FICCI

Crisil Intelligence

Towards safer future: Redefining India's road safety landscape

Final report

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Crisil
Intelligence

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Foreword-FICCI



Mr Ramashankar Pandey

Chairman, FICCI Sub-Committee on Road Safety

Social Defence Fellow of Indian Administrative Fellowship

Ministry of Social Justice & Empowerment, Government of India

"It is my honour to present the FICCI–CRISIL Knowledge Report *"Towards Safer Future: Redefining India's Road Safety Landscape"*, unveiled at the **7th Edition of FICCI Road Safety Awards & Symposium 2025**.

India's economic landscape stands at a crucial juncture of growth. As we rapidly expand our infrastructure, it is imperative that our progress is not measured by kilometres of highways built alone, but by the **safety of those who travel on them**. The recently released accident report by MORTH for 2023 is a sobering reminder of the urgency. In one year alone, our nation recorded **4,80,583 accidents, 1,72,890 deaths, and 4,62,825 injuries**, which means **20 lives are lost every hour on Indian roads**. Despite accounting for just 5% of the road length, **national and state highways claim nearly 60% of fatalities**. Two-wheeler riders and pedestrians remain the most vulnerable.The burden is borne disproportionately by the young and working-age population—**66% of victims are between 18–45 years**. This is not only a human tragedy but a socioeconomic crisis, robbing families of breadwinners and undermining national productivity. Globally, road crashes claim **1.35 million lives each year**, with **93% of these in low- and middle-income countries like India**. Clearly, the challenge is both national and global in scale, but also preventable with collective will and systemic action.

This Knowledge Report seeks to **decode road risk patterns** and chart pathways for systemic reforms, spanning **safer road designs, stronger compliance, advanced vehicle technologies, effective enforcement, emergency care, and widespread awareness**. It emphasises that road safety is not the responsibility of one institution but a **shared mission**. Policymakers must strengthen frameworks and enforcement; the private sector must embed safety into vehicles and logistics operations; civil society organisations must act as catalysts for awareness and victim support; and every individual road-user must commit to safe behaviour.

At FICCI, we believe road safety is a **moral, social, and economic imperative**. Road Safety has to happen on Roads and Charity begins at home. In the spirit of **#BeTheChange**, (**#JabHumBadlengeTohDeshBadlega)**, Indian **corporates are working to set an example** by not only introducing Road Safety code of Conduct among employees, mentioning in their HR Policy Books, but they are drafting supplier agreements incorporating those codes and moving from Awareness to Commitment, by Monitoring and rewarding safe practices, leveraging various technologies of **Alert & Assist.** This report, developed with **CRISIL**, is intended not just as a study but as a **call to action**, aligned with India's commitment under the UN Decade of Action, the Stockholm Declaration & Marrakech Declaration during fourth Ministerial Conference on Road Safety to reduce road fatalities by 50% before 2030. The Marrakech Declaration (2025) recognised road safety as vital to achieving the SDGs & called for people-centred mobility systems that are safe, accessible, and sustainable. India's alignment with these global goals is crucial to advancing the Decade of Action on Road Safety.

I hope you will find this report insightful and useful. We welcome your suggestions, partnerships, and collective resolve to build a safer, more humane India where every journey is not only efficient, but above all, safe."



Mr Durgadutt Nedungadi

Co-Chair, FICCI Sub-Committee on Road Safety &

Senior Vice President (International Business), Netradyne Technologies

"I am pleased to present the **FICCI-CRISIL** Knowledge Report on ***'Towards Safer Future: Redefining India's Road Safety Landscape***', launched at the **7th Edition of the FICCI Road Safety Awards & Symposium 2025**, organised by the Federation of Indian Chambers of Commerce and Industry.

India's expanding road network reflects our economic ambitions and infrastructural progress. However, this growth is marred by a persistent and alarming road safety crisis. In 2023, over 173,000 lives were lost to road accidents, many of them young individuals in their most productive years, whose untimely deaths have profound impacts on families, communities, and the nation's socio-economic fabric.

Vulnerable road users such as pedestrians, two-wheeler riders, and cyclists continue to bear a disproportionate share of these fatalities, often due to gaps in infrastructure, enforcement, public awareness, and the insufficient adoption of best practices, advanced technologies, and safety systems. These tragic losses are not merely statistics; they reveal a systemic challenge that calls for urgent, coordinated, and sustained action across all sectors

This report sheds light on critical risk factors and proposes solutions spanning road design, enforcement, education, and infrastructure. Achieving road safety requires coordinated efforts among government, industry, and civil society. It is important to recognize that technology and innovation play a central role in reducing accidents. AI-powered camera systems monitor driver behaviour, including speeding, distracted driving, fatigue and drowsiness in real time, providing instant alerts to prevent crashes. Technology can also go a long way in improving driver engagement and improving overall driver behaviour. Embedding innovation at the core of our road safety efforts is essential to building safer roads for everyone.

We hope this report serves not only as a source of insight but as a blueprint for coordinated action. With in-depth analysis on stakeholder roles, emerging technologies, and a practical framework for road safety interventions, it aims to guide meaningful change across sectors. Together, let us turn these recommendations into results and build a future where every road is safer, every journey more secure.

Your feedback and insights are most welcome."



Mr Rajesh Poddar

Co-Chair, FICCI Sub-Committee on Road Safety &

CEO, Paracoat Products Ltd

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It is my honour to present the FICCI–CRISIL Knowledge Report *"Towards Safer Future: Redefining India's Road Safety Landscape"*, unveiled at the **7th Edition of FICCI Road Safety Awards & Symposium 2025**.

India continues to grapple with one of the most pressing public health and development challenges of our time—road safety. With more than 1.4 lakh lives lost annually to road accidents, the urgency of the situation cannot be overstated. Behind each statistic lies a family, a community, and a future cut short. The challenge before us demands a holistic approach that goes beyond expanding infrastructure. It requires the integration of innovative safety solutions, stronger enforcement of regulations, and above all, the creation of a culture of responsibility and awareness among every road user.

Children, in particular, need focused protection. Simple yet effective measures, such as high-visibility blinkers, well-designed helmets, and certified safety harnesses for two-wheelers, can directly reduce their vulnerability. By addressing the proven risks of low visibility and lack of restraint, we can make meaningful progress in saving young lives.

Road safety, however, cannot rest on the shoulders of any single stakeholder. Governments, private industry leaders, NGOs, and civil society must act together. Only through the adoption of global best practices, investment in proven technologies, and impactful awareness campaigns can we move toward safer mobility for all.

This Knowledge Report is a call to collective action. It urges us to place the highest priority on developing safe products, promoting responsible practices, and building a culture of safety that safeguards our most precious resource—our people. Together, through commitment and collaboration, we can aspire to a future where every journey is secure, and every life is valued.

I hope you find this report both insightful and thought-provoking, and I warmly welcome your feedback.

"

Message from Crisil



Hemal N Thakkar

Senior Practice Leader & Director,

Transport, Logistics and Mobility

Crisil Intelligence

"

Over the past several years, road accidents in India have claimed over 450 lives daily on an average. Thus, causing a profound socioeconomic impact on millions of lives, as road accidents not only claim lives and lead to serious injuries, but also push families especially those from the lower- and middle-income groups into poverty and financial distress.

Vulnerable road users such as pedestrians, cyclists and motorcyclists account for more than 60% of road accident fatalities, underlining the disproportionate burden on lower-income groups that often rely on non-motorised or affordable two-wheeler transport. Many families not only lose their primary breadwinners but are also forced into debt due to high medical costs, deepening the socioeconomic impact. However, most of the road accident fatalities can be prevented through a well-coordinated, system-based approach to road safety.

Addressing this complex issue requires a multi-pronged, collaborative approach, anchored in data, technology and policy reforms:

- *States must adopt advanced, data-driven road safety action plans, tailored to meet their unique challenges*
- *Speed limits must be enforced through intelligent speed control systems and AI-based traffic monitoring*
- *Driver training and licensing mechanisms, especially for commercial drivers, must be improved using modern simulation and skill-assessment technologies*
- *Rural roads and highways often neglected in safety interventions, must be brought under the ambit of strict design and safety audits*
- *The role of golden-hour response, including the availability of emergency medical services, trauma centres and efficient post-crash care, cannot be overstated*
- *Public awareness and behaviour change campaigns, backed by behavioural insights and targeted at high-risk groups, must be scaled up*

Road safety is one of the most pressing public health and safety challenges of our time. Each life lost on India's roads is an irreplaceable human tragedy, with consequences rippling through families, communities and the economy. Yet, what is equally true is that most of these tragedies are preventable. With the right mix of data-driven policies, smarter infrastructure, deployment of technologies and collective action, India has the potential to change this trajectory.

At Crisil, we view road safety not only as a transport or infrastructure concern, but also as a critical economic and social issue. In collaboration with FICCI, this report brings together insights and actionable solutions designed to empower policymakers, the industry and the civil society to work towards the shared vision of reducing the number of road fatalities by 50% by 2030, honouring India's commitment to the UN under the Stockholm Declaration. We believe that safer roads are possible through sustained action, innovation and collaboration. Together, we can build a future where every journey in India is not just a movement from one place to another, but also a safe and secure passage for all.

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Executive summary

Roads are vital to India's economy and society, serving as critical enablers of connectivity, commerce and development. They facilitate the seamless movement of people, goods and services, linking cities with rural areas and integrating regional markets. A robust road network is not only essential for ensuring efficient supply chains and agricultural linkages, but also supports access to education, healthcare and employment opportunities. In a country with vast and diverse geography, roads remain the predominant mode of transport, driving tourism, trade and inclusive growth by connecting remote communities to the national mainstream.

Yet, this network also poses some serious safety challenges in the form of road fatalities. The alarming scale and intricate nature of this issue underscore the urgent need to prioritise road safety as a matter of public health, economic efficiency and social well-being. Each accident translates into a human tragedy, productivity losses and additional strain on the healthcare system. Addressing this requires a holistic approach, encompassing safer infrastructure design, stringent enforcement of traffic regulations, enhanced public awareness and adherence to vehicle safety standards. A comprehensive road safety framework can save lives, reduce economic losses and create a more resilient and sustainable transport ecosystem for the country. In 2023, 1.73 lakh fatalities and 4.62 lakh injuries were reported from 4.80 lakh road accidents in India *(Source: Ministry of Road Transport and Highways; MoRTH, 2023)*. This translates into an average of ~20 deaths every hour on Indian roads.

The causes of road accidents are complex and interlinked. Significant contributors include infrastructure gaps such as unsafe road design, inadequate signage and poor maintenance. National highways, although constituting just two per cent of the road network, accounted for 36.5% of the total road fatalities in 2023. The top five states of Tamil Nadu, Madhya Pradesh, Karnataka, Maharashtra and

Rajasthan accounted for more than 50% of all highway accidents, underscoring the need for state-specific strategies. Behavioural factors such as over-speeding (responsible for over 72% of fatalities), driver on wrong sides, not wearing helmets or seatbelts and drunk driving exacerbate the risks.

