

Background & introduction to research

In this section, we share the purpose for sustainability in transport sector for India and the potential role hydrogen is slated to play. Possible framework design with current staggered framework in view which can cater to market sounding of opportunities in the automotive space.

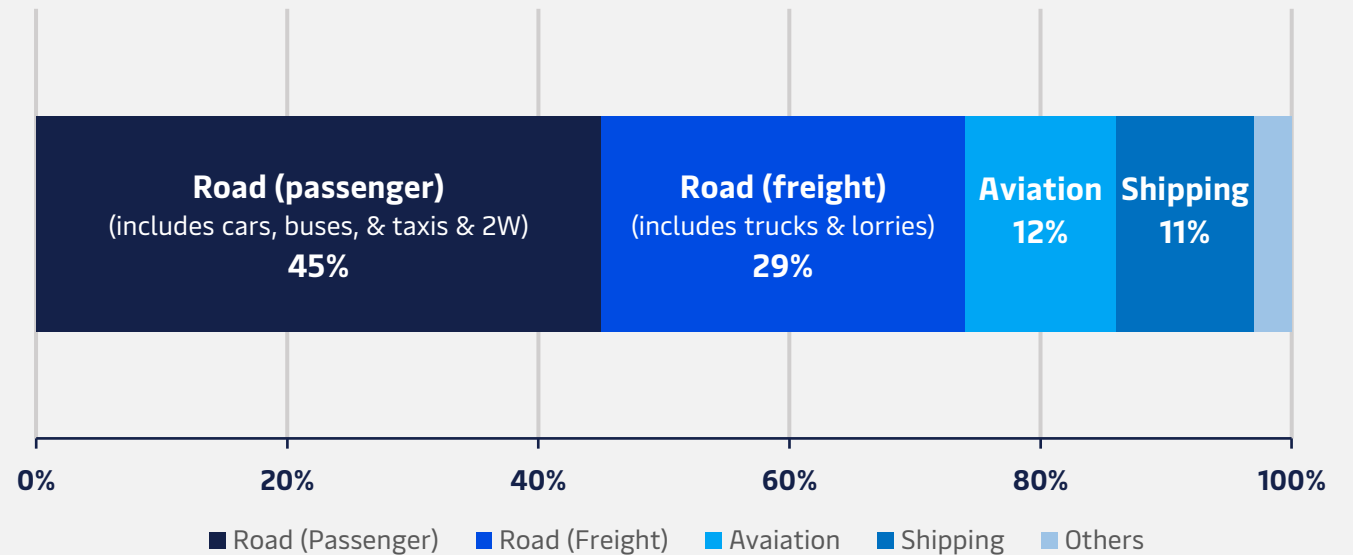


Background & introduction to research

From the beginning of 2000's the automotive industry across the globe has been under tremendous pressure from both the governments and society to pursue more sustainable model for growth. It's been slower but prevalent in India as well as the country has been gradually absorbing the penetration of EVs. The response from the automotive sector in the country in this regards has been phenomenal with all major OEMs planning to launch EVs or have already launched one. However, the transition signals some severe environmental issues as well:

- Transportation accounted for nearly 25% of global carbon emissions with road transportation accounting for close to 20%
- China being the central supplier of EV value chain globally mines most of the graphite used in EVs which is completely non-regulated and is leading large scale environmental damages
- The EVs production consume many critical minerals which are not readily available in India and is completely import dependent

