

Reducing carbon footprint in the automotive industry

Sustainability for Competitiveness

This white paper was a part of the ACMA Annual Compendium 2023



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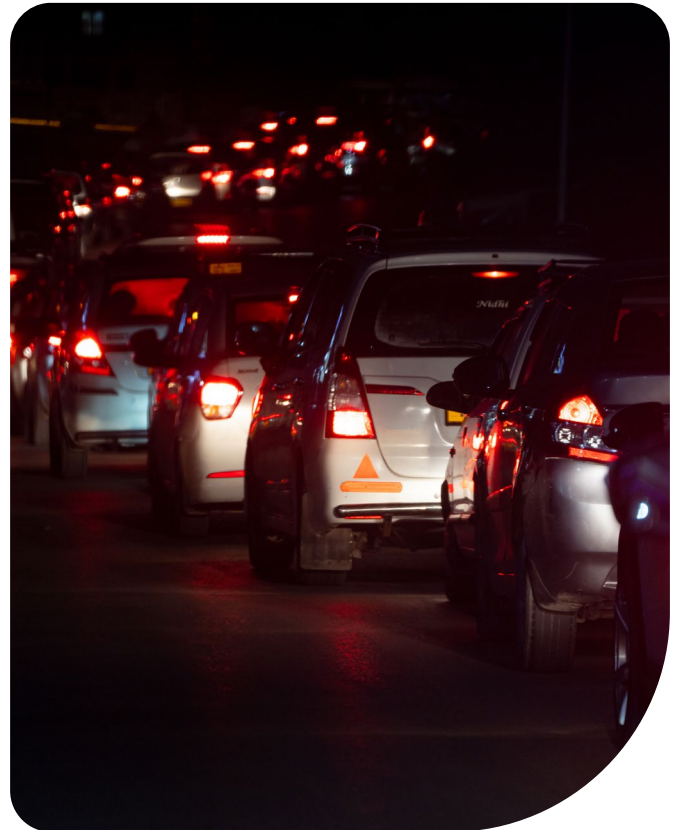
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Abbreviations

BS6	Bharat Stage Emission Standards 6
CAGR	Compound Annual Growth Rate
CD	Cylinder Deactivation
CNG	Compressed Natural Gas
EU	European Union
EV	Electric Vehicles
GDP	Gross Domestic Product
GDI	Gasoline Direct Injection
GHG	Greenhouse Gas
OEM	Original Equipment Manufacturer
OICA	International Organization of Motor Vehicle Manufacturers
SCR	Selective Catalytic Reduction



01

Background



Climate change is no longer a distant reality and people across the globe are already feeling its repercussions. The automotive industry being a key emitter of carbon-di-oxide (CO₂), it becomes important to gauge the different scopes of emissions and ways to reduce the carbon footprint in the industry. Greenhouse gases (GHG), when present in the atmosphere, absorb and trap certain radiations, resulting in the greenhouse effect. These gases, trap heat in the atmosphere, leading to the warming of the planet. As per the Green House Gas (GHG) protocol¹ emissions can be classified into three Scopes based on the control and ownership of the assets causing emissions. These are described as Scope 1, Scope 2 and Scope 3.



Scope 1

Emissions are direct GHG emissions that occur from sources that are owned or controlled by the company. Examples include emissions from combustion in owned or controlled manufacturing sites and factories.



Scope 2

Emissions accounts for greenhouse gas (GHG) emissions resulting from the generation of purchased electricity consumed by the company. Purchased electricity refers to electricity that is bought or otherwise brought into the organisational boundary of the company. Scope 2 emissions physically occur at the facility where the electricity is generated.



Scope 3

Encompasses all other indirect emissions. These emissions are a consequence of the company's activities but originate from sources that are neither owned nor controlled by the company. For example: Emission occurring from burning of petrol and diesel by cars and vehicles used by consumers. There are a total of 15 categories defined by GHG Protocol under Scope 3 emissions. These comprises upstream and downstream emissions in the value chain including emissions from business travel, employee commuting and from purchased good and services.

With rising emission levels, the average temperature of the globe is increasing causing global warming. To counter this, different scenarios are computed which aim to reduce emissions and ultimately driving it to net zero level by 2050. Net zero emissions refers to the balance between the amount of GHG that is produced and the amount that is removed from the atmosphere. It can be achieved through a combination of emission reduction and emission removal².

1. <https://ghgprotocol.org/>

2. <https://www.nationalgrid.com/stories/energy-explained/what-is-net-zero>



02

Global context

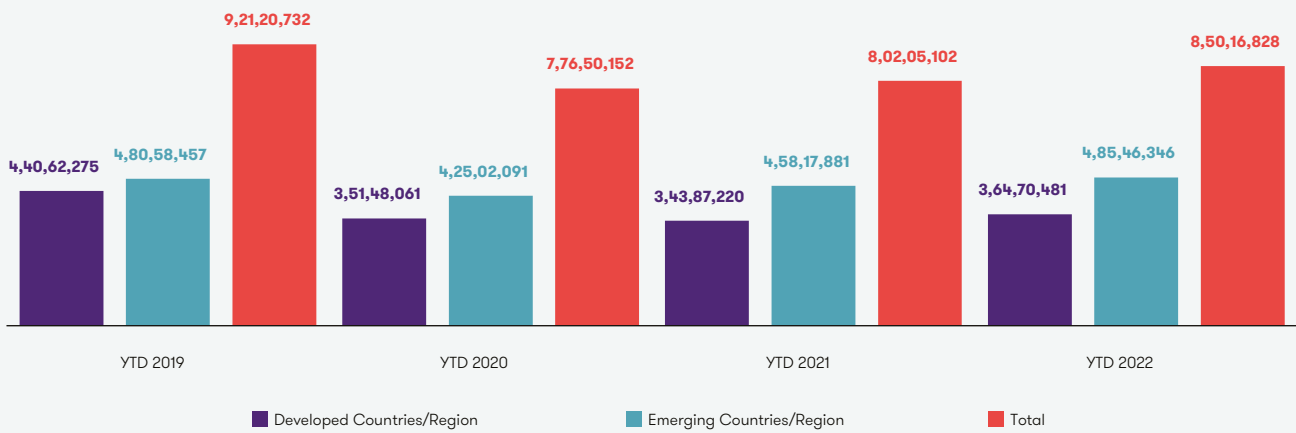


Currently, the global automotive sector is faced with a myriad of challenges and trends. The industry's trajectory has been significantly impacted by the COVID-19 pandemic, leading to reduced production and sales, further compounded by chip shortage, which is important to boost fuel efficiency. Simultaneously, there is a transformation towards electric vehicles (EVs) propelled by governmental regulations, consumer preferences and technological advancements.