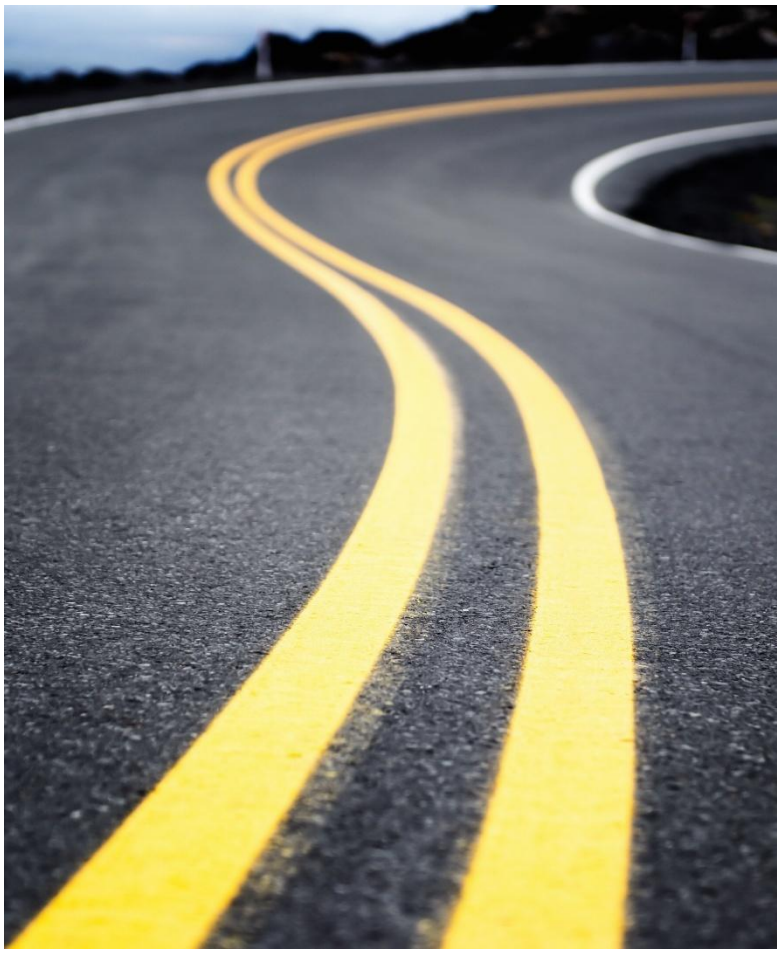
The central government, through the MoRTH, has been driving a comprehensive and progressive policy framework to strengthen road safety across the country. Landmark measures such as the Motor Vehicles (Amendment) Act, 2019, have introduced stricter penalties, ensured mandatory third-party insurance, and designed provisions for road safety funds, reinforcing accountability and citizen protection. It is imperative to note MoRTH's crucial role in the development and maintenance of national highways, incorporating advanced safety features like crash barriers, guardrails and rumble strips. Complementing these efforts, state governments are entrusted with on-ground implementation of these measures, including driver training, licensing, traffic enforcement and emergency trauma care. This, in turn, creates a strong, decentralised safety ecosystem.

A significant stride towards this direction is the Integrated Road Accident Database (iRAD), developed by National Informatics Centre (NIC) and implemented nationwide. It is a centralised digital platform facilitating real-time accident data collection and analysis. Rolled out across all the 36 states and union territories, it enables evidence-based intervention by integrating inputs from multiple stakeholders, supporting black spot identification, accident-prone-area improvement, streamlined claims processing and cashless treatment for victims. With iRAD, India is taking a major leap towards a data-driven, technology-enabled road safety ecosystem in India, fostering safer roads for all.

With respect to the automotive and transport sectors, vehicle manufacturers in India have been steadily incorporating/adopting Advanced Driver Assistance Systems (ADAS), airbags and pedestrian-protection features in compliance with the Bharat New Vehicle Safety Assessment Program (Bharat NCAP) standards. The logistics sector is similarly leveraging innovation, integrating fleet management systems, driver monitoring tools, and fatigue-detection technologies to minimise accidents involving commercial vehicles and improve operational efficiency.

Meanwhile, technology is emerging as a game-changer. The Intelligent Solutions for Road Safety through Technology and Engineering project (the iRASTE project), launched by the Central Road Research Institute in Nagpur and Telangana, integrates AI, sensors and real-time mobility analytics to prevent crashes. It has set an ambitious target of reducing accidents by 50% in Nagpur, with early results showing promising reductions in high-risk driving events. The project also helps authorities identify "grey spots" before they become black spots, enabling proactive infrastructure interventions.

Global experiences highlight that effective road safety management requires a combination of strong institutions, evidence-based policymaking and targeted intervention.



Tabel 1: Global best practices

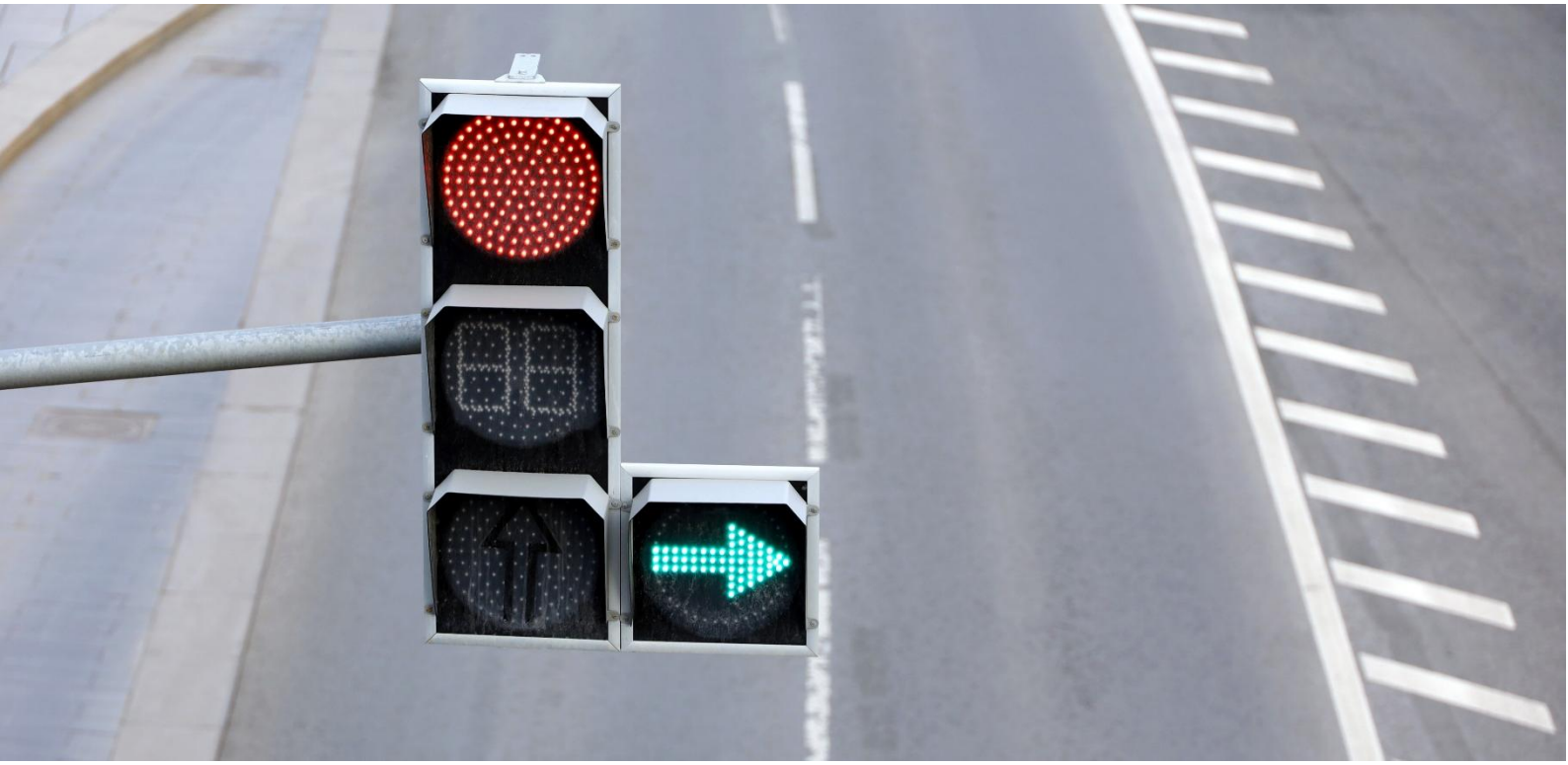
Country	Best Practice	Description
Thailand	Strict Enforcement of Helmet Laws & Public Awareness	Measurable progress through strict enforcement of helmet laws, coupled with

Country	Best Practice	Description
		public awareness campaigns
Brazil	Pedestrian-Friendly Infrastructure & Speed Management	Reduced urban fatalities through focus on pedestrian-friendly infrastructure and speed management
Sri Lanka & Bangladesh	Regional Collaboration, Knowledge-Sharing, & Community-Driven Initiatives	Importance of regional collaboration, knowledge-sharing, and community-driven initiatives to improve road safety

Source: Crisil Intelligence

Collectively, these examples reinforce that a blend of institutional frameworks, robust enforcement, infrastructure design, and community engagement is critical for advancing road safety outcomes.

For India, the path ahead calls for adoption of a more efficient, and data-driven, multi-stakeholder approach. Policymakers must strengthen enforcement and institutionalise evidence-based decision-making, while industry players should accelerate the deployment of advanced safety technologies. NGOs have a vital role to play in driving awareness and shaping safer road-user behaviour, and technology must be leveraged to create smarter vehicles and infrastructure. Only through sustained, collaborative action, can India meet its commitment under the UN Decade of Action for Road Safety (2021–2030) to reduce road traffic fatalities by 50% and save hundreds of thousands of lives annually.



Introduction

Overview of the current landscape of road accidents in India

Road safety in India presents a significant public health and economic issue, demanding urgent and comprehensive policy interventions. A detailed analysis of accident data reveals that the issue disproportionately affects the most vulnerable road-users. In 2023, two-wheeler riders emerged as the most impacted demographic, accounting for the highest proportion of both road accidents and fatalities. Nearly 45% of all road-accident fatalities involved two-wheeler riders, underscoring their acute exposure to risk. Similarly, pedestrians constituted about 20% of the total fatalities, a figure that highlights the importance of safe infrastructure and systemic protections for non-motorised users. *Source: Ministry of Road Transport and Highways; MoRTH, 2023*

India's road safety challenge stems from multiple interlinked but complex factors, however, it significantly presents opportunity for transformation. Gaps in road design, including lack of dedicated footpaths, safe crossings, and inclusive infrastructure often create inherently hazardous conditions for road users.