Exhibit: Global CO₂ emissions from transport



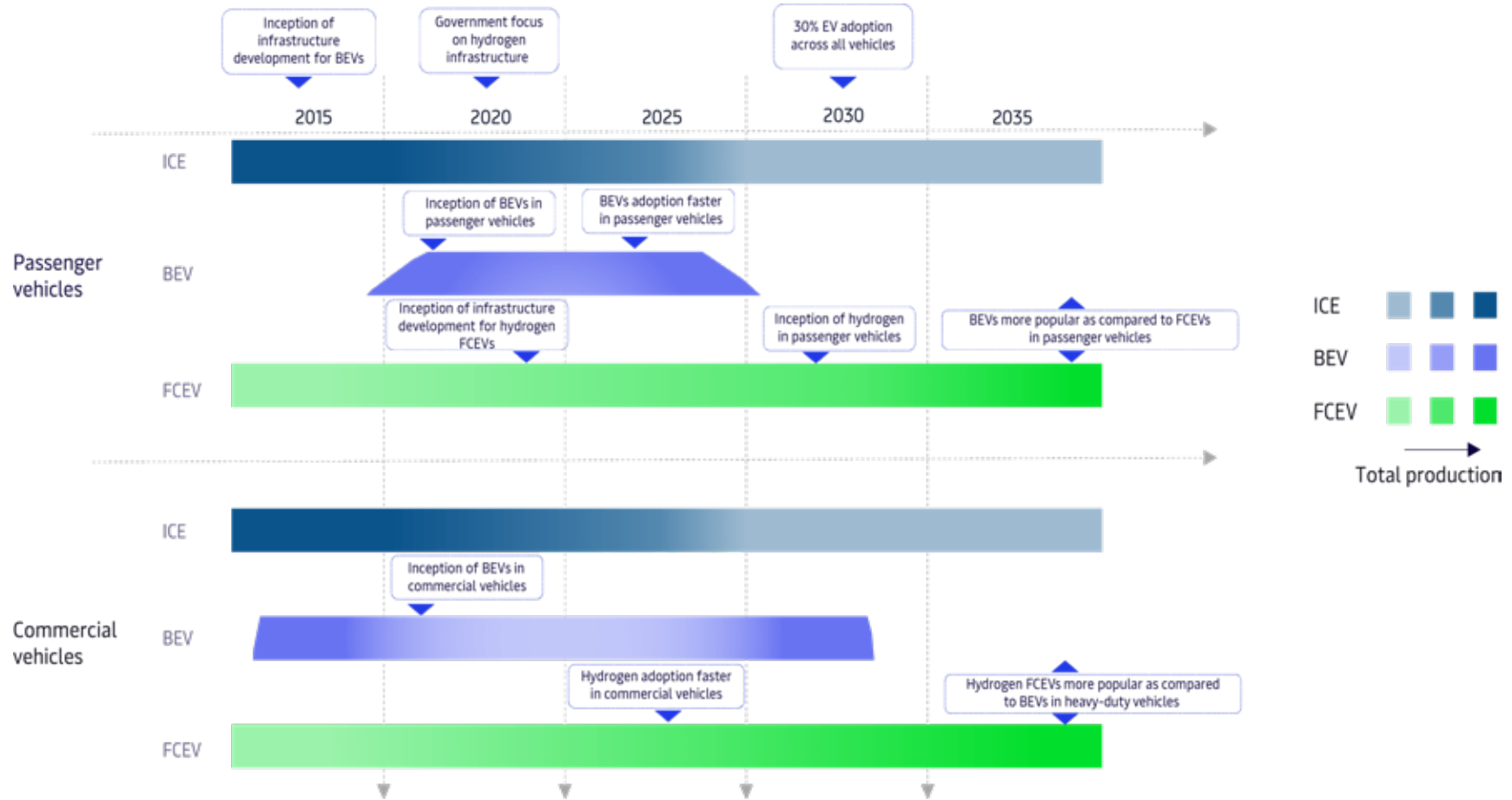
Source: IEA, eninrac research

Purpose – Sustainability & hydrogen role

While sustainability has been on the agenda for automotive OEMs for some time now in India, today we can safely say it has achieved new urgency and importance. Given the constraints faced up by BEVs w.r.t imports the chances for growth of FCEVs improves as it provides for credible alternative and support from Gol through “Atamnirbhar” initiative. Steps taken by the Government and industry combined will enable the sustainable transition for transport sector in the country.

The FCEVs in a fast-evolving mobility space may lead to some uncertainties for OEMs especially while focusing India as a market. Co-existence with various technologies would be a clear way forward for the country. One of the possible strategy is to introduce FCEVs for buses, trucks, and other heavy-duty vehicles while BEVs may remain exclusive to the passenger cars paving way for faster hydrogen adaption.