The demand for connected and personalised vehicles is rising significantly, driven by the proliferation of mobile devices. As the industry navigates these dynamics, adapting to the aftermath of the pandemic, embracing EVs, managing autonomous vehicle complexities and catering to connectivity, demands are central to its evolution.

Global Automotive Production Statistics

World Motor Vehicle Production



Source: World Motor Vehicle Production³

Figure above depicts worldwide motor vehicle production, drawing from data collected in the survey conducted by International Organization of Motor Vehicle Manufacturers (OICA). ¹ World Motor Vehicle Production

The data indicates a notable decline of 20% in production within developed countries, juxtaposed with a marginal increase of 1% in emerging countries. The classification of developed countries encompasses EU15, NAFTA (Canada, Mexico, USA), Japan, South Korea, and Australia, whereas emerging countries refer to all other regions.

³ <https://www.oica.net/category/production-statistics/>



Projected growth trajectory for global automotive market

Despite challenges, the worldwide automotive industry is projected to expand. This growth is propelled by emerging markets such as China and India, where economic growth and rising incomes drive automobile demand. Technological progress, including innovative materials and manufacturing processes, further fuels the sector, enhancing fuel efficiency, safety, and affordability. Amidst myriad influences driving change in 2023, the global automotive sector stands on the brink of growth, propelled by expanding markets and significant technological advancements.

According to McKinsey's report⁴, in a net-zero context, low-emission car sales are projected to increase from 5% of global new-vehicle sales in 2020 to nearly 60% by 2030. This trend extends to road mobility sectors — passenger cars, buses, two/three-wheelers and trucks.

Trends shaping the industry in 2023

Here are some specific trends in the automotive sector in 2023:

Connected Cars

Connected cars are gaining traction for their safety and convenience features. They communicate with vehicles, infrastructure, and smartphones, providing hazard alerts, traffic updates and automated parking.

Autonomous Vehicles

Autonomous vehicles are in the nascent stage of development but hold transformational potential for transportation. They might eliminate accidents, ease congestion, and offer mobility to non-drivers.

Electric Vehicles

Growing demand for EVs arises from their advantages over gasoline vehicles such as fuel efficiency, zero emissions, and reduced noise pollution. These appeals to the consumers and makes them an eco-friendly choice.

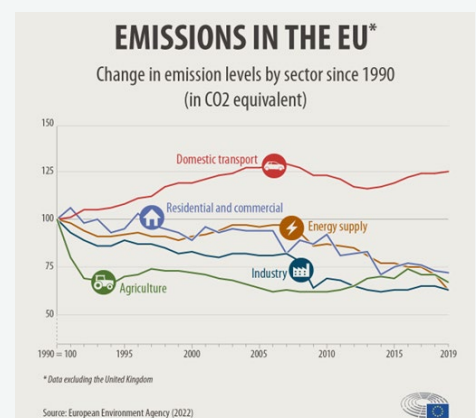
Sustainable Materials

The auto industry's push for eco-friendliness fuels the use of sustainable materials, such as recycled plastics and fabrics, aligning with environmental concerns and driving positive impact through vehicle interior innovation.

These are just a few of the trends that will be shaping the global automotive sector in 2023. The automotive industry is undergoing a significant transformation, and it will be interesting to see how these trends play out in the coming years.

Regulations governing automotive emissions in the EU

The urgency for sustainability in the automotive sector is evident due to its carbon intensity. Globally, transportation contributes to 23% of energy-related CO₂ emissions⁵, with road transport comprising 72% of the EU's transport GHG emissions. Road vehicle tailpipe emissions alone represent nearly 75% of mobility sector carbon emissions⁶, equivalent to around 6 billion metric tons of CO₂ annually and around 15% of worldwide CO₂ emissions.



4. <https://www.mckinsey.com/capabilities/sustainability/our-insights/spotting-green-business-opportunities-in-a-surging-net-zero-world/transition-to-net-zero/road-mobility>

5. <https://www.itf-oecd.org/decarbonising-transport#:~:text=The%20Decarbonising%20Transport%20initiative%20promotes,affects%20lives%20around%20the%20globe.>

6. <https://op.europa.eu/en/publication-detail/-/publication/14d7e768-1b50-11ec-b4fe-01aa75ed71a1>



As per the report by OICA⁷, recent EU legislation strives to enhance air quality and counter climate change, with the EU Green Deal presenting additional regulations. Euro 6 Real Driving Emissions (RDE) and Euro 6d advance pollutant control technology bridges the real-world and lab emission gaps. Euro 6d-TEMP diesel vehicles showcase lowered on-road NOx and PN (particle number) emissions through testing. The worldwide harmonised light vehicle test procedure (WLTP) assesses real-world fuel consumption and CO₂ emissions. Reduced CO₂ emission targets for new passenger car fleets are set for 2025 and 2030 to combat climate change. Efficiency of modern diesel vehicles together with electrification aids in achieving these goals.

Globally, governments are implementing policies for eco-friendly automotive sectors. In the EU, emission reduction goals and policies to curb fossil fuel used in the auto sector have already been enacted. This includes:

Fuel prohibitions

The EU's fresh CO₂ targets intend to curtail road transport emissions, with 55% and 50% interim reductions for cars and vans, respectively, by 2030. Approved in February 2023, these goals reinforce the transition towards a green automotive and fleet sector, accentuated by the 2035 ban on new petrol and diesel cars.