Furthermore, non-compliance with traffic regulations, coupled with limited enforcement capacity perpetuate a culture of high-risk behaviour, where over-speeding, distracted or drunken driving remain persistent concerns.

Addressing these challenges demands a paradigm shift from reactive traffic management to proactive, data-driven policy formulation. Targeted interventions are essential to protect vulnerable road-users. This includes upgrading the road infrastructure to be more inclusive of two-wheelers and pedestrians, implementing advanced traffic-management systems and enhancing public awareness campaigns. It is crucial to build a robust enforcement framework to ensure strict adherence to safety laws, thereby to fostering a culture of compliance, and ultimately to mitigate the devastating human and economic costs owing to road accidents.

The five-year (2019-2023) trend of road accidents in India reveals a deeply concerning pattern, underscoring the persistent and severe threat to public safety. Accident numbers remained alarmingly high in 2019, with fatalities exceeding 1.57 lakh each year. In 2020, the COVID-19 pandemic and nationwide lockdowns brought a drop, with the number of accidents falling

18.6%, fatalities 13% and injuries ~23%, compared with 2019.

However, this temporary decline was short-lived. By 2021, as restrictions eased, the number of road crashes surged again, accidents rose 10.8%, fatalities 11.3% and injuries 10.9%. The upward momentum intensified in 2022, with a further 11.9% rise in accidents, 9.4% rise in fatalities and a staggering 15.3% increase in the number of persons injured, compared with the previous year.

Statistics from the 2023 report are startling, with 4,80,583 accidents, 1,72,890 fatalities and 4,62,825 injuries, averaging to 1,316 accidents per day. These numbers are not mere statistics, but they represent shattered families, lost breadwinners and a growing economic and social burden.

The 4,80,583 road accidents and their composition reveal the sheer gravity of the issue. Fatal accidents, those in which at least one person dies within 30 days of the crash, accounted for 1,55,781 cases, making up 33.8% of all accidents. These crashes claimed 1,72,890lives (one-third of all reported incidents), underscoring the extreme severity of the situation.

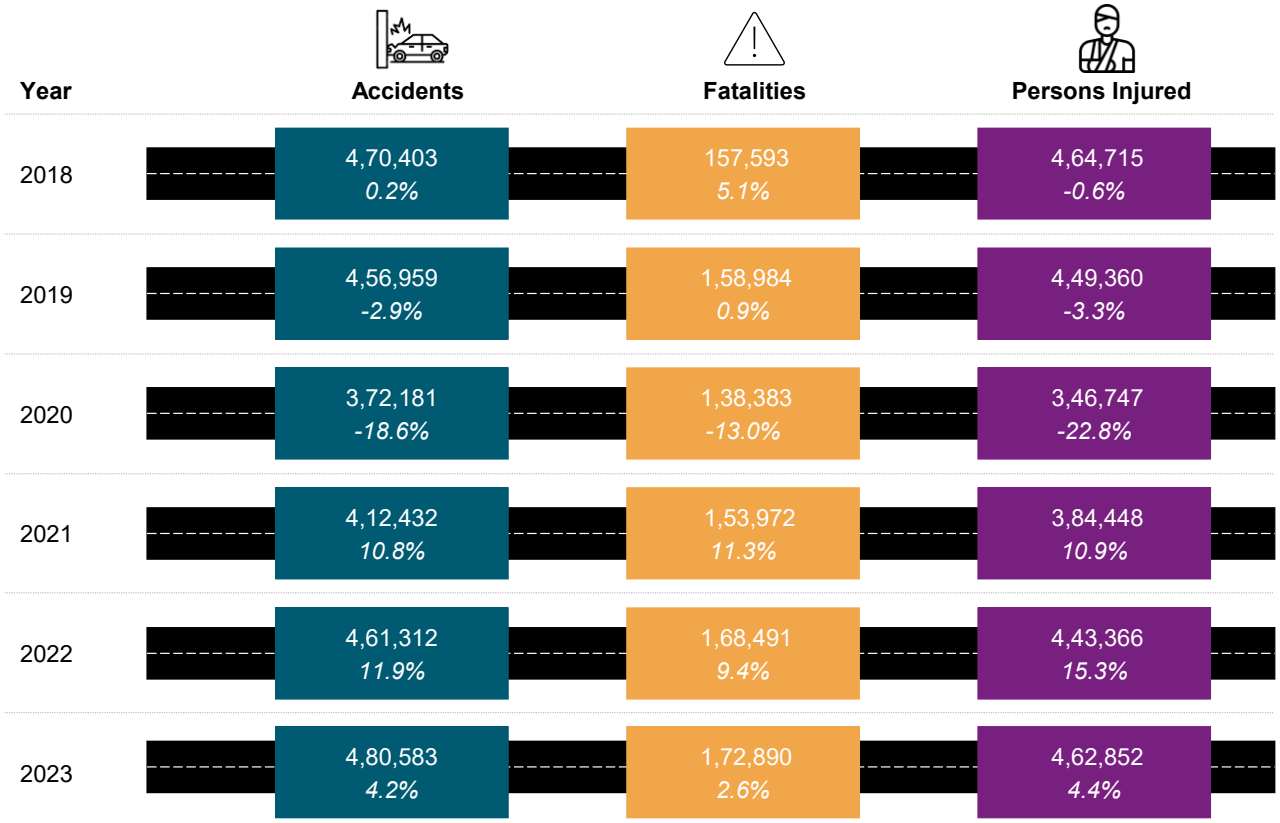
Most of the accidents (60.8%) were injury-causing, a category that includes both grievous and minor injuries. Grievous injury accidents (where the victims suffer long-term disability, fractures, and/or other severe harm) made up 31.1% of all accidents, while minor injury accidents (involving short-term or less severe harm) accounted for 29.3%. What is especially concerning is that fatal and grievous injury accidents together accounted for more than 65% of all road accidents in 2023, indicating that many crashes in India are not minor fender-benders, but high-impact, life-altering events.

The gender-wise age profile of fatal road accidents in 2022 and 2023 reveals that young and middle-aged adults remain the most vulnerable. In 2023, the 25-35 age group alone accounted for 25.7% of male and 21.4% of female fatalities, closely followed by the 35-45 age group (21.5% male and 20.8% female) and the 18-25 age group (20.6% male and 16.0% female). Together, these three age brackets represent nearly three-fourths of all road crash deaths, underscoring the fact that the most economically productive segment of the population is at the greatest risk.

Alarmingly, fatalities among minors (under 18 years) remained high in 2023, with 5.0% males and 8.2% females compared with 2022 pointing to increasing vulnerability of children and teenagers in road environments. Fatalities in the 60+ age group also rose significantly (7.7% males and 11.9% females), suggesting that senior citizens remain inadequately protected in India’s traffic ecosystem.



Figure 1: Total number of accidents, fatalities and persons injured during 2018-2023



% change over previous period

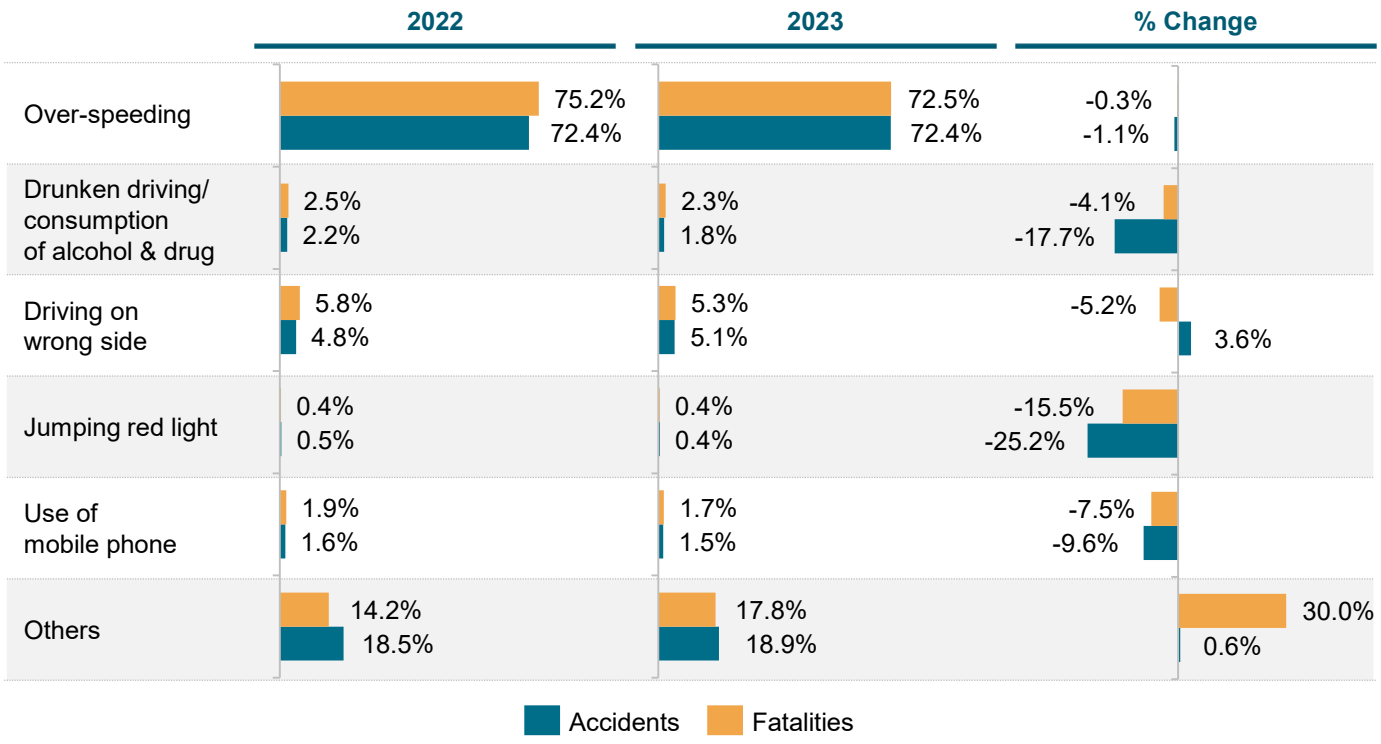
Source: Ministry of Road Transport and Highways – Road Accidents in India Report 2023, Crisil Intelligence

Decoding road risk patterns

Road accidents caused by violation of traffic rules

- Traffic-rule violations remain the single largest cause of road accidents in India, with 2023 data painting a stark picture. Over-speeding alone accounted for an overwhelming 68.4% of all road accidents, claiming 1,17,682 lives and injuring more than 3.20 lakh people. These figures underscore that speed continues to be the deadliest factor in collisions on Indian roads.
- Drunken driving/consumption of alcohol and drugs caused 9,143 accidents (1.9% share), , with fatalities of 3,674 pointing to the lethal combination of impaired judgement and delayed reaction times.
- Driving on the wrong side or lane indiscipline accounted for 5.3%of accidents (25,242 cases), killing 9,432 people. It has seen the most alarming growth, with fatalities rising over the previous year, while jumping red lights makes up about 0.5% of accidents, These spikes signal a dangerous disregard for traffic signals, likely linked to aggressive urban driving and poor enforcement.
- The use of mobile phones while driving continues to be a threat, with fatalities of 2,884 individuals due to this violation in 2023.
- Over-speeding remains the dominant and deadliest violation, but the sharp rise in driving on the wrong side or lane indiscipline highlights an urgent need for stricter enforcement, awareness campaigns and technology-driven deterrents such as speed cameras and AI-based signal monitoring.