Exhibit: Likely Timelines for different vehicle types across different use cases



Source: eninrac research & Arthur Little

Sustainability – Strategic priority for India

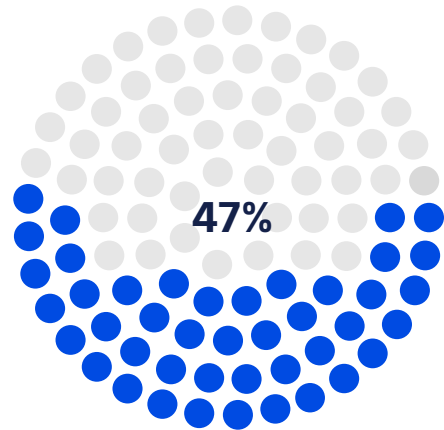
We conducted a sector based “voice of customer” (VoC) for understanding the sustainability perspective for the automotive industry of India along with the potential role which hydrogen can play under both passenger and heavy vehicles sector. The general perspective is reaffirmed focus upon sustainability aspects by almost all domestic and international OEMs. Sustainability is a long-range plan for the companies not only under their subsequent operations but also to work with the supply chain network to transform the entire value chain sustainable. Furthermore, sustainability now plays a key role in the investors and board priorities. The VoC revealed that for India the key drivers for automotive sector’s sustainability would be zoned around compliance to be at global level and responsible organization and focused R&D to meet customer expectations around sustainability for both new and existing product lines.

Exhibit: VoC survey responses on progress of automotive industry in India w.r.t sustainability initiatives

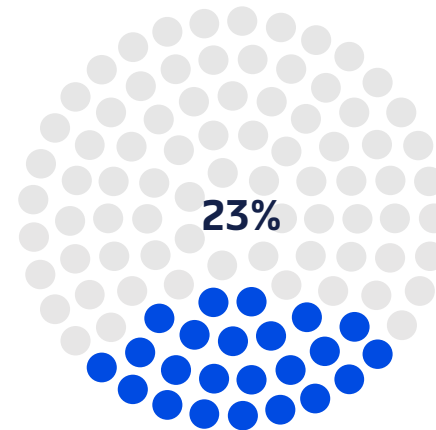


What is the status of Indian automotive industry in ensuring sustainability?

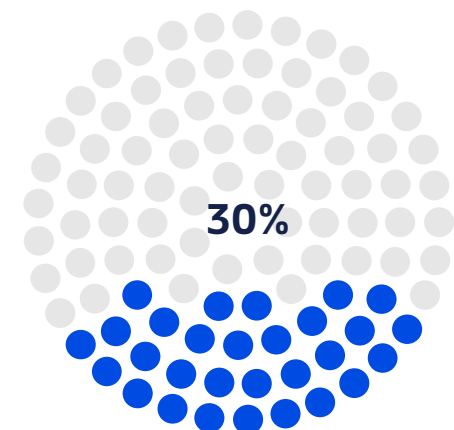
Ahead of other industries in India



In line with other industries in India



Lagging with other industries in India



Source: eninrac research & VoC on Hydrogen & Sustainability in Automotive

Base:943

Automotive industry & sector experts are aligned on sustainability priorities for the country

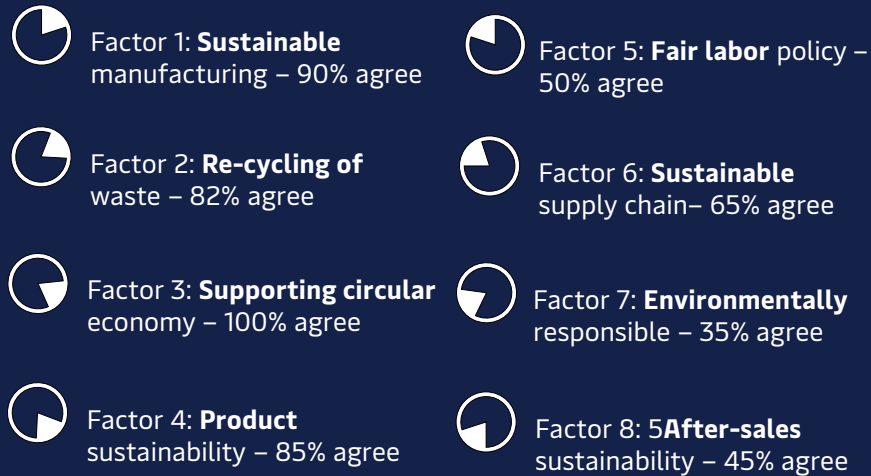
With industry united behind sustainability as a strategic priority in India, our VoC also found broad alignment on the priorities that will have most significant impact on driving results and progress in the country. We conducted the survey at a base of over 900 industry experts and executives for understanding the priorities.

