KM2



Jobs to Population Ratio, Endstate 2035 -1.121.20 1.02 0.97 1.00 0.80 0.53 Regional 0.60 0.50 average: 0.40 0.7 0.40 0.28 0.20 0.00 Base 2015 Trend Compact Growth Core Seriphery Satellite

PRIORITIZING BETTER JOBS/HOUSING BALANCE



REDUCED INFRA COST BY 5.4 BUS\$



Source: Calthorpe Analytics for The World Bank

Improvement of Public Transport

Bus supply in India's cities is just a fraction of what they need. The urban travel market is being lost to competing modes. Bus systems have been ignored because attention is usually focused on capital expenditure while buses require a focus on operational sustainability. Currently, the frameworks, organization, traffic congestion, high costs and low fares all discourage investment in new buses. A structured program to support a major expansion of the national urban bus fleet would transform the sector, with great benefits for cities.



The Opportunity

A program with 150,000 urban bus would lead to

A fleet of 150,000 urban buses can deliver 86 million daily trips or 320 billion passenger kilometres per annum, at a cost lower by 63% than the alternative, **saving INR84,000 cr** per annum.

Over INR59,000 <u>cr</u> per annum in vehicle operating cost savings Postponed infrastructure upgrade (better use of road space) 4,700 million fewer litres of fuel consumed per annum

8,400 fewer lives lost in road accidents per annum

6.5 million tons of CO2 emission avoided per annum 8,900 tons of PM emission avoided per annum

INR105,000 cr in private investments in buses Over 780,000 jobs in the service industry

Low Carbon Pathways for Urban Mobility in India

 Model for 108 Indian cities with a population size of half a million+ to determine the impact of alternate government programs and policies y urban mobility and GHG emissions.

Lowest emissions result from:

- The investments are redeployed across a combination of modes rather than on a single mode;
- Investments are made beyond the Tier I & II cities, especially in Tier III cities;
- Policies can be initiated for arresting sprawl and catalyzing compact cities
- The new trends in favor of shared mobility can be channelized towards higher occupancy vehicles
- The electric mobility strategy for the country is conceived within the framework of the urban mobility strategy; and with a shift to a cleaner electric grid.



High Level Results

- Combining the mixed strategy with 2Degree Scenario/High electrification can address both CO₂ and sustainable mobility objectives
- Focus next on clean source of electricity in high electrification scenario



CO2 Emissions in 2 Degree & High Electrification Scenario

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Chennai City Partnership

• Provides a comprehensive approach to mitigation in the urban context.

This multi-sector project will:

- Focus on the issue of sustainable and integrated service delivery in the city
- Support policy, institutions, investments, and finance
- Place a special emphasis on "integrating" across sectors
- The project will cover urban mobility and spatial development; water and resilience; urban governance and finance, and aims to provide a comprehensive development agenda which tackles both the spatial growth elements of 'avoiding' trips, and improving public transport and NMT to encourage the use of these modes (shift).



Avoid & Shift:

Support the development of private intercity bus services and rapid rail with access to good quality intermodal terminals.

For example

The mode split in passengerkm in China was

Rail/ Highways/Civil aviation

31%, 53%, 14% in 2010 41%, 27%, 31% in 2018

INTERCITY TRANSPORT-PASSENGERS



Improve: Explore eMobility business models in order to support rollout as technology matures (charging depots).

Develop hydrogen-based solutions for next generation of long distance travel

Intermodal Station Development

Support:

- Encourage multimodal transport by facilitating transfers
- Reduce congestion: Better accessibility & improved facilities drive a shift from private modes
- City transformation: Integrated TOD & commercial development to create a hub of economic activity in cities

Through the:

Creation of a National Scheme and Frameworks for the evaluation, designing, development of IMS, paired with a sustainable financing facility can have a transformative effect in urban mobility in India



Electric Mobility

- The National Electric Mobility Mission Plan (NEMMP) 2020 is India's policy for promoting the manufacturing and adoption of EVs in India.
- In initial stages, new technologies need to be tested • through small scale pilots than bigger scale ones. This allows a fine tuning of policies, as well as the institutional build up required to integrate such technologies in the mobility ecosystem.

₹5

- In India we see two wheelers and three wheelers • reaching parity and electric buses not far behind
- Once parity in terms of Total cost of ownership is • reached, scaling up requires access to large scale commercial financing. This is the 10 X to 100 X story [scaling up 10-100 times].

Green Hydrogen

The race to decarbonization is also requiring a broadening of options. While this decade is likely to be the decade of e-mobility, the surge of interest in hydrogen across countries is likely to lead to a strong role in next decade as a complementary solution. We see this in green states like Kerala, where the drop in green energy prices combined with innovation by KIPT on hydrogen fuel cell (the first hydrogen fuel cell car in India was tested in October)

supports the development of business models that allow for private participation of EV charging infrastructure, fleet and services.