Figure 2: Road accidents and fatalities on national highways due to traffic violations

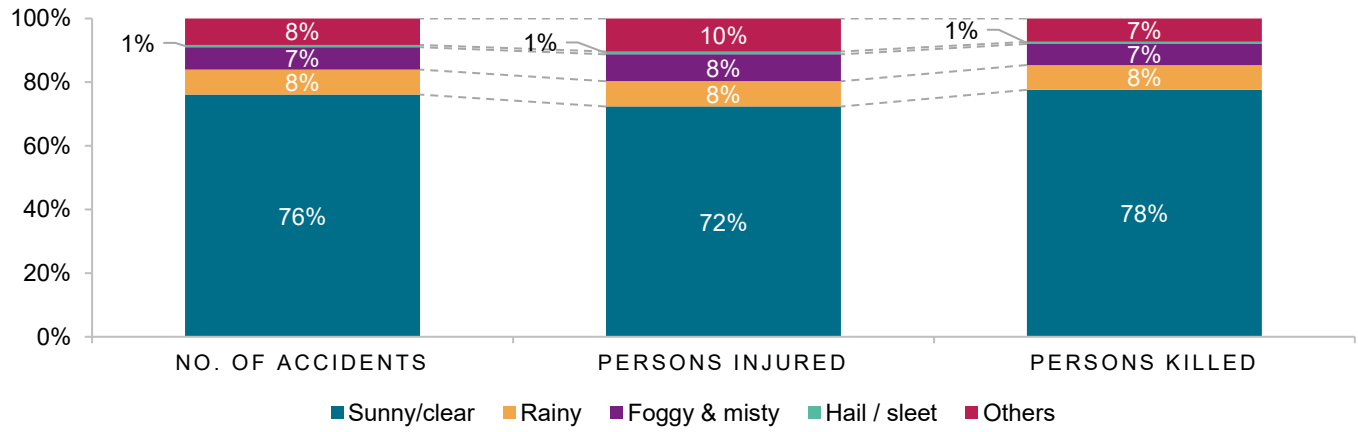


Source: Ministry of Road Transport and Highways – Road Accidents in India Report 2023, Crisil Intelligence

Weather conditions and their impact on road safety

Weather plays a crucial role in road safety, influencing visibility, traction and overall driving conditions. In the calendar year 2023, nearly three-fourths of road accidents (76.1%) and fatalities (77.6%) occurred under sunny/clear weather. Although adverse weather poses challenges such as reduced visibility and slippery roads, the majority of road accidents still occur on sunny days. This suggests that factors such as higher traffic volumes, overconfidence, speeding and general negligence of road safety norms play a significant role in causing accidents.

Chart 1: Road accidents caused by weather conditions (2022-2023)



Source: Ministry of Road Transport and Highways – Road Accidents in India Report 2023, Crisil Intelligence

In 2023, rainy weather conditions caused 37,316 accidents (7.8% share), with 13,374 fatalities owing to reduced tire grip and water-logged roads.

Foggy and misty conditions were especially dangerous, causing 34,266 accidents (7.1% of the total road accidents) in 2023. 14,617 fatalities were recorded owing to foggy conditions due to low visibility and delayed driver reaction times.

Hail/sleet conditions, while rare (0.7% of total road accidents), still resulted in 1,516 deaths, indicating the high severity of such crashes.

The data underlines that while adverse weather is inherently risky, most deadly crashes occur in seemingly safe conditions, underscoring the need for driver awareness and enforcement of speed limits even in clear weather.

Role of overloading in road accidents

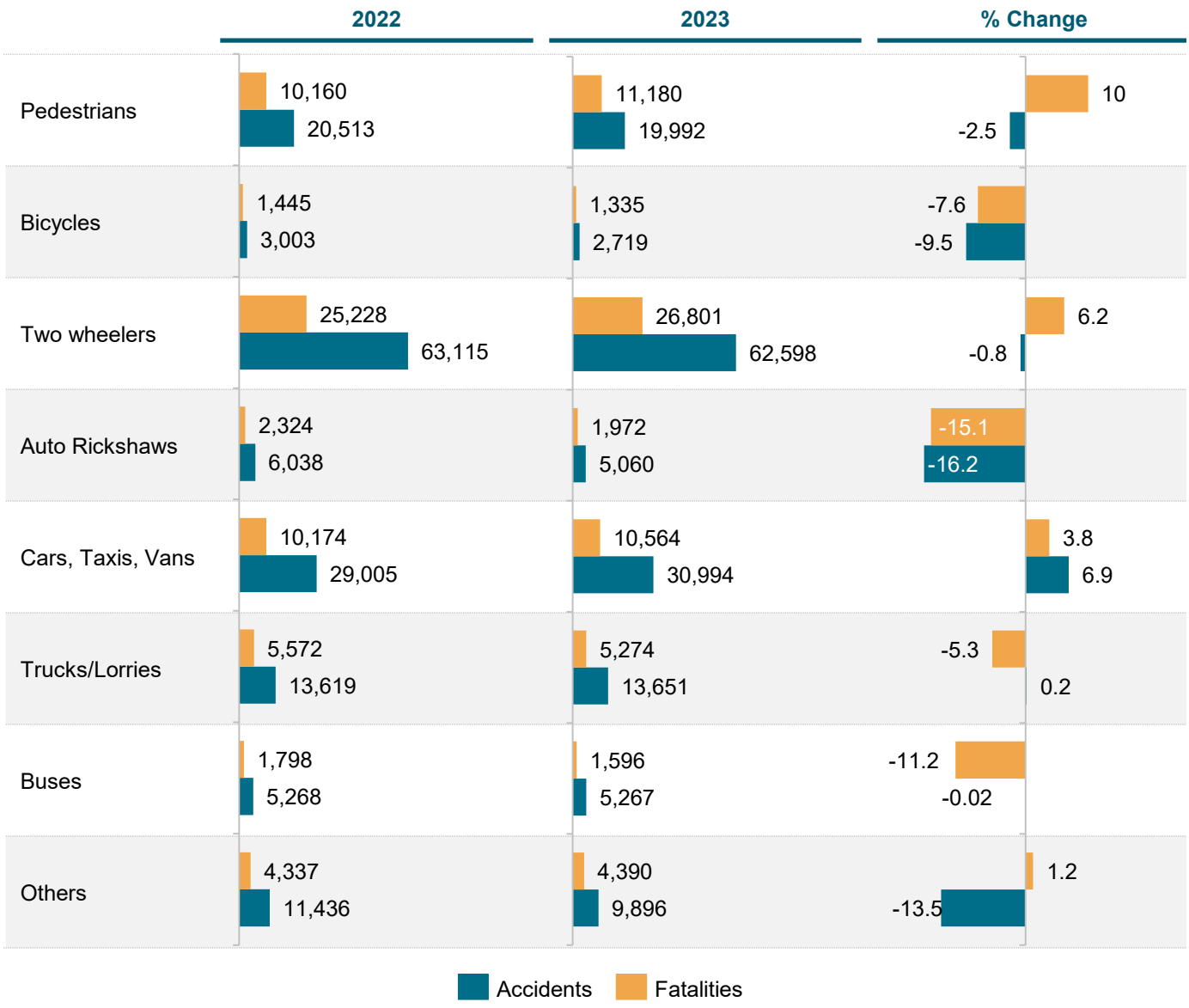
Overloading occurs when a vehicle's weight exceeds its designed or permitted capacity, leading to reduced braking efficiency, compromised vehicle stability, increased tire blowout probability and impaired manoeuvrability. Such vehicles, with protruding or hanging loads, increase the risk of accidents, posing a threat for other road users too. In 2023, overloaded vehicles caused 5.8% of total reported road accidents, with disproportionately high share of fatalities (7.0%) and injuries (6.0%), highlighting that when overloading is a factor, the severity of crashes tends to be greater.

Overloading is considered alarming even when it is a factor in a small percentage of incidents due to its strong correlation with fatal outcomes. Overloaded vehicles and vehicles with hanging load caused over 7% of road crash deaths in 2023, underscoring the need for stricter enforcement of load regulations, routine roadside checks and awareness campaigns for goods transport operators.

Areas/Opportunities to enhance road safety

The problem of increasing road accidents stems from individual behaviour and broader systemic gaps in the road safety ecosystem. These concerns, underscored in the 2023 accident data, can be addressed by improving road design, user behaviour, enforcement and emergency care.

Figure 3: Road-user category-wise distribution of accidents in 2022 and 2023



Source: Ministry of Road Transport and Highways – Road Accidents in India Report 2023, Crisil Intelligence

Need for redesigning of roads and ensuring maintenance

Despite a rapidly expanding road network, certain stretches lack safety-enhancing features, such as lane markings, crash barriers, pedestrian crossings and adequate lighting. Poorly visible signage and lack of proper signalling at intersections significantly increase the risk of collision. In 2023, India recorded 4,80,583 road accidents and over one-third were classified as fatal, with many occurring at accident-prone black spots where timely design interventions could have prevented recurrence.

Mitiagting risks in driving practices and increased training

Over speeding, abrupt lane changes, tailgating and distracted driving, often linked to mobile phone use, are common on urban and rural roads. Alcohol consumption and driver fatigue further heighten accident risks. In 2023, two-wheeler riders accounted for 44.8% of fatalities. Strengthening driver licensing standards, improving formal training and promoting defensive driving practices could reduce such high-risk behaviours.

Ensuring timely emergency medical response

The “Golden Hour” refers to the critical first hour after a road accident. It is often missed due to reporting delays, ambulance shortages or traffic congestion affecting emergency vehicle movement. Of the 1,72,890 fatal accidents in 2023, a portion may have been survivable with faster intervention. In addition, limited trauma care facilities, especially along highways and in remote areas, remain a concern. Enhancing accident reporting technology, improving ambulance coverage and setting up well-equipped trauma centres can significantly reduce fatality rates.

Strinegnt enforcement and compliance

While India’s traffic safety laws are comprehensive, enforcement capacity is stretched. Manual checks are insufficient to handle the high traffic volumes and automated enforcement systems are not yet universal, contributing to inconsistent rule compliance. In the calendar year 2023, over 65% of recorded accidents were either fatal or involved grievous injuries, underlining the consequences of not rigorously enforcing rules on speed limits, helmet usage and seat belts. Wider use of technology, including speed cameras and AI-based monitoring can strengthen deterrence.