The top initiatives which lie common to both the experts and executives wherein both seem aligned in the results of VoC were – **a.** supporting a circular economy for India **b.** sustainable R&D and product development **c.** promote sustainable manufacturing & **d.** recycling of waste and easy returns for end-of-life disposal

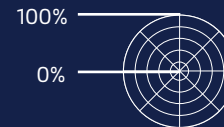
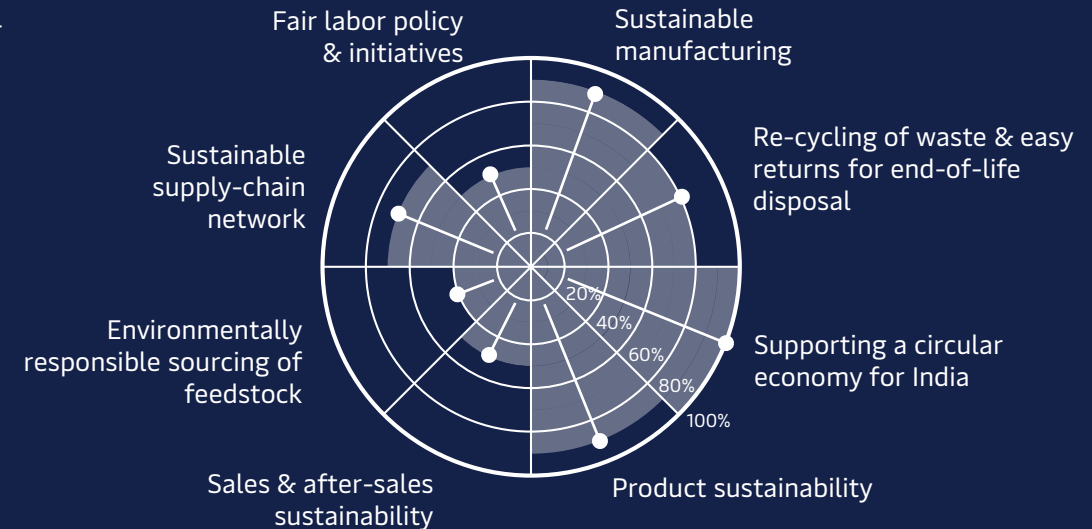
Most of our plants are partially meeting their electricity consumption needs through renewable energy. Further, to reduce the carbon footprints in manufacturing we are exploring the application of green hydrogen as well to be sustainable in our product manufacturing. Also, we are working on a multi-product strategy to cater to the consumer choices and meet industry expectations for sustainability

Head of Sustainability,
Marelli India

Exhibit: Priorities ranked as per inputs in VoC for automotive industry expert



Base:943

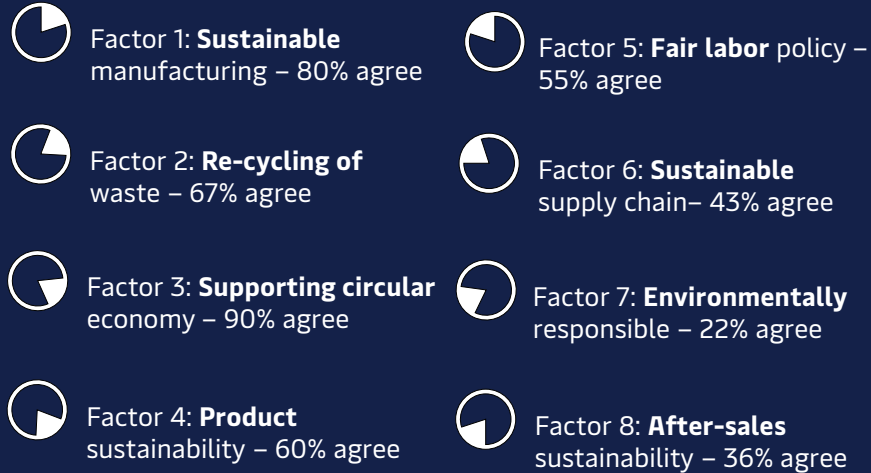


Score by Vector (0% = lower; 100% = higher)