Similarly, the **Program for Transformative** explore opportunities to investment in battery energy storage for both power system and e-mobility applications.



In partnership with the IFC, the

Shift: Focus rail and waterway development efforts on key development corridors.



Avoid & Improve: Regionally, focus on avoid-improve strategies for the freight sector through better, fuller trucks.

In the freight sector, avoid strategies refer to initiatives that optimize movement (e.g coal by rail) and that look at reducing the number of empty trucking trips, while improve refers to upgraded vehicles, technology for more efficient deliveries and vehicle use, and fuel efficiency.

Eastern Dedicated Freight Corridor

- The Eastern Corridor is 1,840 km long and extends from Ludhiana to Kolkata. The World Bank is supporting the Eastern Dedicated Freight Corridor (EDFC) as a series of projects in which the three sections with a total route length of 1,146 km will be delivered sequentially, but with considerable overlap in their construction schedules.
- A Green House Gas Emission Analysis conducted by DFCCIL for the Eastern DFC Project shows that the Eastern corridor is expected to generate about 10.48 million tons of GHG emissions up to 2041-42, as against 23.29 million of GHG emissions in the absence of EDFC – a 55 percent reduction of GHG emissions.



Inland Water Transport Project

- Assam Inland Water Transport Project: aims to (a) improve passenger ferry infrastructure and service in Assam, and (b) improve the institutional capacity and framework for inland water transport in Assam
- Capacity Augmentation of the National Waterway: looks to enhance transport efficiency and reliability of National Waterway-1 and augment institutional capacity for the development and management of India's inland waterway transport system in an environmentally sustainable manner.



50,000 tons of CO2 equivalent in

Assam IWW

ons of CO2 equivalent in greenhouse gas emissions annually

Better, fuller trucks

- While rail is significantly more carbon-efficient than trucks, the forecasts indicate that in an urbanizing world of increasing incomes, trucking growth will swamp any growth in rail.
- The trucking sector in the region is characterized by being highly fragmented, informal and inefficient. Medium size trucks (seven to ten-ton payloads) are most common in the region, given infrastructure limitations in many countries. Low rates, and the lack of strict inspections discourage the purchase of new trucks.
- If India had China's composition of fleet, the GHG emissions would reduce by 4% and costs would drop by 7%. Similarly, if India had a fleet age comparable to that of the US, GHG emissions would be reduced by 8%. Reducing backhauls would also reduce GHG emissions by 10% and costs by 12%



by TruckGuru

Impacts of COVID-19 pandemic

- This health crisis will create, at least in the short term, a particularly difficult environment with a need to push for more resilient, sustainable and climate-friendly solutions
- The crisis has affected transport services both from the demand and supply sides. Reliability and efficiency of transport networks and logistics services have significantly decreased. Public transport has rapidly become associated with the potential spread of the virus.
- It is critical that transport stakeholders find solutions to enhance the resilience of transport networks and reenergize the construction sector while considering adequate safety and hygiene measures to ensure that connectivity and transport services can be sustained in a resilient manner on critical links.



In Summary for Policy Making

- Major policy support to decarbonization already in place
 - Public transport Investment
 - Fuel types
 - E-mobility
- But what percentage of resources are invested in the most effective decarbonization solutions? Rebalancing for impact would accelerate decarbonization
 - Integrated Transport and Land Use Planning, network thinking
 - Walkable and bikeable neighborhoods with good access
 - Growing cost-effective public transport (e.g buses) on intercity/intracity
 - Leveraging private operator engagement •
 - Intercity rapid rail
 - Efficient multimodal logistics (rail and in, making better use of trucks







Decarbonizing and climate proofing transport infrastructure against increased incidence of climate shocks produce the co-benefits of more reliable infrastructure with year-round access, cleaner air, green jobs, and reduced traffic congestion

There is thus growing awareness of the need for countries to (a) reduce GHG emissions, the primary cause of climate change, and (b) reduce vulnerabilities of transport systems and its beneficiaries, i.e., respond to the negative impacts of climate change.

The transport sector has thus developed a robust portfolio that tackles both mitigation and adaptation issues-two important elements of the global climate change agenda.

In the WB SAR Approved FY19 and FY 20 Portfolio:

- Mitigation accounted for US\$412Million and \$223Million in co-benefits, representing 24% and 13% of the portfolio respectively (mainly urban projects)
- Adaptation accounted for US\$435Million and \$724Million in co-benefits, representing 25% and 43% of the portfolio respectively (mainly road projects)





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