Moving forward

The 2023 data reveal that fatal and grievous injury accidents formed most of the India’s crash profile, highlighting the need for road safety improvements, which depend on better infrastructure, disciplined road use, stronger enforcement and faster emergency care. A reduction of even one percentage point in road fatalities means saving thousands each year.





The stakeholder ecosystem

Urgency for cross-sector collaboration

India's roads are the lifelines of its economy, connecting people, goods and services across a rapidly urbanising and motorising nation. However, these roads have become sites of an alarming public safety matter. The road safety challenge is not the responsibility of any single entity, it is a shared burden, cutting across public health, infrastructure, mobility and governance. Despite efforts from government agencies, the automotive industry, law enforcement, and civil society, the approach has largely remained fragmented. Since each stakeholder worked toward safer roads, vehicles and drivers but without a unified framework, the cumulative impact has been insufficient to curb fatalities and serious injuries.

Driving change through collective action

Road safety is shaped by three interlinked components:

- Human: Driver behaviour, awareness and compliance with rules
- Vehicle: Safety standards, design and maintenance
- Infrastructure: Road design, traffic management and enforcement systems

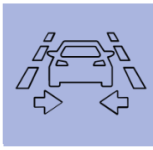
The interplay between these elements demands a multi-pronged, cross-sectoral approach. Isolated measures such as improving enforcement without enhancing infrastructure or raising awareness without better vehicle safety cannot deliver lasting change.

Figure 4: Highways as the flashpoint

The urgency becomes starker when looking at India's high-speed corridors. National and state highways form only 5% of the total road network, yet they accounted for more than 59.3% of road accident fatalities and 54.0% of recorded injuries in 2023. These stretches amplify risk due to higher vehicle speeds, heavier freight movement and mixed traffic conditions. Reducing casualties here requires synchronised action on multiple fronts:



Engineering safer highways through targeted audits and upgrades



Technology-enabled enforcement of speed limits, lane discipline and overloading rules



Rapid emergency medical response along high-risk corridors



Data-driven interventions using platforms, such as e-DAR, to identify and address hotspots

Source: Crisil Intelligence

Global targets, local responsibility

The World Health Organization has called for a 50% reduction in road traffic deaths by 2030. For India, this target, which is not just about meeting an international goal but also saving hundreds of lives every day, can be achieved through collaborations that align with the innovation capacity of industry, the regulatory authority of the government and the grassroots reach of the civil society.

The case for a united front

To improve road safety, stakeholders must shift from parallel efforts to coordinated strategies such as:

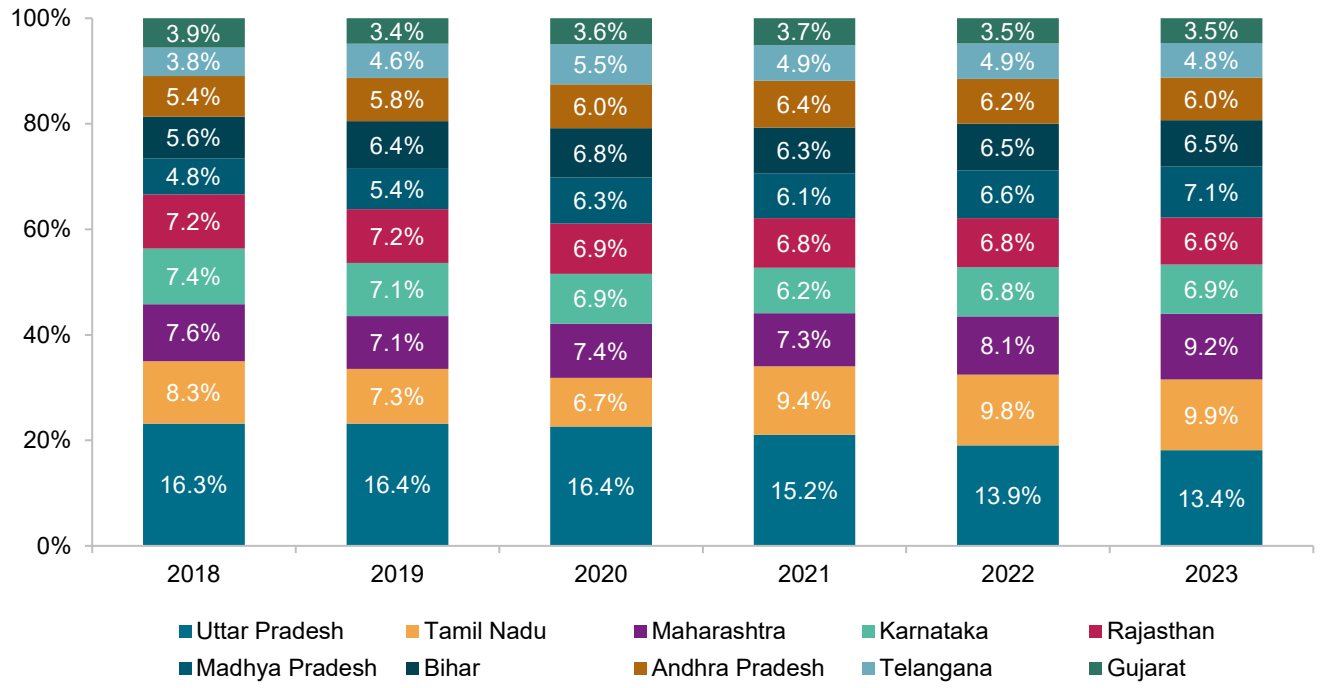
- Adopting a comprehensive approach by integrating infrastructure improvements, safer vehicle technologies and public awareness campaigns
- Pooling resources by allowing for larger and impactful interventions that no single stakeholder could fund alone
- Exchanging expertise through leveraging industry's technical knowledge, government's enforcement powers and the civil society's on-ground insights

Road safety is not just a transport issue—it is a public health imperative, an economic concern and a moral responsibility. The 2023 Ministry of Road Transport and Highways (MoRTH) accident statistics are a warning that the current pace of action is not enough. A collective, cross-sector commitment is no longer optional, it is the only way forward to make India's roads safer for every user.

Role of policymakers

Road safety in India is a collaborative effort, with the central and state governments sharing working together to ensure policies are properly implemented and enforced and create the infrastructure ecosystem for safer mobility. While the central government provides the policy framework, funding and technical guidance, state governments translate these directives into on-ground action tailored to local needs. This coordination is vital, given India's high accident rates on critical corridors such as the national highways.

Figure 5: Top 10 states in the number of fatalities on national highways



Source: Ministry of Road Transport and Highways – Road Accidents in India Report 2023, Crisil Intelligence

Central government: Setting the framework and driving national action

The central government, primarily through the MoRTH, plays a strategic role in shaping India's road safety landscape:

- Policy and legislation: The Motor Vehicles Act, 1988, (amended in 2019) forms the foundation of road safety regulations, covering vehicle standards, driver licensing and penalties for violations. The central government periodically evaluates and updates these laws to strengthen enforcement and address emerging safety concerns
- Highway development and safety features: Responsible for the design, construction and upkeep of national highways, the central government ensures these corridors meet prescribed safety standards with measures, such as proper lane markings, signage and surface quality
- Funding and technical support: States receive financial assistance for road upgrades, advanced traffic management systems and public awareness initiatives. Technical expertise is also shared to guide states in implementing evidence-based safety programmes
- Research and Innovation: Through specialised institutions, the government invests in research on safer road design, vehicle technology, human behaviour and traffic systems to inform future policies
- Global engagement: India actively participates in international road safety forums and aligns with global best practices, including the United Nations Decade of Action for Road Safety 2021-2030.

State governments: Converting policy into ground reality

State governments hold the operational responsibility for implementing road safety measures within their jurisdictions:

- Policy implementation and enforcement: States translate central guidelines into local rules, ensuring compliance through traffic police, enforcement drives and technology-based monitoring
- Driver training and licensing: Licensing authorities under state control oversee driver education, skill testing, and initiatives to improve road user behaviour
- Infrastructure maintenance: States manage roads under their purview, maintaining signals, signage and local infrastructure to enhance safety
- Traffic management: State authorities regulate traffic flow through intelligent transportation systems and on-ground personnel, addressing congestion and violations
- Emergency and trauma care: States ensure quick medical response and trauma facilities to improve survival rates during the “golden hour” after accidents

The highway challenge

Despite making up only 2.08% of India’s total road network, National highways accounted for 36.5% of road accident fatalities in 2023. Alarmingly, just five high-burden states contribute to more than half of all highway accidents nationwide. This highlights the urgent need for state-specific, data-driven interventions from enhanced enforcement in high-risk stretches to better emergency response units. Without tailored, localised action supported by the central framework, national efforts to reduce fatalities will remain incomplete.

The central government’s role as the policy architect and the state governments’ role as the on-ground executors are inherently complementary. Close coordination, continuous information exchange and a shared accountability framework, can lead to smoother enforcement of road safety laws across India.

Role of the automotive and transport sectors

The automotive and transport sectors play a key role in road safety in India, with their contributions spanning vehicle design, compliance with safety standards, adoption of advanced technologies, and operational practices in public and private fleets.

Vehicle design and safety standards

For embedding safety into vehicle design, the MoRTH mandates a range of features, including anti-lock braking systems (ABS), reverse parking alerts, over-speed warnings, and improved crash protection for both passengers and pedestrians *(Source: Press Information Bureau, 2023)*. In addition, public transport vehicles are required to be equipped with Automotive Industry Standard-140-compliant telematics devices, enabling real-time tracking and monitoring for improved safety oversight.

Shifting consumer preferences

Indian automobile consumers are increasingly attentive to vehicle safety ratings. Global NCAP star ratings have emerged as a significant factor in purchase decisions, encouraging manufacturers to prioritise safety innovations over traditional considerations such as fuel efficiency and cost.

Transport operator practices

Safety in the transport sector also depends on operational practices of fleet owners and operators. For instance, the enforcement of School Vehicle Operation Regulations in states such as Bihar has made it mandatory for school transport fleets to comply with norms relating to speed governors, valid permits, insurance and vehicle fitness. Challenges such as frequent breakdowns of Bengaluru’s state-run electric bus fleet highlight the safety risks from inadequate fleet maintenance and operational inefficiencies.

Technological integration and enforcement

Technology adoption is transforming road safety in terms of both vehicle design and traffic enforcement. Integrated Traffic Management Systems (ITMS) and AI-based enforcement tools are being deployed across states to detect violations such as over-speeding, signal jumping, and non-compliance with helmet and seatbelt rules. Kerala’s “Safe Kerala” initiative, which deployed AI cameras across the state, helped reduce daily traffic violations from nearly 450,000 during trial runs to about 200,000 after implementation.