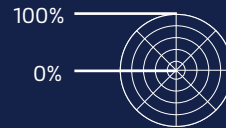
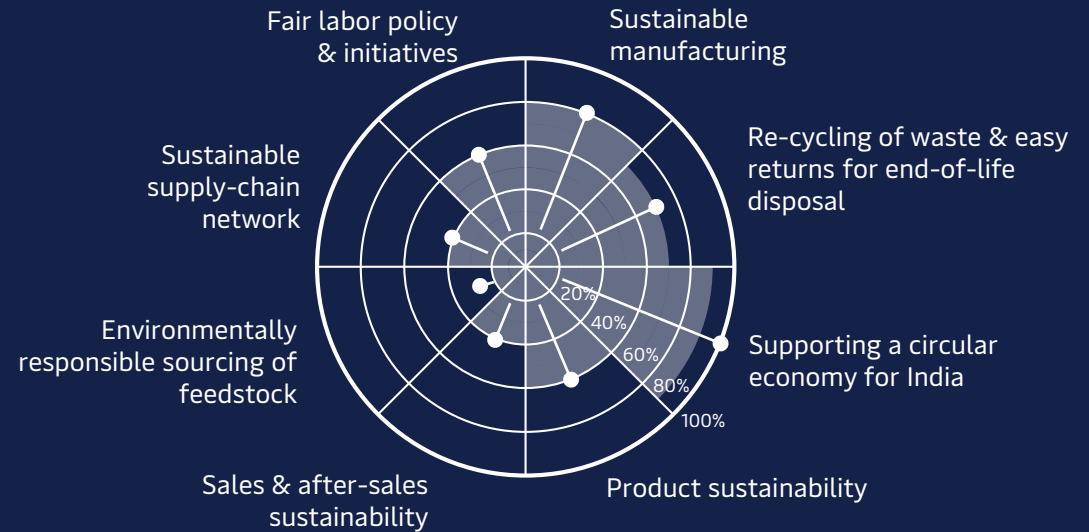
For us, hydrogen was the most viable source of sustainable fuel, based on our requirements for medium-to-long-haul and heavy-payload capable light vans. Renewable energy is a key focus for us, as our delivery fleet represents our largest individual source of emissions."

Head of Products,
Commercial UK

Exhibit: Priorities ranked as per inputs in VoC for automotive executive priorities



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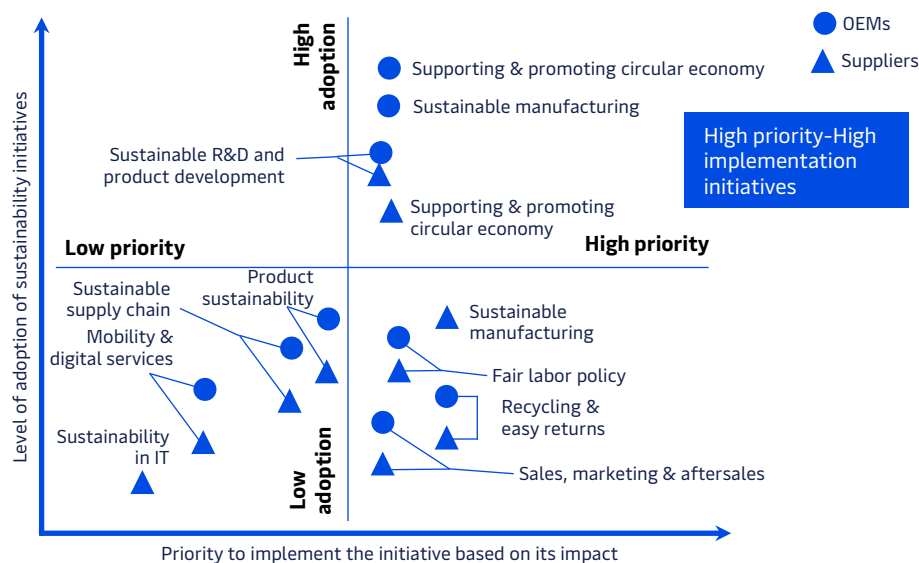