Green Deal Industrial Plan (GDIP)

Published on 1 February 2023, the EU's Green Deal Industrial Plan (GDIP) aims to improve European industrial competitiveness while transitioning to climate neutrality for sustainable prosperity. It responds to global net-zero industrial initiatives, encouraging decarbonisation and innovation via existing subsidies. The GDIP aims to fortify the EU industry through four pillars — a streamlined regulatory framework, expedited funding access, skill enhancement and resilient supply chain trade.

Introducing the Emissions Trading System (ETS)

To reinforce reduced CO₂ emission goals, the EU introduces additional measures — a new emissions trading system for transport and buildings, expanded renewable transport fuels, fossil fuel tax changes, and revising alternative fuels infrastructure.

Corporate sustainability reporting directive (CSRD)

Effective FY 2024, the CSRD mandates large companies to regularly disclose environmental and social impact activities. This facilitates assessment by investors, consumers, policymakers, and stakeholders, fostering responsible business practices. The CSRD imposes substantial obligations on automotive and fleet corporations, necessitating prompt establishment of meaningful sustainability metrics and KPIs.



7. <https://www.oica.net/wp-content/uploads/200901-modern-diesel-MTZ.pdf>



Integrated approach for environmental concerns

OICA has suggested⁸ that legislation tends to prioritise CO₂ emissions from new vehicles rather than adopting an integrated approach involving all relevant stakeholders. This, in turn, overlooks the potential benefits of a more holistic and collaborative approach to address environmental concerns effectively. This is outlined below:

Evolving vehicle engineering

Enhance the efficiency of new automobiles and trucks through advancements in vehicle technology to lower the average CO₂ emissions produced by these vehicles

Fuelling sustainable solutions

Promote the development of environmentally sustainable fuels and establish necessary infrastructure for their distribution, thereby diversifying energy sources and reducing environmental impact in the transportation sector

Optimising infrastructure

Enhance traffic movement and mitigate inefficient congestion through improved infrastructure measures

Enhancing driver practices

Educate drivers about practices to diminish fuel usage and CO₂ emissions, enhance road safety by altering driving behaviour for a green and safe transportation approach

Carbon-driven taxation

Shape consumer preferences and buying decisions to foster reduced CO₂ emissions in driving behaviour, leveraging CO₂-related taxation strategies



8. <https://www.oica.net/category/climate-change-and-co2/>



03

The Indian scenario



India's automotive excellence

In the global landscape, India stands tall as the third-largest automobile market, showcasing its prowess in various segments. During FY2021-22, the Indian automobile industry⁹ exhibited its vitality by producing a substantial 22.93 million vehicles, across passenger, commercial, three-wheelers, two-wheelers and quadricycles. Notably, India's position in the international heavy vehicles space is formidable, being the largest tractor manufacturer, second-largest bus manufacturer and third-largest heavy truck manufacturer worldwide.

It significantly bolsters India's GDP, constituting 6% of the total and 35% of the manufacturing GDP. The EV domain foresees substantial growth, with an anticipated 49% CAGR between 2022 and 2030, aiming for 10 million annual sales by 2030 and generating 50 million job opportunities. Projections also indicate a USD 50 billion EV financing market by 2030. FY2022-23 reported record passenger vehicle sales at 2,504,084 units. Looking ahead, the truck market in India is poised to expand by more than fourfold by 2050. This thriving sector's value exceeds USD 222 billion, contributing 8% to exports and 7.1% to GDP.

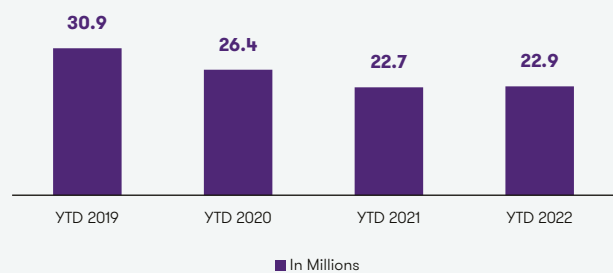
Driving India's economy and ecology

Original equipment manufacturers (OEMs) within the automotive sector emerge as significant catalysts for India's economic progress. The automotive manufacturing domain constitutes a remarkable 49% share of the country's manufacturing gross domestic product (GDP), contributing 7.5% to the overall GDP and fostering 32 million employment opportunities¹⁰. This status positions it as a cornerstone of the economy.

On the global scale, India is the fourth-largest automotive market, with a penetration rate of 33 automobiles for every 1,000 individuals. At the same time, the country is the third-largest emitter of GHGs, after China and the US. This carbon footprint, predominantly from road transportation, manifests as 90% of the total CO2 emissions.

In response to this ecological challenge, India, as a rapidly emerging country, has embarked on a trajectory towards constructing a resilient and low-carbon economy. A pivotal means to realise this ambition is vigorously promoting and

National Auto Production



Source: National Auto Production¹¹

adopting electric vehicles (EVs). Through this green revolution, the automotive industry finds itself in a momentous role as a vital contributor to India's overarching goal of attaining carbon neutrality or net zero emissions by 2070.

Therefore, with its OEMs and dynamic evolution, the automotive landscape is a driving force in the national economy and an instrumental player in steering India's path towards sustainable environmental practices.

9. <https://www.investindia.gov.in/sector/automobile>

10. <https://www.capgemini.com/in-en/insights/expert-perspectives/sustainability-in-automotive-industry-an-india-perspective/>

11. <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2023/feb/doc2023217160601.pdf>



Regulations shaping sustainability

India ranks as the third-largest contributor to global GHG emissions. Achieving net zero entails avoiding the addition of further GHG to the atmosphere. Part of this effort involves reducing one billion tonnes of projected carbon emissions by 2030.

