Climate Action Series: Warming Up to Climate Action – the Transport Sector

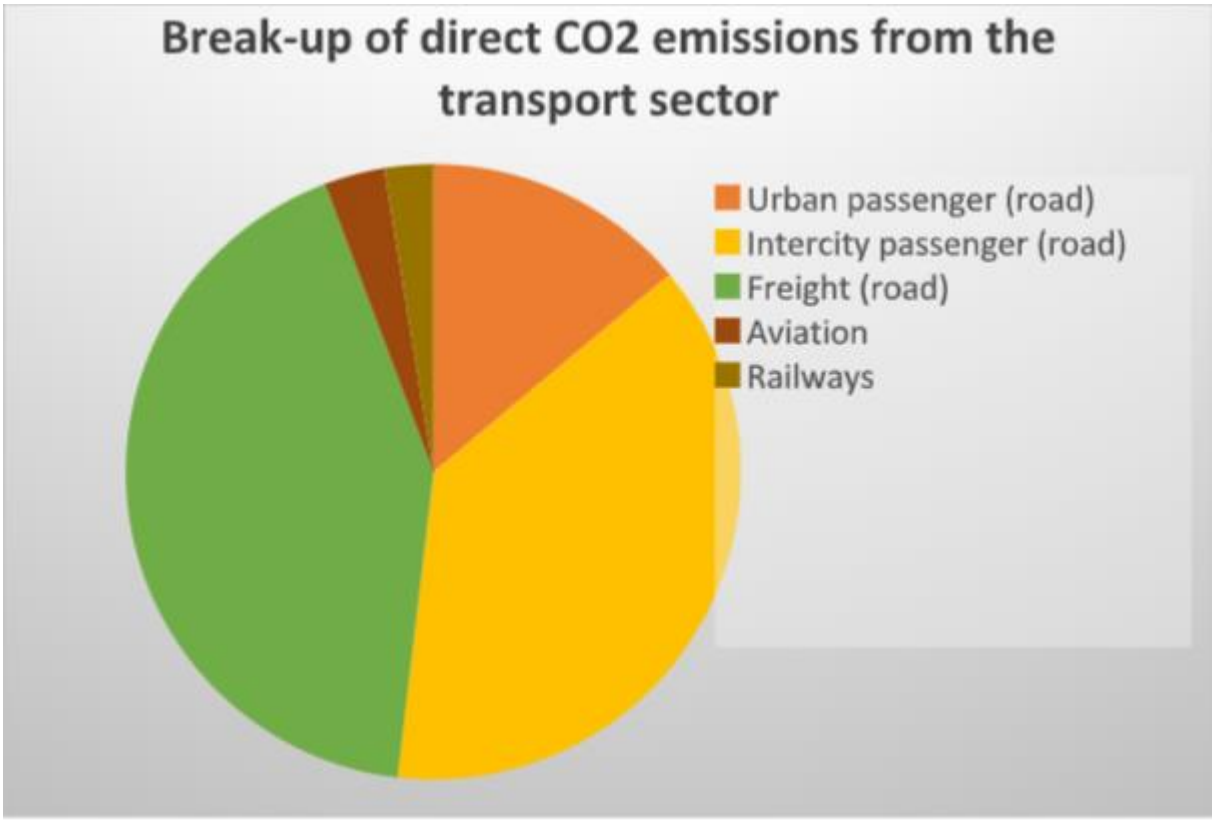
This series, a joint editorial initiative of ETEnergyworld and CSTEP, will discuss key sectors in terms of their contribution to total emissions, policies to reduce footprint, and actions required in the coming years to meet India's climate targets.

By Krithika Ravishankar and Ramya Natarajan

The year 2021-22 has been a milestone year in many ways for climate action in India. While a lot more could have been done (as is always the case), the wins cannot be ignored. The highlight was of course India's 'net zero by 2070' announcement at the 26th UN Climate Change Conference (COP26), along with other announcements on short-term targets for renewable energy and emissions reduction. Many States and Union Territories, such as Kerala, Chhattisgarh, etc. have taken the lead on pursuing carbon neutrality and resilience. Several companies too have set net zero targets. Earlier in the year, the Government showed its commitment to use of ethanol and alternative fuels for transport, the ramifications of which are of course debatable. And most recently, the Union Budget 2022-23 referred to the energy transition and climate action upfront as one of the key focus areas, and low-carbon development as an economic opportunity rather than a trade-off, for the very first time.

This series is a joint editorial initiative of ETEnergyworld and CSTEP. It will discuss some of the key sectors in terms of their contribution to India's total greenhouse gas emissions, policies in place to reduce their footprint, and actions required in the coming years to meet India's climate targets. The first article in the series focuses on the transport sector with a special emphasis on the electric vehicle industry.