Score by Vector (0% = lower; 100% = higher)

Fragmented implementation of sustainability

For sustainability to meet the ambitious goals of the industry, it needs to be pursued over the automotive value chain network. The VoC conducted by eninrac found that nearly 58% of automotive organizations claimed to have developed a comprehensive sustainability with well-defined goals and targets. In the exhibit below we compared the level of adoption of sustainability initiatives against their priorities indicated by experts. The top-right quadrant is the sweet spot – where OEMs and suppliers are implementing initiatives that have the most impact. We found that OEMs outperformed suppliers in all apart from three initiatives.

Exhibit: Suppliers lag OEMs in adopting sustainability initiatives



Source: eninrac research & Channel checks

Table: Highest & lowest adoption of sustainability initiatives – By country and deployment levels

Sustainability Initiative mandated & deployed	Highest adoption		Lowest adoption	
	Country	Deployment	Country	Deployment
Circular economy promotion	Germany 🇩🇪	67%	India 🇮🇳	22%
Sustainable R&D	France 🇫🇷	56%	China 🇨🇳	37%
Sustainable manufacturing	Germany 🇩🇪	55%	France 🇫🇷	31%
Product sustainability	France 🇫🇷	38%	India 🇮🇳	26%
Supply-chain sustainability	USA 🇺🇸	37%	France 🇫🇷	23%
Recycling of waste	USA 🇺🇸	35%	UK 🇬🇧	13%
Sustainable power procurement	Germany 🇩🇪	31%	India 🇮🇳	15%
Fair labor policy	USA 🇺🇸	30%	UK 🇬🇧	6%
Environmentally responsible sourcing	Sweden 🇸🇪	30%	France 🇫🇷	8%
Sales & after sales sustainability	USA 🇺🇸	28%	UK 🇬🇧	13%
Mobility & digital services	Germany 🇩🇪	23%	UK 🇬🇧	3%
Sustainability in IT	Sweden 🇸🇪	22%	UK 🇬🇧	13%
Due diligence of all material & product	India 🇮🇳	15%	Sweden 🇸🇪	4%

Source: eninrac research & Channel checks

Sustainability in automotive industry – maturity framework for India

The questions which remains as an imperative is how can automotive firms in India attain a sustainability strategy and deliver to its goals. To do this, we assessed the maturity of automotive organizations’ sustainability programs against four areas:

- Vision for Sustainability
- Engagement for Sustainability
- Governance for Sustainability
- Iterative roadmap

We scored the responses of automotive organizations that we surveyed based on the elements of the above framework. Organizations who do better than the average across all four pillars are classified as sustainability leaders. Those that perform below average on at least three of the four pillars are classified as laggards. The remaining population in between forms the majority cohort.

Exhibit: Sustainability maturity framework for automotive industry in India



Source: eninrac research & Channel checks

Sustainability framework for automotive industry in India

- **Vision for Sustainability** - the long-term ambition on sustainable action, declared strategy, goals, and an assessment of risks, exposures and opportunities related to climate change
- **Engagement for Sustainability** - partnering within and outside the automotive value chain on mitigating environmental impact and communicating it effectively to all stakeholders
- **Governance for Sustainability** - how sustainability is managed, including the specific responsibilities of executives at different levels for delivering the organization-wide vision
- **Iterative roadmap** - operational activities involving other value chain partners. For example, to implement and drive to completion new business models, mobility and digital services, and circular economy initiatives

Indian H₂ economy & transport model

The size of the opportunity for Hydrogen for Transport relates to the size of the existing transport market and the size and value of existing vehicle fleets. As the exhibit illustrates, when considering all modes, India has approximately US\$ 280 Billion transport industry including road freight and revenue from transport services. This presents significant scope for technological application.

Value: Largest mode types of the transport sector

Passenger vehicles are the dominant component for India's transport industry, particularly from a wholesale revenue perspective where more than a 3 to 4 million vehicles are sold in the country every year. The sales of SUVs and utility vehicles have gone up in past 3-4 years and are amongst highest in vehicle sales.