In April 2020, the automotive sector, particularly passenger vehicles, underwent significant changes with the enforcement of stringent BS6 norms. This led to car manufacturers shifting away from diesel engines, and opting for petrol or CNG, or exploring electric options. In 2023, the industry has started gearing up for the next phase of BS6 emission norms, referred to as BS6 2.0. Few vehicles conforming to BS6 2.0 are already in the market.

BS6-compliant vehicles must run on engines emitting low NOx and particulate matter, meeting prescribed limits through Lean NOx Trap or selective catalytic reduction (SCR). This ensures clean fuel combustion with reduced pollutants. BS6 2.0 will impose even strict emission standards, demanding compliance in real-world conditions and laboratory tests. To achieve this, engines will require upgrades and onboard self-diagnostic devices to monitor driving behaviour and traffic conditions.

Achieving BS6 Stage 2 compliance for diesel engines involves high-capacity engines adhering to SCR using AdBlue as a catalyst. This upgrade is costly for carmakers with small engines, leading some brands to discontinue diesel-powered budget vehicles. In the future, expect carmakers to introduce new BS6 2.0 models or retire some from their line-up.

Panchamrit

The core areas, represented as “nectar elements” or ‘Panchamrit,’ outlining India’s climate initiatives during the 26th session of the Conference of Parties (COP26) to the United Nations Framework Convention on Climate Change (UNFCCC), encompass:

01

Attaining 500 GW non-fossil fuel energy capacity by 2030

02

Aiming for 50% of India’s energy demand to be fulfilled by renewables by 2030

03

Curbing total anticipated carbon emissions by one billion tonnes between 2022 and 2030

04

Decreasing the economy’s carbon intensity by 45% by 2030 compared to 2005

05

Striving to achieve the goal of net zero emissions by 2070



04

Consumer behaviour trends and results



The rate of the global shift to electric vehicles varies notably among different markets. Except for China, hybrid technology is more popular than full-battery electric vehicles (BEVs). The prevailing trend in consumer preference for EVs is primarily rooted in the perception of significant reductions in vehicle operating costs rather than being driven primarily by climate change concerns.

The analysis¹² by Grant Thornton Bharat aims to focus on consumer sentiments and factors influencing purchasing decisions, along with their willingness to transition to the new dynamics presented by the industry. We conducted a survey to evaluate this.

The pandemic-induced changes have reshaped the vehicle demand and supply dynamics in the past two years. Survey findings reveal a significant trend within the passenger vehicles sector — consumers' growing inclination towards hybrid and EVs, indicate a shift towards more sustainable and efficient transportation options.

In the near future, it is expected that there will be an increased acceleration towards e-mobility, driven by introduction of new electric and hybrid vehicle models. Survey results analyse this shift, with 31% of respondents expressing a preference for EVs and 39% for hybrid models. Remarkably, the preference for electric cars has witnessed a substantial 46% increase, while the inclination towards hybrid cars has surged by an impressive 62%. These statistics emphasise the evolving consumer mindset, with a significant proportion favouring environment friendly and technologically advanced transportation options.



12. <https://www.granthornton.in/globalassets/1.-member-firms/india/assets/pdfs/auto-festive-survey-report.pdf>



05

Financial implications



International economy

The global automotive finance market is predicted¹³ to expand to USD 385.42 billion by 2028 from USD 245.62 billion in 2021, with a 6.5% CAGR during the forecast period. Despite the sector's worth of USD 248.10 billion in 2020, a considerable decline of 6.45% occurred due to the pandemic. Globally, the pandemic's negative impact led to reduction in demand. However, the sudden surge in CAGR reflects the projected post-pandemic recovery and growth.

Shifting landscape in the pandemic

The automotive sector was significantly affected by the COVID-19 pandemic, particularly in 2020. According to OICA, the demand for new vehicles experienced a 3–4% decline and that for used cars dropped by 1–2% compared to 2019. However, sales began to recover after June 2020, when lockdowns eased in many countries. Some data shows a 3.2% rise in demand for new loans later in 2020 as compared to the same period in 2019.

Growth via online finance

Online loan services have significantly disrupted the industry by offering convenient mobile/web platforms for loan comparison and application. Rising vehicle costs drive demand for automotive finance. Developed countries showed saturation, while developing nations provided growth potential.

Electric vehicles

The automotive industry is transforming with the increasing global acceptance of EVs. Given the higher cost of EVs, the evolving landscape presents substantial prospects for the automotive finance sector. In 2019, EVs comprised 2% of total vehicle sales, projected to rise to 8% by 2028.

Indian context

NITI Aayog established the National Mission on Transformative Mobility and Battery Storage in March 2019. It aims to promote eco-friendly, interconnected, shared and comprehensive mobility endeavours in India through policy actions and strategies.

In a transformative move¹⁴, the FAME-II scheme was restructured, resulting in an increase in the adoption rate of electric two-wheelers from 3.5% to a remarkable 72% within eleven months. Simultaneously, a ground-breaking step was taken with developing the world's largest electric bus tender for 5,450 e-buses, leading to a substantial 18–24% price reduction during price discovery. NITI Aayog, in its pursuit of comprehensive electrification, launched the National E-Bus Programme, aiming for an aggregate demand of a staggering 50,000 e-buses, with almost 19,000 already at various deployment stages. This commitment to electric mobility inspired the State EV Accelerator Programme, prompting 33 states and Union Territories to formulate distinct EV policies. The Cabinet has approved the "PM-eBus Sewa" scheme¹⁵, aiming to enhance urban bus services with 10,000 e-buses through a PPP model. The scheme will promote e-mobility, which diminishes noise, air pollution and carbon emissions as well as bring in economies of scale for procurement of electric buses through aggregation. This scheme will support bus operations for 10 years.