The automotive and transport sectors, together with regulatory oversight, form a critical link in the broader road safety ecosystem. Manufacturers are embedding safety features in vehicles, consumers are increasingly

purchasing safer products, and fleet operators are expected to ensure compliance and maintenance. At the same time, the integration of digital enforcement and monitoring systems is redefining the way safety is managed on Indian roads. Continued collaboration across these fronts is essential to reduce accidents and fatalities.

NGOs as catalysts for change

NGOs are a crucial part of the road safety ecosystem in India, serving as advocates, educators and service providers. Their work complements government initiatives and addresses gaps in the official response to road accidents. They play a particularly important role in raising public awareness, providing victim support and influencing policy.

Roles of NGOs in road safety

- **Advocacy and policy influence:** NGOs lobby for stronger legislation, such as the Motor Vehicles (Amendment) Act, 2019, and advocate for its effective implementation. They use data and community insights to highlight policy gaps and propose evidence-based solutions to government authorities
- **Awareness and education:** NGOs conduct grassroots campaigns and workshops to educate the public on safe road behaviour, such as using helmets and seatbelts. They target various groups, including students, drivers and pedestrians, to foster a culture of safety
- **Data collection and research:** Many organisations undertake independent research to supplement official statistics. They collect on-the-ground data on accident causes and "black spots" to gather a more detailed understanding of the problem, which, in turn, informs their advocacy and helps create targeted interventions
- **Victim support and post-crash care:** NGOs provide essential support to accident victims and their families. This includes offering legal aid, psychological counselling and financial assistance. Some groups also work to improve post-crash care by training community members to act as "Good Samaritans" and provide timely aid
- **On-the-ground implementation and collaboration:** NGOs collaborate with local police, hospitals and municipal bodies to implement practical safety measures. They help improve road infrastructure by identifying and fixing high-risk accident zones and assist in training traffic personnel





Tackling safety challenges on other roads and behind the wheel

Addressing vulnerabilities on other roads

When it comes to road safety in India, the conversation often revolves around National and State Highways. However, a deeper analysis of data reveals a silent but worrying trend, the steady rise in accidents and fatalities on 'other roads', which include rural, village and urban local roads.

Other roads (including district roads, rural roads, urban roads and project roads) make up the largest share in India's road network, accounting for over 95% of the total road length. These stretches, which weave through cities, towns and villages, are the lifelines of daily commutes, but they often do not receive the same level of attention as highways.

By the numbers:

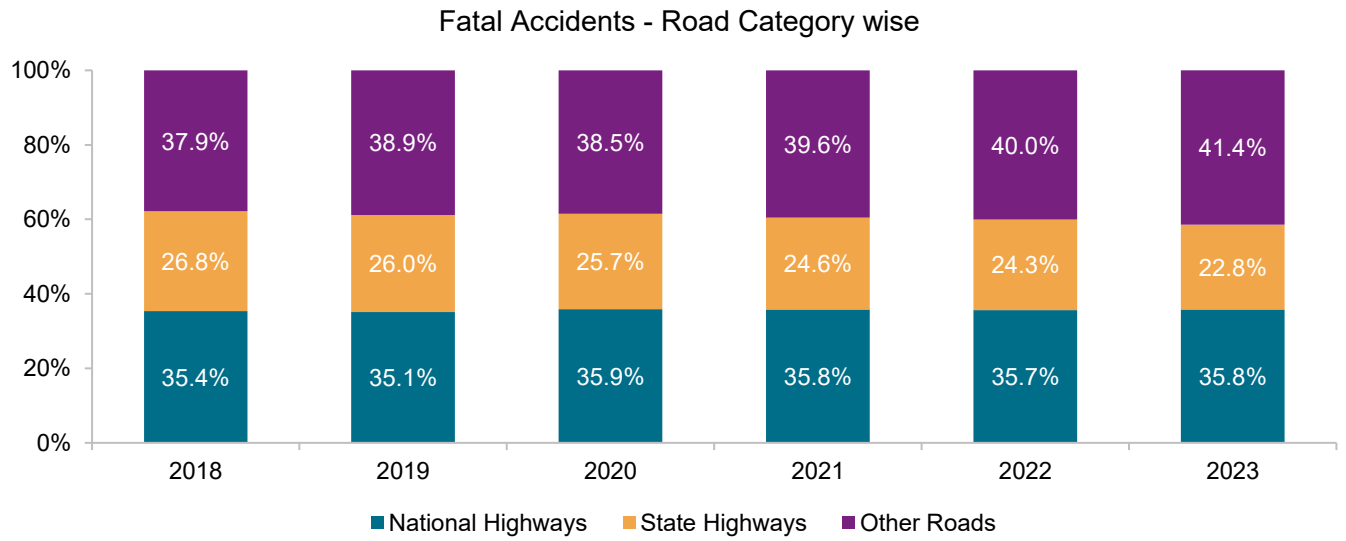
- 46.8% of total accidents occurred on other roads in 2023
- Over 2.12 lakh people were injured and 70,339 lost their lives during accidents on other roads in 2023

An alarming trend

Although fatalities on national and state highways have fluctuated over recent years, they have been rising consistently on other roads. This is visible in terms of both number and share of fatalities.

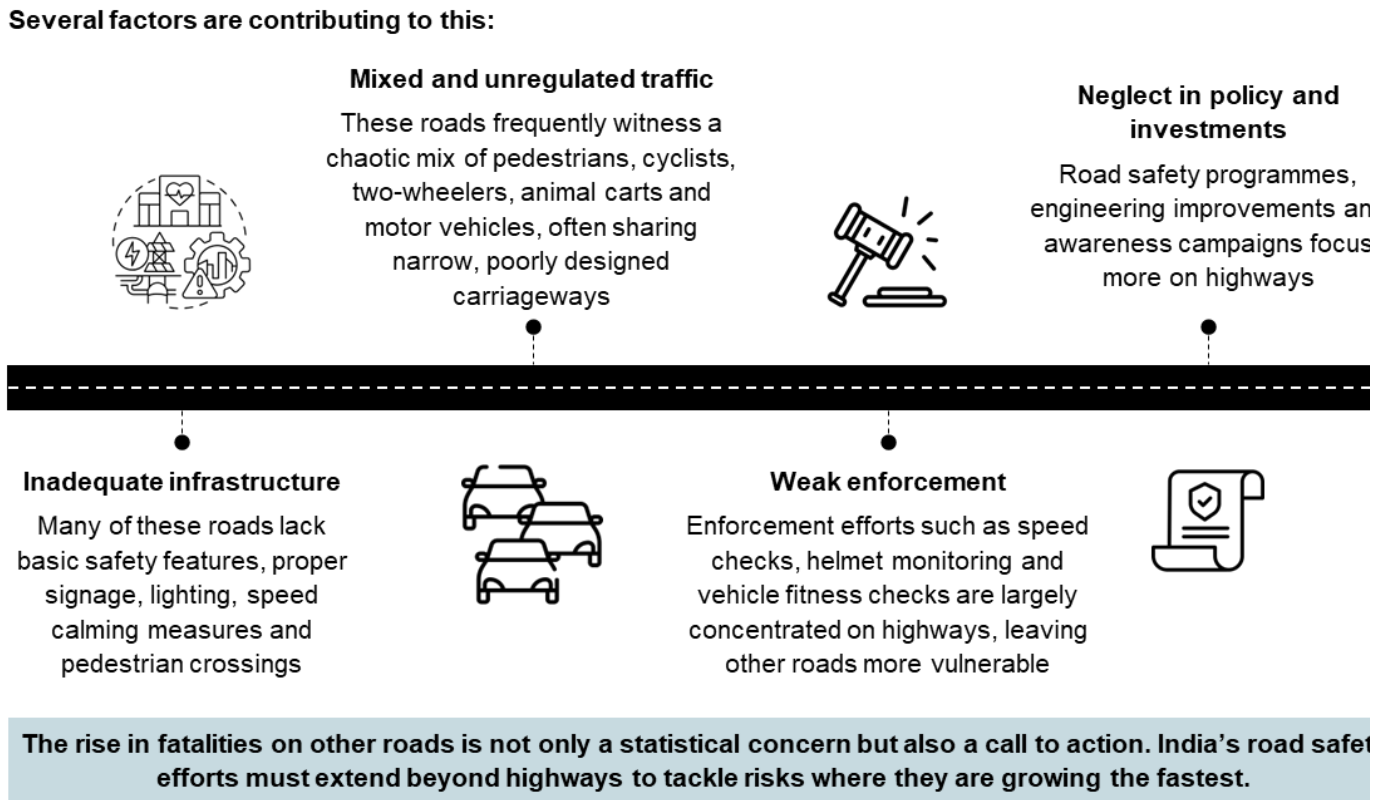
In 2018, other roads had accounted for 38% of total road fatalities. By 2023, this percentage climbed to 41.4%, underscoring the increasing risks on these seemingly ordinary roads.

Figure 6: Fatal accidents by road category: 2018-2023



Source: Ministry of Road Transport and Highways – Road Accidents in India Report 2023, Crisil Intelligence

Figure 7: Why are other roads becoming more dangerous?



Source: Crisil Intelligence

Driver fatigue – the hidden safety challenge

Truck driver fatigue is a serious road safety hazard on Indian highways, contributing significantly to accident rates. Due to gruelling work hours and minimal rest, often just 2 to 4 hours a day, many drivers suffer from chronic sleep deprivation. This fatigue impairs their alertness, reaction time and decision-making on the road. Alarmingly, estimates suggest that nearly 40% of road accidents involving trucks are caused by drivers dozing off at the wheel.

Several factors aggravate the safety risks posed by driver fatigue:

- Long hours behind the wheel without adequate breaks lead to mental exhaustion and physical strain
- Lack of ergonomic cabins and air conditioning in most trucks results in driver discomfort and reduced concentration, especially in extreme weather conditions
- Drivers often resort to stimulants such as tobacco and caffeine to stay awake, which may suppress tiredness temporarily but do not eliminate the underlying fatigue

Another major safety concern is the lack of secure and designated parking or resting areas along highways:

- In the absence of proper facilities, drivers are forced to stop at unsafe spots such as road shoulders or poorly lit areas, increasing their exposure to accidents and security threats
- Sleep deprivation, when combined with unsafe halting locations, creates a high-risk environment for both drivers and other road users
- These conditions collectively compromise not only the safety of truck drivers but also that of other commuters sharing the road. Fatigued driving leads to slower response times, higher chances of lane drifting and poor hazard perception, often resulting in fatal or high-impact crashes. Addressing truck driver fatigue through well-equipped rest areas and improved driving conditions is, therefore, a critical road safety imperative, not just a welfare issue.





Harnessing AI and digital solutions for safer roads

Project iRASTE

Project iRASTE, conceived as a collaborative effort between government agencies, industry leaders and academic institutions, leverages AI and advanced technologies to help prevent road accidents. It aims to reduce road fatalities by 50% in the pilot city of Nagpur and eventually replicate the model across other regions.