Machinery also forms a significant market segment from wholesale perspective. Applications of this equipment are varied but relate to India's primary industries such as mining and agriculture, and downstream activities such as logistics and construction.

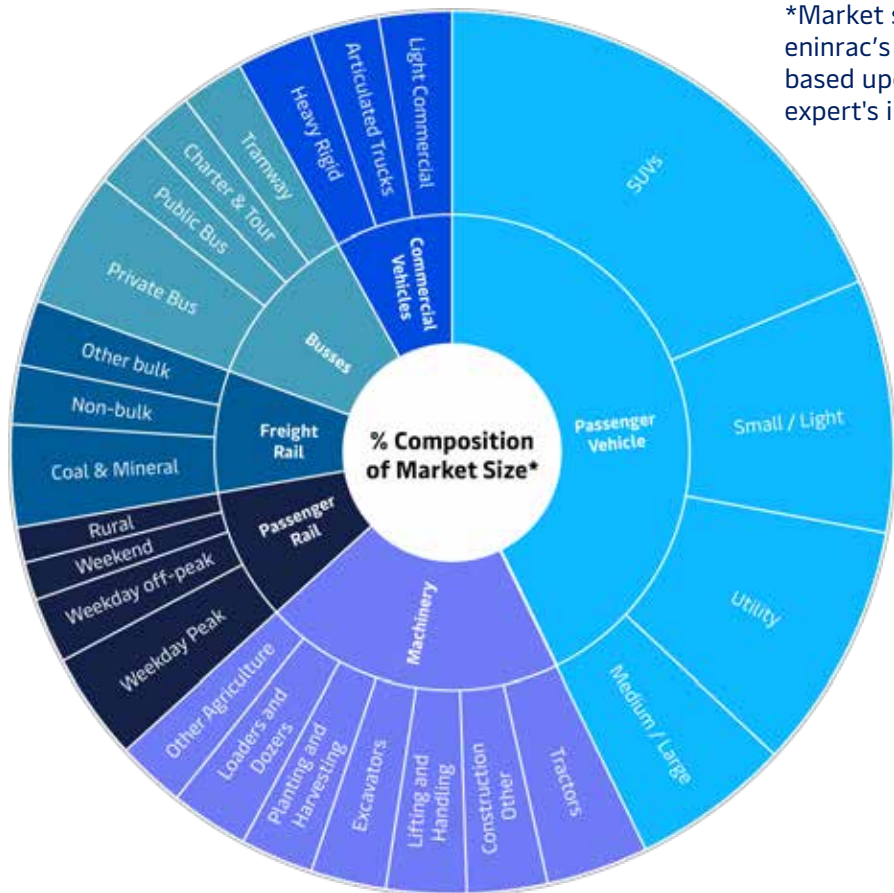
Emissions: Most carbon-intensive modes of transport sector

When considering the market in terms of emissions, transport accounted for around 23% of man-made greenhouse gas emissions globally in 2010 and has continued to increase since then, according to a report to the Intergovernmental Panel on Climate Change. India's transport emissions are in line with the global proportion, projected to be responsible for around 25% of all Indian emissions in 2022.

The road-based transport modes make 75% of Indian transport emissions. Private passenger vehicles are the single largest mode in terms of their emissions contribution. Commercial vehicles are also significant greenhouse gas producers relative to the size of the Indian fleet. This composition highlights the opportunities that exist within the private, freight and commercial sectors to apply hydrogen technology and mitigate greenhouse gas emissions. While hydrogen as a fuel has a carbon intensity dependent on its manufacturing process, it is possible to produce low-emission hydrogen through electrolysis from renewable electricity. Currently, only 2% of global hydrogen production is produced by electrolysis. The other 98% of hydrogen is produced from fossil fuels, through methods such as steam methane reforming and coal gasification