13. <https://www.fortunebusinessinsights.com/>

14. https://www.niti.gov.in/sites/default/files/2023-02/Annual-Report-2022-2023-English_06022023_compressed.pdf

15. <https://pib.gov.in/PressReleaseframePage.aspx?PRID=1949430>



Amongst these advancements, the Accelerated e-Mobility Revolution for India's Transportation (E-AMRIT) was introduced, serving as a centralised repository of EV-related information, presented during COP 26. An emblem of sustainability efforts, the Shoonya -Zero Pollution Delivery Campaign united 140 industry partners, culminating in an impressive 70 million deliveries and 40 million rides, significantly reducing emissions.

COP 27: NITI Aayog's EV Initiatives

NITI Aayog, the UK, and the US initiated a ZEV Country Partnership at COP 27, offering targeted assistance to expedite India's ZEV adoption. India joined 45 other nations in launching Priority Actions for Road Transport Breakthrough for clean technologies against climate change. During side events, NITI Aayog, with the World Economic Forum, introduced an executive brief on financing India's electric two- and three-wheeler fleets.

Circular Economy Action Plan for Li-ion Batteries

NITI Aayog has formulated a Circular Economy Action Plan for Li-ion Batteries, addressing all battery lifecycle stages from creation to recycling.

Sustainable freight solutions

NITI Aayog, in partnership with ICLEI-Local Governments for Sustainability, South Asia, aims to strengthen initiatives for promoting low-carbon urban freight. Initially assisting Kochi, Shimla, and Panaji, the project's Phase-II expansion includes Gangtok, Imphal, and Ranchi.

e-FAST India: Transforming freight transport with electric solutions

In collaboration with World Resources Institute (WRI) India and with the support of World Economic Forum (WEF), CALSTART and RMI India, NITI Aayog unveiled a platform that brings together stakeholders in the freight sector. The platform aims to foster collaborations, advance supply and demand dynamics, and promote innovative solutions for electrified freight transport. This, the country's inaugural national electric freight platform, is called the Electric Freight Accelerator for Sustainable Transport - India (e-FAST India).

Driving innovation in hydrogen economy

NITI Aayog is actively managing the hydrogen economy initiative, convening brainstorming sessions led by the Vice Chairman. Leading industries presented insights on the hydrogen economy on 22 April 2021, shaping the collaborative framework developed by the SGT Vertical and Atal Innovation Mission to empower stakeholders and innovators.



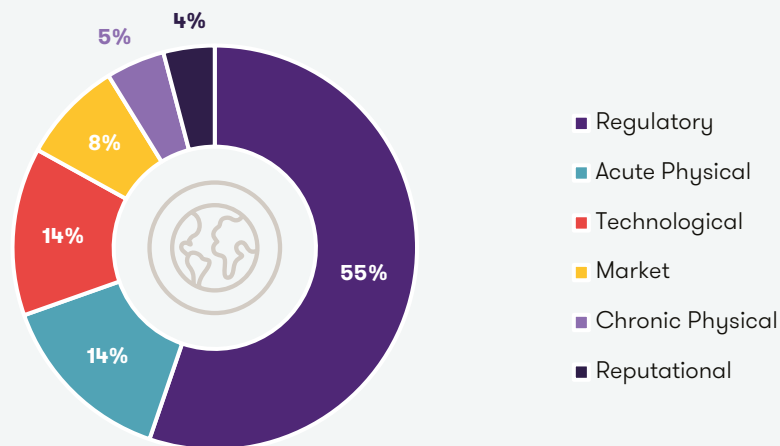
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Climate change induced risks and opportunities



The impact of climate-related risks and opportunities on an industry’s operations is seldom direct and obvious. Therefore, identifying material issues is challenging. The automotive industry is at the crossroad of emissions from manufacturing and use of automobiles makes a difficult path to traverse. A robust climate-related risk assessment process helps identify the likelihood and magnitude of present and future climate-related impacts on the environment and business performance. India is ranked among the top-10 most climate-vulnerable countries according to the Global Climate Risk Index 2021 by German Watch¹⁶. When seen globally from the lens of the automotive industry, it is projected that the total risk from climate change is approximately USD 400 billion.

Automotive industry exposure to climate change risk as a percentage of financial impact.



Source: GT Analysis

Regulatory actions around climate change are continuously evolving. The objectives of regulatory changes are broadly classified into two categories, i.e., action that attempts to limit the adverse effects of climate change or regulatory actions that promotes adaptation to climate change. Some examples include implementing carbon-pricing mechanisms to reduce GHG emissions, shifting energy use towards lower emission sources, adopting energy-efficiency solutions, encouraging more extraordinary water efficiency measures and promoting more sustainable land-use practices. Leading automotive companies are raising concerns about risks posed by climate change issues. The foremost among these are regulatory risks, which arise primarily because of emission taxation, carbon-pricing mechanism, and carbon taxes etc. In the Indian context, the likely introduction of new emission norms [BS VI CAFE 2.0] for automobiles will call for additional interventions by OEMs and prices of both petrol and diesel vehicles are set to fluctuate. The Indian automotive industry is witnessing a transition towards more robust, stringent, but environmentally impactful regarding curbing tailpipe emissions.

16. https://germanwatch.org/sites/default/files/Global%20Climate%20Risk%20Index%202021_2.pdf



An equal weightage of risk is considered for acute physical and technological risk. Acute physical risks generally impact manufacturing sites and facilities, which are event-driven (acute) in climate patterns. These have financial implications for organisations, such as direct damage to assets and indirect impacts from supply chain disruption. Water availability, sourcing and quality may also affect organisations' financial performance, and extreme temperature changes affect organisations' premises, operations, supply chain, and employee safety.

Technological risks, especially the adoption of new technologies such as battery swapping, the adoption of fuel cell, or the use of alternative fuel in automobiles, still presents a challenge not only from a consumer viewpoint but also from an advancement in the technology adoption in the hot and humid climate regime for a country for example, India.