Multi-stakeholder collaboration

iRASTE draws on the strengths of its diverse stakeholders:

Government agencies: Led by the MoRTH, with local execution by the Nagpur Municipal Corporation (NMC) and the Government of Telangana, the public sector provides the policy framework, infrastructure access and governance support necessary for large-scale implementation.

Industry partners: Technology and automotive companies bring practical solutions to the table. Intel India drives the AI-based systems and ADAS, while Mahindra & Mahindra provides its expertise in automotive safety and driver training initiatives. Uber, participating in the Telangana phase, supplements the effort with its global road safety know-how.

Academic institutions: Research and innovation are powered by academia. The International Institute of Information Technology, Hyderabad (IIIT-H), through its Applied AI Research Centre (INAI) and I-Hub Foundation, leads the development of AI models and mobility data analytics. Meanwhile, CSIR-Central Road Research Institute (CSIR-CRRI) provides vital expertise in road engineering and infrastructure safety.

How iRASTE works

The project's strength lies in its integrated, multi-pronged approach:

Vehicle safety enhancements: Public transport fleets, particularly city buses, are fitted with ADAS and advanced sensors. These systems provide real-time warnings for collisions, sudden lane shifts, and speeding, interventions capable of averting up to 60% of crashes.

Predictive mobility analysis: Using AI-driven monitoring, iRASTE identifies “grey spots” with a high potential for accidents before they escalate into “black spots,” or accident-prone stretches. This predictive capability enables preventive measures, rather than reactive ones.

Data-driven infrastructure improvements: The vast amount of data collected through vehicles and sensors is analysed to detect engineering flaws in the road network. Evidence-based recommendations then guide the redesign and rectification of hazardous black spots, making infrastructure inherently safer.

Advanced Driver Assistance Systems (ADAS)

ADAS enhance vehicle safety by using sensors, along with AI and machine learning algorithms, to help drivers prevent collisions and maintain safe distances. Similarly, smart infrastructure solutions such as intelligent transportation systems and safer road design contribute to reducing accident risks. Technologies such as blind-spot detection and pedestrian detection provide additional protection for vulnerable road users (VRUs). A critical component of technology integration on roads is the collection of relevant data, which can be analysed to identify high-risk zones and design targeted interventions. This data-driven approach also enables continuous monitoring and evaluation of road safety strategies, ensuring their effectiveness over time.

Integrated Road Accident Database (iRAD)

The Integrated Road Accident Database (iRAD) is a centralised accident database management system developed by the NIC, Chennai, and implemented by NIC-National Informatics Centre Services Inc. (NIC-NICSI) across India. Its objective is to systematically analyse the causes of road crashes and support evidence-based interventions to reduce accidents and fatalities.

iRAD enables real-time, on-site data collection through a mobile application, as well as a web-based module, ensuring seamless reporting and integration across stakeholder departments such as the police, transport, highways and health. The platform supports accident data collection, black spot identification, analysis of crash patterns and recommendation of remedial measures. It also facilitates road safety improvements in accident-prone areas, streamlined motor accident claims processing and even cashless treatment for road accident victims through integration with eDAR, approved by police officials. Currently rolled out in all 36 the states and union territories, iRAD represents a major step forward in building a robust, data-driven road safety ecosystem for India, improving governance and accountability and ensuring the effectiveness of interventions.

AI- and big data analytics-based road safety project in Uttar Pradesh

In July 2025, Uttar Pradesh launched a road safety pilot project based on AI and big data analytics. The initial proof-of-concept phase is scheduled to run for six weeks. During this time, AI models will be developed and tested to validate their predictive and analytical capabilities. Upon successful completion of the pilot, the AI engine is planned for a phased rollout across all core functions of the Transport Department, including:

- Faceless licensing and permits: AI-based automated decision-making will power the faceless system for issuing driving licences and permits
- Modernised enforcement: The system will enable real-time fraud detection, vehicle status mapping and predictive monitoring of violations, providing data-backed alerts to field officers for on-the-spot action

Revenue and e-challan operations: The AI engine will facilitate interoperability across databases for revenue administration and e-challan processing, automating alerts and risk scoring related to tax liabilities and document validity

- Vahan-Sarathi integration: It will be integrated with "Vahan-Sarathi" registries to provide a comprehensive digital dashboard with insights into revenue, violations and document status

Driver fatigue detectors in Kerala

In April 2025, Kerala State Road Transport Corporation undertook proactive measures to enhance passenger and driver safety by installing AI-enabled driver fatigue monitoring systems in its premium long-distance buses. These systems use dashboard cameras to track driver

alertness; detect drowsiness and distractions such as mobile phone use or smoking; and issue real-time audio alerts. Alerts are also sent to a central control room for continuous monitoring. To expand this initiative, KSRTC has floated tenders to equip 5,000 more buses with the technology. This complements KSRTC's existing crew-change policy, which limits night driving shifts to reduce fatigue-related incidents.

ATMS for national highways and expressways

The National Highways Authority of India has rolled out a comprehensive advanced traffic management system (ATMS) using AI-powered Video Incident Detection and Enforcement Systems (VIDES) cameras along major highway corridors. These are placed every 10 km and detect 14 types of violations, such as helmet non-compliance, signal jumping, wrong side driving and overseeding. The system enables:

- Real-time e-challan generation
- Emergency alerts to patrol vehicles or ambulances
- Driver notifications via the RajmargYatra app and variable message signboards

AI-powered ITMS on Mumbai-Pune Expressway

The Mumbai-Pune Expressway has been equipped with India's first AI-enabled intelligent traffic management system (ITMS). With over 200 AI-driven closed-circuit television gantries and automatic number plate recognition (ANPR) systems, it can detect and record 17 traffic violations. Data is automatically fed into enforcement and analytics platforms to streamline compliance and reduce manual policing.





Global inspirations: Learning from international best practices

Vietnam: Strong institutional framework and data-driven policy

Vietnam has established a coordinated approach to road safety through its National Traffic Safety Committee (NTSC) and National Road Safety Observatory (NRSO). The NRSO integrates data from the police, transport and health sectors to provide real-time, accurate information on road crashes, fatalities and injuries. This centralised data platform allows evidence-based policymaking, targeted enforcement and transparent public reporting.

Key learning: A dedicated, multi-agency body with strong data management capabilities ensures effective road safety governance.

Malaysia: Research-driven road safety and vehicle safety standards

Malaysia has made significant progress in road safety through the establishment of the Malaysian Institute of Road Safety Research (MIROS), which conducts research and supports the government in implementing safety interventions. Additionally, Malaysia is a key contributor to the ASEAN New Car Assessment Program (ASEAN NCAP), which promotes higher vehicle safety standards by encouraging manufacturers to meet stringent crash test benchmarks and publicly display safety ratings.

Key learning: Institutional research and mandatory vehicle safety standards are critical to improving road user protection.

Thailand: Helmet law enforcement and motorcycle safety focus

Thailand faces high motorcycle-related fatalities but has responded with targeted campaigns for helmet use and enforcement. Strengthening helmet standards and improving compliance through awareness drives and stricter enforcement have shown measurable impact, especially in urban areas with dense two-wheeler traffic.

Key learning: Robust enforcement of helmet laws, combined with public awareness, is vital for reducing two-wheeler fatalities.

Brazil: Safer urban infrastructure and speed management

Brazil, particularly in urban areas, has adopted road safety measures focusing on infrastructure improvements, such as traffic calming, pedestrian-friendly street designs and speed management. These have contributed to reduced crash severity and improved pedestrian safety in cities.

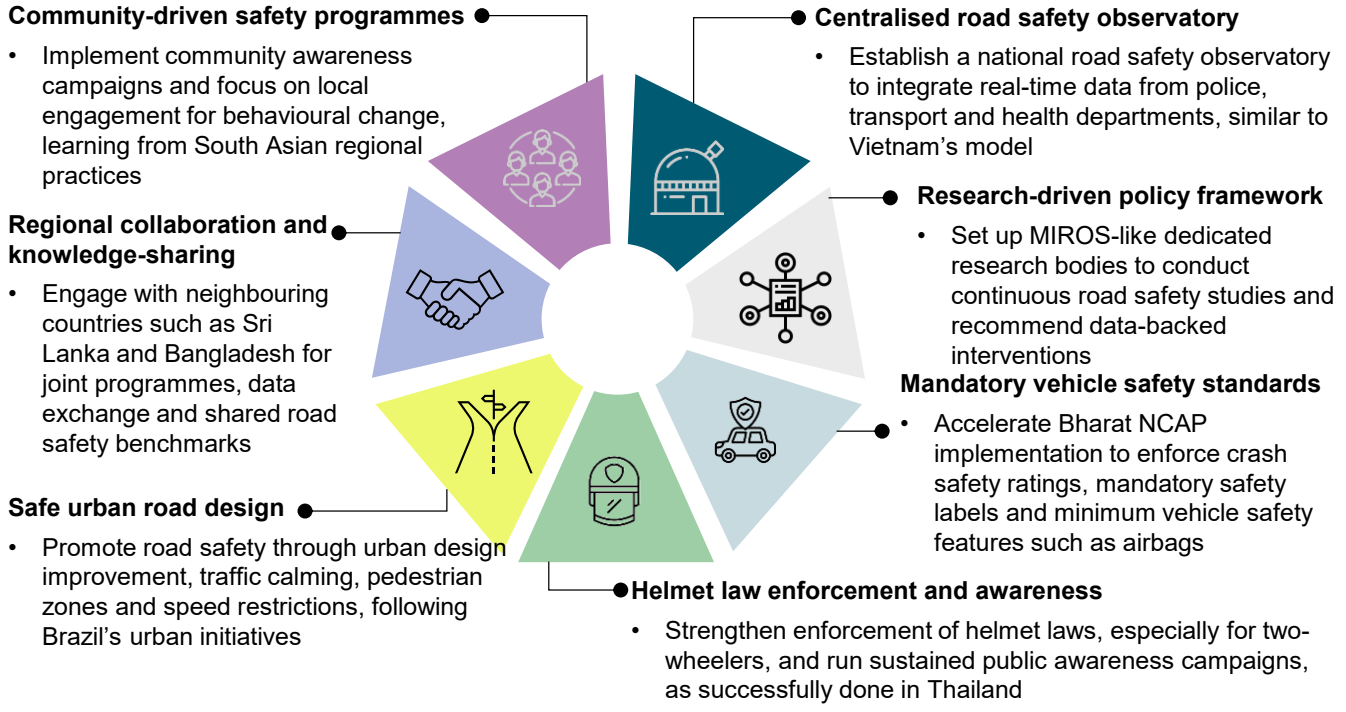
Key learning: Road design interventions, including speed management and pedestrian-focused infrastructure, are effective in reducing urban road fatalities.