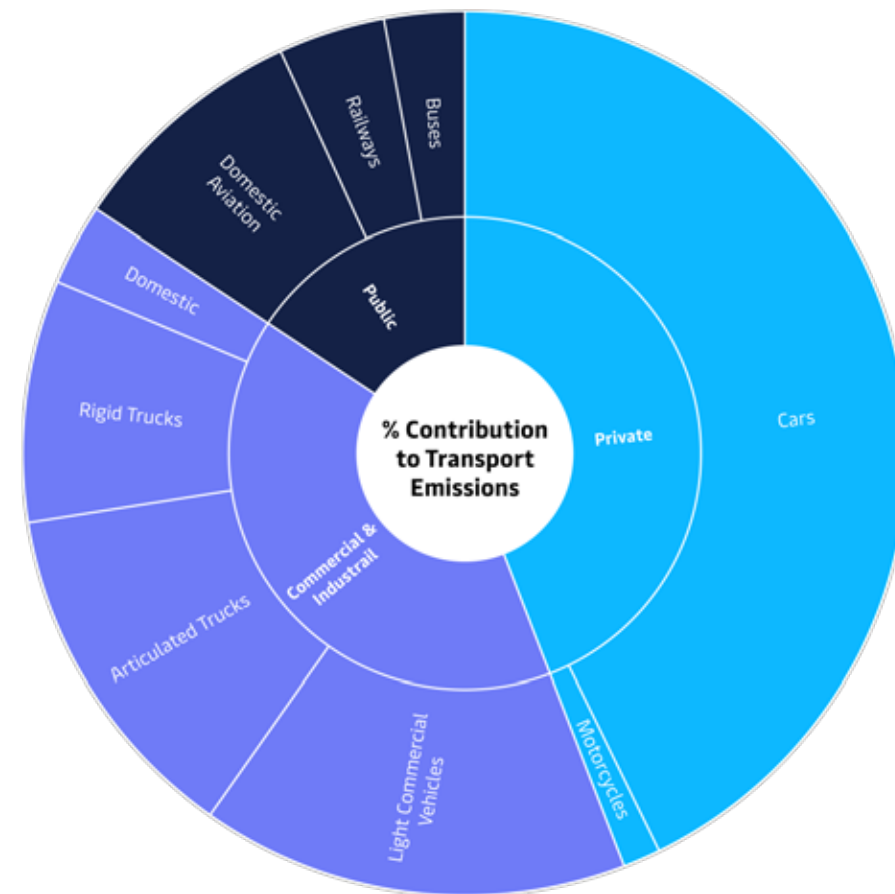
Exhibit: Market opportunity based upon wholesale revenue for India

*Market size as assessed by eninrac's domain specialists based upon the industry expert's inputs and viewpoints



Source: eninrac research & Channel checks

Exhibit: Emissions of transport by mode in India



Source: eninrac research & Channel checks

Market sounding and opportunity

Market sounding

As a part of the process of developing this report, eninrac consulting engaged with a range of stakeholders who are a part of or have links to transport industry, to gather their insights and perspectives on hydrogen. The stakeholder group encompassed Original Equipment Manufacturers (OEMs), fuel retailers, hydrogen distributors and commercial end users. All stakeholders have been anonymized within the body of this report, and it should be noted that the conclusions and recommendations contained within this document do not necessarily reflect the views of the organizations that were consulted as part of the market sounding through “VoC” survey.

Benefits of the opportunity for India

Using hydrogen as fuel transport is likely provide number of benefits to Indian industries and transport sectors which by and large will benefit the automotive industry as well. The primary reasons as to why hydrogen evolves as a credible fuel alternative source:

- 1 Fuel security:** Hydrogen is a fuel source that can be produced through chemical processes (e.g., electrolysis). This presents the opportunity to create a fuel supply chain wholly within India. The ability to reduce reliance on overseas supplies of liquid fuels, and hence increase local fuel security.
- 2 Improvement in air quality and emissions:** Fuel cell technology produces no direct emissions, and this has the prospect to reduce air pollution, which is currently contributed to by petroleum and diesel-powered transport. Furthermore, hydrogen that is derived from renewable energy sources (so-called ‘green hydrogen’), presents the opportunity to introduce a carbon-neutral fuel source into the transport energy mix
- 3 Use and range:** Hydrogen transport technology offers a similar user experience to incumbent technology, including the driving experience, driving range, and refueling time. These characteristics make hydrogen technology attractive as a substitute to incumbent technology in a broad set of applications.

Truth is ever to be found in the simplicity, and not
in the multiplicity and confusion of things

- Sir Isaac Newton

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