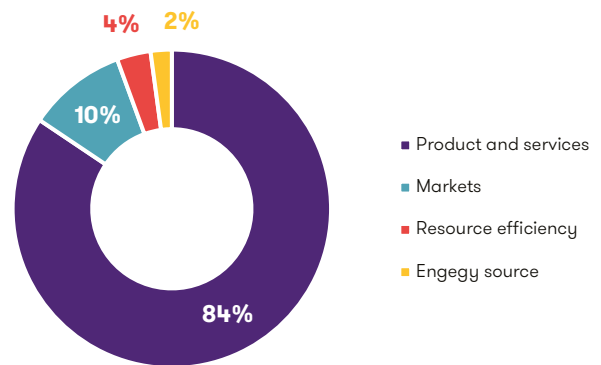
Innovation in the automobile industry has led to a wide array of technology available to manufacturers to achieve CO2 emissions, fuel economy and performance goals. Several manufacturer-specific technologies emphasise the reduction of CO2 emissions and increased fuel economy. Many manufacturers have adopted several technologies to enhance engine efficiency and thus reduce tailpipe emissions. Each manufacturer is choosing technologies that best meet design requirements of their vehicles, and in many cases, that technology is changing quickly. Engine technologies such as turbocharged engines (Turbo) and gasoline direct injection (GDI) allow for more efficient engine design and operation. Cylinder deactivation (CD) allows only a portion of the engine when less power is needed, while stop/start systems can turn off the engine entirely when idle to save fuel. Hybrid vehicles use a larger battery to recapture braking energy and provide power when necessary, allowing for a small, more efficiently operated engine. The hybrid category includes "full" hybrid systems that can temporarily power the vehicle without engaging the engine and small "mild" hybrid systems that cannot propel the vehicle independently. Transmissions with more gear ratios, or speeds, allow the engine to operate near peak efficiency more frequently.

Rising anthropogenic carbon levels in the environment not only pose risks but also present opportunities to battle the impacts of climate change and, in the process, create stimulus in the market for robust and clean technologies for disruption. In the automotive industry, the emergence of the use of low-emission vehicles is creating opportunities for companies across the value chain. Some opportunities include manufacturing of EV batteries and fuel cells; raw material sourcing to make these batteries and fuel cells; building, operating, and maintaining the charging infrastructure of these EVs and refuelling fuel cells; and creating new age technology to help integrate the new

vehicle infrastructure with the existing power grid. The net-zero scenario could also give rise to e-hailing and micro-mobility services (e-bikes and e-scooters). A study based on Network for Greening the Financial System (NGFS) Net Zero 2050 scenario reflects that close to USD 3.4 trillion are likely to be spent on low-emission vehicles, their charging and fuelling infrastructure and upstream production of electricity and hydrogen¹⁷.

Adoption-Electrification-Acceleration: The opportunity cycle for the automotive industry can be trifurcated with the adoption, electrification, and acceleration of new, clean, and more efficient vehicle freights. The cause-to-impact ratio study of these three phases of the opportunity cycle suggests that a more significant push is required for the adoption and electrification phase, whereas the acceleration phase would follow the former phases. In line with the Task Force on Climate-Related Financial Disclosures (TCFD), five categories of opportunities arise because of climate change issues — products and services, markets, resource efficiency, energy source, and resilience. An analysis of the significant opportunities identified outlines that most opportunity creation for the automotive industry is likely to be done in the products and services category, which will fall in the adoption phase of the opportunity cycle.

Opportunity: Automotive industry opportunity creation potential as a percentage of financial impact



Source: GT Analysis

17. <https://www.mckinsey.com/capabilities/sustainability/our-insights/spotting-green-business-opportunities-in-a-surging-net-zero-world/transition-to-net-zero/road-mobility>



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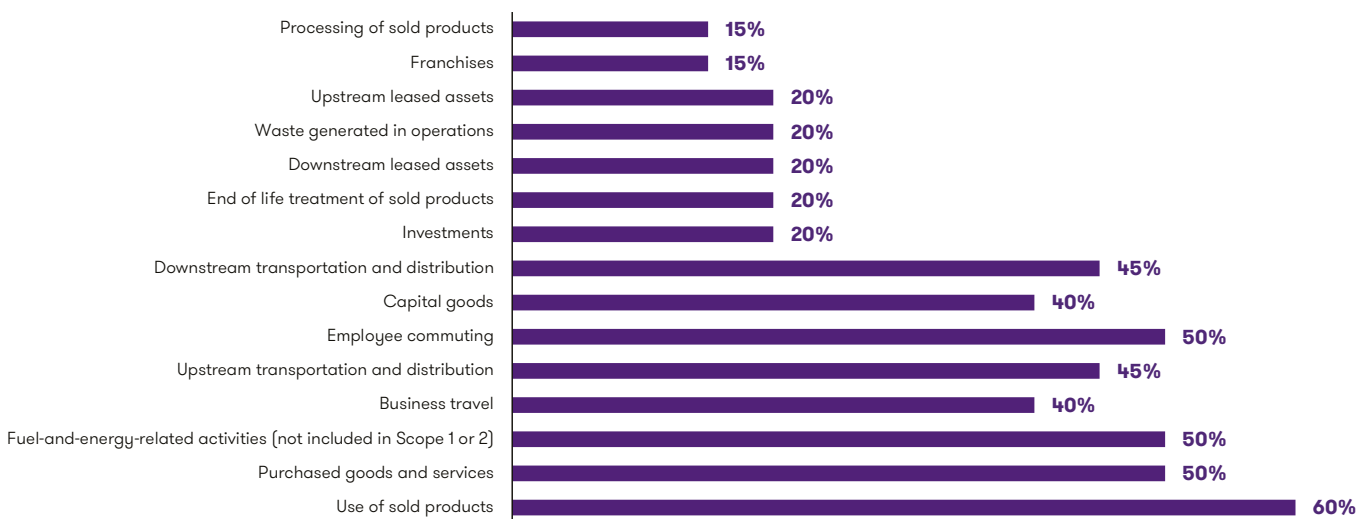
Emissions in the automotive industry



According to IEA, there was a rebound in passenger and cargo transport activities in 2022 after the COVID-19 pandemic led to a 3% increase in overall transport-related CO₂ emissions as compared to last year¹⁸. Traditionally, transport emissions have grown at an annual average rate of 1.7% from 1990 to 2022. The clean energy progress report 2023 suggests that the transport sector is not on track towards the NZE scenario by 2050. The modelled requirement is to reduce the emission by around 25% by 2030 for the transport sector to be in line with the NZE 2050 scenario¹⁹. Most of the emissions from the transport are tailpipe emissions as compared to the freight's manufacturing emissions. As discussed above, tailpipe emissions can be reduced through the opportunity cycle of adoption, electrification and acceleration of clean, lean and robust technologies in the automobile sector.