We begin by focussing on decarbonisation of the different segments that come under the transport sector. Modelling studies conducted at the Center for Study of Science, Technology and Policy (CSTEP) using the Sustainable Alternative Futures for India (SAFARI) model project that in 2022, India's transport sector will be responsible for ~375 million tonnes of direct carbon dioxide emissions (Mt CO 2), which is ~10% of India's total greenhouse gas (GHG) emissions. Road transport contributes more than 90%, followed by aviation and railways (see Figure 1 for the break-up). As India develops, transport emissions will more than double by 2050, as will the share of sectors such as aviation.



Typical transport emission reduction strategies include electrification, the use of alternative fuels, the shift towards public transport and railways, and improved fuel efficiency. However, are all of them equally effective and sustainable across all vehicle segments? For example, should segments with viable electric alternatives such as two-wheelers and cars even be considered for resource-intensive alternative fuels like ethanol? On the other hand, is electrification the most efficient decarbonisation strategy for segments such as heavy-duty trucks? It is important to develop strategies that direct each segment to a sustainable low-carbon pathway with optimal use of resources.

Electrification and Public Transport

Electrification is likely to play a significant role in reducing emissions in the urban passenger transport segment. Budget 2022-23 has provided a boost to the electric vehicles (EVs) ecosystem. Allocation for the Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles in India (FAME-India) scheme has tripled compared to the previous year. The finance minister (and later, the NITI Aayog) announced that a battery swapping policy and interoperability standards will be formulated, which could help address the issue of range anxiety. Additionally, special mobility zones for zero-emission vehicles in urban areas and reduced customs duties on minerals required for indigenous battery manufacturing have also been proposed to encourage the manufacture and uptake of EVs.

While electrification helps reduce emissions from vehicular fuel combustion, reductions in India's overall GHG emissions depend on the source of electricity. Also, the lack of domestic lithium

reserves results in import dependence for battery manufacturing (until sodium-ion options become feasible), making it critical to establish infrastructure for battery recycling and end-of-life services. Given the uncertainties around large-scale electric mobility, a sustainable decarbonisation plan for urban passenger transport should consider a healthy mix of electrification and increased use of public and non-motorised transport. In alignment with this, the budget has allocated INR 23,875 crores for metros and mass rapid transit systems (MRTS), with improved multi-modal connectivity as one of the focus areas.

The urban passenger transport sector is certainly growing and affects the quality of life in India's cities, but the majority of transport sector emissions comes from intercity and road-based freight transport. These segments may not be top contenders for electrification because of battery densities (and therefore vehicle weight) and range (until battery swapping is effectively brought in). Instead, a modal shift to railways would be more efficient—electricity needed to transport 1 tonne-kilometre by rail is almost ten times lower than electric trucks.

Railways

The Indian Railways saw a significant rise in budgetary allocations this year (by ~INR 20,000 crore). It is emerging as one of the leading options for freight decarbonisation while also showing potential for rural development. Despite accounting for a minuscule part of the transport sector emissions, the Indian Railways announced a 2030 net-zero target, backed by targeted action towards electrification, dedicated freight corridors (DFCs), and RE usage.

The budget hopes to ensure improved logistics efficiency, and this could enhance the scope for development outside of the usual urban economic hubs by aiding rural employment generators such as agriculture (small farmers) and small industries.

An increase in the share of rail in freight from 30% at present to 45% by 2050, enabled by DFCs, could reduce up to 100 Mt CO 2 per year compared to a continued 30%. However, it is infeasible for all road freight to shift to rail because of the lack of last-mile connectivity and dearth of railways in certain isolated regions, necessitating alternative mitigation options. Hydrogen, biodiesel, dimethyl ether, compressed natural gas (bio-CNG), and electrification (with technology improvements) are potential options for the future—subject to scalability and costs.

Alternative Fuels and Aviation

Aviation, the other long-haul intercity segment, is expected to grow exponentially in the coming decades. It cannot be electrified because of current battery weights. Alternative fuels such as sustainable aviation fuel (SAF) made from used cooking oil or biomass residues are promising options for India. Being of the drop-in fuel category, existing infrastructure and planes could be used and co-benefits such as increased farmer income, energy security, and job creation could be realised. However, SAF production is currently expensive and requires policy support to bridge the

cost gap. It might be time for India's biofuel policy to shift focus away from ethanol-blended petrol towards aviation fuels so that this sector can really take off and literally keep biofuels here for the long haul.

A transport decarbonisation strategy that includes diverse options for various segments to complement electrification and ensure optimal use of resources will help India move towards net-zero emissions more sustainably.

(Krithika Ravishankar is a Research Analyst and Ramya Natarajan is a Research Scientist at CSTEP. They work in the Climate, Environment and Sustainability sector)