Scope 3 emissions, as defined by the Greenhouse Gas (GHG) protocol, are the result of activities from assets not owned or controlled by the reporting organisation but that the organisation indirectly affects in its value chain. Tailpipe emissions are categorised under Scope 3 emission under the use of sold products categories. The graph below outlines the relevance and importance of all 15 categories of Scope 3 emissions for automotive companies. The most important and relevant categories for any automotive industry are the use of sold products (which comprise the tailpipe emissions), followed by purchased goods and services and fuel- and energy-related activities. The scale of emissions from these categories is path-defining for the automotive industry in transitioning to net zero. To achieve this, automotive manufacturers are moving towards electric and clean freight manufacturing and exploring alternative fuels or fuels of the future for next-generation mobility.

Relevancy Scale of Scope 3 categories for the Automotive Industry



Source: GT Analysis

18. <https://www.iea.org/energy-system/transport>

19. <https://www.iea.org/reports/tracking-clean-energy-progress-2023>



From an Indian context, historically, the railways and two-wheelers have dominated India's passenger demand, but this may not be the case in the future. Numerous studies and the growth potential of the country signify that with rising income levels, four-wheelers will drive passenger service demand in future. The share of four-wheelers in motorised passenger service is expected to increase five folds, mainly driven by the desire to own a personal four-wheeler with growing income levels and on-demand mobility services.²⁰ This significant growth of four-wheelers is expected to come at the cost of reduced usage of other modes, e.g., two-wheelers and public transport. The share of public transport, mainly railways and buses, is expected to decline, which will significantly impact the Indian automotive industry from an energy and emission point of view. This also is also likely to increase congestion and infrastructure requirements. The passenger vehicle segment is set on a disruptive mode, especially with an increased uptake of electric vehicles. However, the upfront cost incurred in e-vehicles has created a bottleneck that deaccelerated the momentum. Some indicators that can be used in assessing the efficiency of the automotive industry, especially in a country like India, can be defined as:

- The ratio of Scope 3 emissions to the sum of Scope 1 and 2 emissions.
- The ratio of electric penetration in the transport sector to the total fuel consumption.
- The share of public transport with rising GDP per capita for the country.

The metrics mentioned above will help quantify the automotive industry's decarbonisation rate from a manufacturing and a use-case scenario perspective. The three metrics track the energy penetration, emission intensity and economic prosperity of the society and development scenarios.

Levers for emission reduction

Companies in the automotive industry can use and implement strategies mentioned below to accelerate the emission reduction from different sources and nodes of operations. These are:

Carbon pricing: It is an approach to reduce greenhouse gas (GHG) emissions by using market mechanisms to pass the cost of emissions onto emitters, usually by pricing the carbon dioxide equivalent (CO₂e) emitted. A carbon price works as an economic signal to polluters, and based on economic incentives, allows them to decide to either transform their activities, operate more sustainably and lower their emissions, or continue emitting and paying for them.

There are two forms of carbon pricing — external and internal. External carbon pricing usually consists of:

- **The Emissions Trading Scheme (ETS):** ETS caps the total level of emissions pertaining to GHG. It allows those industries with low emissions to sell their extra allowances

to more significant emitters. This way, it acts like a cap-and-trade system.

- **Carbon taxes:** CO₂ emissions can also be priced implicitly by Government policies encouraging emissions reductions, such as energy efficiency standards and renewable energy subsidies. This sets a price directly on carbon by defining a tax rate on GHG emissions or, more commonly, on the carbon content of fossil fuels. For example, India's excise duty on petrol and diesel is an implicit carbon tax.

Companies can voluntarily set an internal carbon price (ICP) to value the cost of a unit of CO₂ emission. This price varies depending upon the trade regions and objectives of individual companies. ICP is a strategic planning tool that, when implemented correctly, can help organisations in the transition to a low-carbon economy, as the fees collected can have a tangible impact on business operations and related decision making. Corporations have been using ICP as a strategic planning tool to manage climate-related business risks and prepare for the transition to a low-carbon economy. CDP (formerly Carbon Disclosure Project) showcased in their 2022 data that approximately 100 companies from the automotive sector have an internal carbon pricing, and another 150 companies intend to put a price on carbon in the next two years. By 2025, there will be close to 250 automotive companies that will be pricing carbon emitted from their operations and value chain.

Science-based targets to reduce emissions: The science-based targets initiative (SBTi) is a global body enabling businesses to set ambitious emissions reduction targets in line with the latest climate science. It is focused on accelerating companies and financial institutions worldwide to halve emissions before 2030 and achieve net-zero emissions before 2050. The initiative is a collaboration between CDP, the United Nations Global Compact (UNGC), World Resources Institute (WRI) and the World Wide Fund for Nature (WWF) and is one of the "We mean business coalition" commitments. The initiative champions science-based target setting to boost competitive advantage of companies and financial institutions in transitioning to a low-carbon economy.

Globally, approximately 480 companies from the automotive sector are committed to reducing their emissions by aligning or intending to align their business with the latest science of limiting warming to 1.5°C in line with the Paris Agreement. Out of the total 480 companies committed to the emission reduction initiative, 245 companies have already got their targets approved from the SBTi and are in line to align to decouple their businesses from the emissions²². From an Indian context, a total of 22 companies from the automotive sector are under this initiative, which is less than 10% of the total global companies under the initiative. Looking at the significant potential of companies in India striving to reduce their emission, it is highly likely that there is an upsurge in participation of Indian companies in these global initiatives.

20. Kamboj, Puneet, Ankur Malyan, Harsimran Kaur, Himani Jain and Vaibhav Chaturvedi. 2022. India Transport Energy Outlook. New Delhi: Council on Energy, Environment and Water

21. <https://www.carbonpricingleadership.org/what>

22. <https://sciencebasedtargets.org/companies-taking-action>



08

Sustainability framework for the automotive industry



To assess and accelerate progress in sustainability, automotive companies should have a robust framework that can help decouple emissions from business growth. One such framework can be explored as follows:



Integrate vision

Long-term ambition on sustainable action, defined and declared strategy, goals and assessment of climate change-induced risks and opportunities



Implement engagement

Multi-stakeholder partnership within and outside the automotive value chain on adapting and mitigating environmental impacts



Instil governance

Top-level definition of how sustainability is managed, including specific responsibilities of executives at different levels of the organisation



Iterative transformation

Operational activities involving other value chain partners and support transitioning towards low emission intensive business.

A broader sustainability best practice module for the automotive industry, in accordance with the above framework, can be explored below:

Demonstrate progress through disclosure

The first and most important aspect of sustainability is demonstrating and tracking progress through disclosures. With the reporting and disclosure landscape evolving at an increased pace both from the regulatory and voluntary point, it becomes essential for automotive entities to communicate their progress against key sustainability measures to their stakeholders. With the advent of regulatory requirements such as the Corporate Sustainability Reporting Directive (CSRD) in the European Union and Business Responsibility and Sustainability Reporting (BRSR) in India, governments and regulators are primarily interested in putting non-financial disclosure in the mainstream. These disclosures not only help in a transparent communication of sustainability initiatives but also promotes peer-to-peer learning of best practices both regionally and globally.



Sustainability as the organisation's mission

Automotive players create focus departments on sustainability by including distinct expertise with a unique set of requirements, promoting sustainability in existing processes and constantly looking for change and innovation. Organisations should consider creating separate departments for different initiatives for a more extended vision.

Governance and accountability

Traditionally, the automotive industry has adopted a two-pronged strategy of cost savings and efficiency improvements as primary drivers of sustainability. However, there should be a long-term broad vision, which defines a purpose and sets accountability in the entire organisation. Sustainability should be considered driving commitments to the organisation's moral and ethical values. Organisations should imbibe sustainability in their culture, promote employee awareness, and advocate sustainability to the external world. Sustainability not only serves as accountability towards investors, customers, employees, and society but also helps attract new talents and retain the existing workforce.

Imbibing sustainability in the entire value chain

By collaborating with different partners in the value chain, focusing more on customer needs and requirements through engagements and taking advantage of the current digitalisation could assist in lowering total cost and improving efficiencies.

Technology-enabled sustainability solutions

Leading organisations must introduce technologies to promote sustainability and employee welfare. Automotive companies are already realising significant benefits from additive manufacturing or 3D printing technologies, which help in reducing waste. They can also learn from other sectors to implement energy-efficient solutions using AI. For example, Google uses AI to monitor the cooling of its data centres to reduce emissions and energy consumption.

Collaborative approach towards more significant impact

The operations of the automotive industry are intricately linked across geographies. As a result, critical initiatives, such as the circular economy and developments in EVs, will not come to fruition without the active participation of all players. Collaboration will be key. For example, BMW, Scania, Volvo, and Volkswagen were lead partners in promoting a harmonised approach to driving sustainability in automotive procurement processes. It created a self-assessment questionnaire for suppliers for parts procurement. This questionnaire is now increasingly becoming the standard for the automotive industry.²³ Similarly, deploying material or component-related innovations in isolation (such as using biodegradable materials or recycled components) will only gain traction if value chain partners are on board.

Government incentive programmes

The programmes are meant to encourage Indian OEMs to focus more intently on their sustainability goals, both on the manufacturing and product use front. For example, the Government of India has announced a USD 3.5 billion incentive programme to increase EV production in India. Around 8–18% of EVs and components' total sales value will be allocated as incentives.



23. "10 of the biggest world automakers partner to launch 'DRIVE Sustainability,'" Drive Sustainability, March 2017



09

Challenges faced by the automotive industry in the sustainability journey



Lack of awareness on linking sustainability with business case

Often, sustainability does not seem to make up a business case. However, with emerging times, large multinationals and mid-sized companies are increasingly taking a long-term view toward managing environmental and social risks. It is established that by addressing environmental and social issues, they can achieve better growth and cost savings, improve their brand and reputation, strengthen stakeholder relations, and boost their bottom line. Strategic integration of sustainability prepares companies to anticipate and understand long-term trends and the effect of resource use and address stakeholder expectations.

Lack of clear sustainability strategy

Sustainability is a dynamic concept and evolving at a significant pace. Companies often need help to have a clear sustainability strategy on what and how to proceed as a next step. There needs to be clear guidelines on potential next steps in terms of decarbonisation. But with the advent of new technologies and initiatives, it is likely to have a clear view on the sustainability journey ahead.

Difficulty in measuring and reporting sustainability matrix

With several reporting standards on the horizon, it becomes difficult for companies to decide and communicate their results too. However, as mentioned above, with more regulatory aspect emerging in recent times on reporting and disclosure, it would be a more transparent and robust reporting framework across all the hierarchies of companies in the sector.

Lack of relevant talent/skills

With the advent of sustainability and increased emphasis on reimagining the business models with ingrained sustainability, it becomes more challenging for companies to identify relevant skills and talents in the team. With a lot of institutional and academic collaboration with the industry, the sector and industry are bound to attract the right skill and expertise, thus leading to a larger talent pool to serve the notions of sustainability.



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