Other emerging economies (Sri Lanka, Bangladesh): Regional collaboration and community engagement

Neighbouring countries such as Sri Lanka and Bangladesh have focused on community awareness campaigns, regional knowledge-sharing and post-crash care systems to enhance road safety outcomes. Joint initiatives under the South Asian Association for Regional Cooperation have aimed at sharing best practices and aligning safety standards.

Key learning: Regional collaboration and community-driven initiatives play a key role in building sustainable road safety programmes.

Figure 8: What India can learn from international best practices

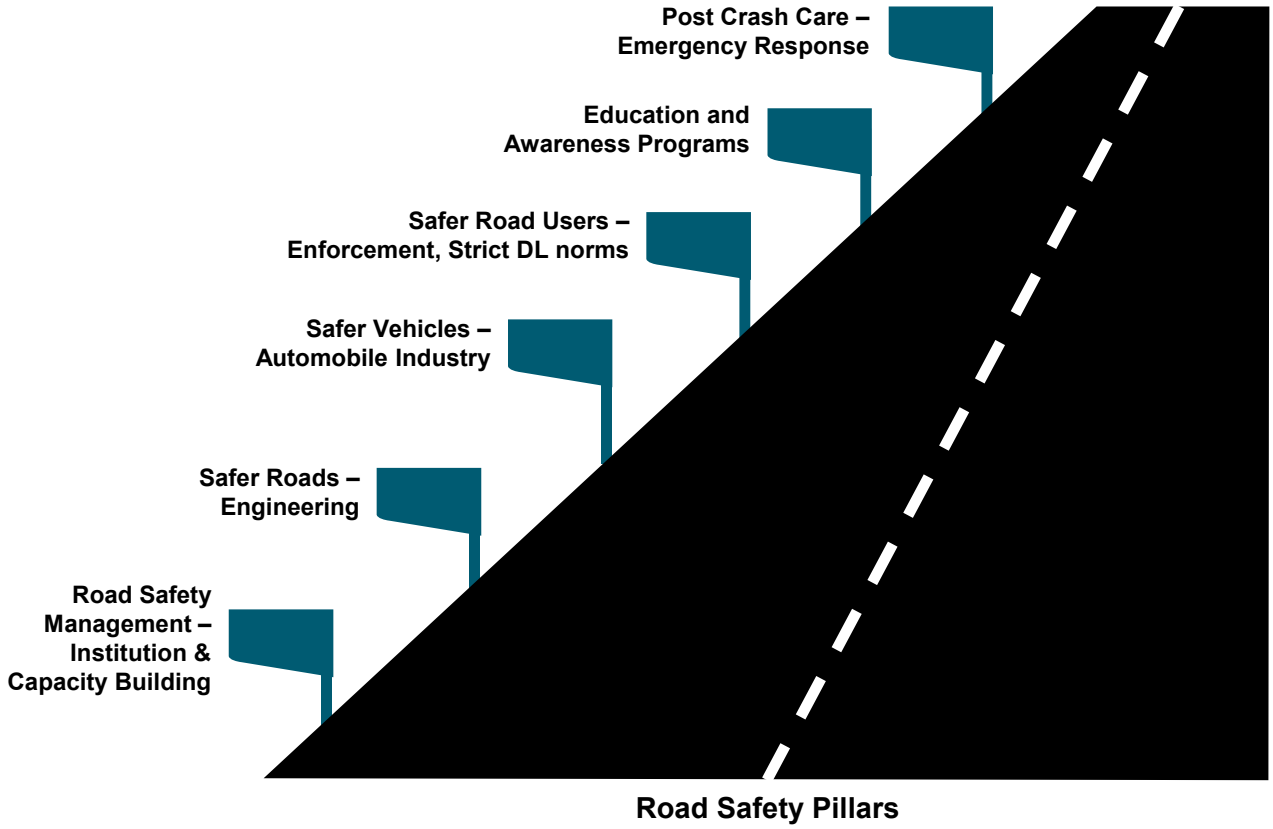


Source: Crisil Intelligence



Action plan

Figure 9: Road safety pillars: Interventions and implementation



Source: Crisil Intelligence

To create an ecosystem for the implementation of the above-mentioned pillars of road safety considered by various national and international organisations, various interventions are required. These six pillars would yield results through a holistic, bottom-up approach, wherein:

- The issue would be first identified and then backed by data and quantified
- The data received would be analysed
- The outcome would be comprehensively discussed with stakeholders, and a solution would be drafted
- With funds allocated, the solution would be implemented and monitored

Major interventions required

- Unlocking the potential of technology
- Encouraging the use of new technologies such as AI, IoT and GPS to check speeding, seat belt and helmet use, drowsiness and fatigue of drivers, and provide real-time alerts to drivers and enforcement agencies
- Driver behaviour, which is a subjective matter, can be tracked using AI and IoT and converted on a real-time basis into a safe driving score (SDS)
- Mandating an SDS for every driving licence (DL) holder can be a game-changer for road safety. Incentive schemes to encourage safer driving habits by linking SDS with all road-and vehicle-related permits
- Collaboration among all stakeholders, with continuous monitoring and discussion of challenges and solutions on a unified platform
- Prioritize pedestrian safety with infrastructure design, traffic calming, and education to create safer communities

Anti-collision/speed-control devices in vehicles

Installing ADAS in vehicles with features such as collision prevention sensors/lane departure warning systems/automatic speed adjust/IoT-based speed control.

Enforcement

Tech-based automated enforcement system: The enforcement system needs to be automated, comprising speed cameras, incident detection cameras, redlight violation detection and ANPR systems, IoT, and real-time detection of violations and issuance of automated penalty challans.

However, the problem with an automated system is not the availability of technology, but of funds. The equipment and software of automated enforcement systems are expensive and require skilled workers for operation. Since most Indian cities/municipalities do not have enough financial resources, this requires innovative public-private partnerships.

Infrastructure

Sensor- and location-based apps to provide drivers advance alerts of black spots, potholes and poor roads conditions.

Auditing of high-fatality corridors for engineering and design faults using technology and then converting them into zero-fatality corridors.

Emergency care

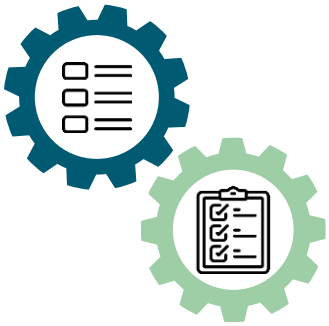
E-call buttons in vehicles, QR code-based stickers and mobile apps can map trauma centres/hospitals and create a database to provide quick emergency care during the golden hour of accidents.

Further, a national safety index/road safety action plan could raise accountability and competition and encourage states to undertake road safety initiatives.

Figure 10: Need for National Safety Index and Safety action plans

Need for a national safety index

- A ranking system must be established to recognise the overall safety fabric of states, metropolitan cities and national highways. The ranking parameters could include road quality, use of technology, number of fatalities and new initiatives (campaigns undertaken, collaboration with industry, driver unions, rectification of black spots, 24x7 surveillance and patrolling).
- Further, the index could be used to provide incentives for funding proposals of states. It could also be used as a benchmarking tool and an input to assess other infrastructure rankings (such as the Sustainable Development Goal India Index). Hence, the index would encourage competition among states. Investors could also use the index as a tool for investments in states.



Need for road safety action plans

- There is a need to formulate and professionally manage state road safety action plans to implement Vision Zero in road accidents with ambitious goals and targeted safety outcomes.
- An action plan is a strategic way to prioritise safety improvements and justify investment decisions. It helps communicate more clearly with stakeholders and access funding opportunities. Local road safety plans (LRSPs) help promote road safety awareness, develop lasting partnerships that may benefit future projects, enhance collaboration across disciplines and support local agencies in better leveraging funding.

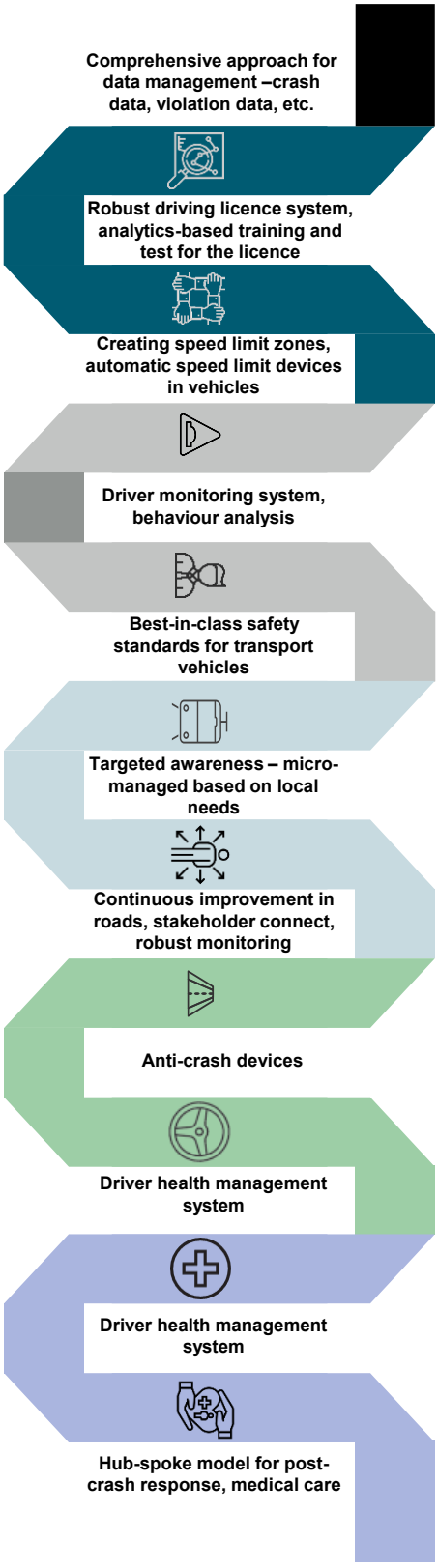
Source: Crisil Intelligence

Framework for road safety interventions

S no	Pillar	Action areas				
1	**Capacity building**	Implementation of RSAPs	Use of automated driving test track-based testing for DL/ crash prevention course	Accessible advanced driving training based on DL for type of vehicle	Training on adoption of modern technologies for all drivers, especially commercial drivers	Psychometric test/vision improvement/portal for learning from analysis of accidents/best practices
2	**Engineering**	Re-design and construction of black spots/intersections/high-impact zones	Creation of no-parking zones/ installation of required road signage	Setting up of crash barriers/impact absorb design	Continuous monitoring of potholes/infrastructure maintenance	Separate lanes for VRUs, cycle tracks, etc.
3	**Safe vehicles**	Speed-limiting (speed control) devices/alarm systems/intelligent IoT-based intervention systems	High safety standards for vehicles irrespective of the segment	Research/innovation on safety of vehicles based on post-crash analysis	Installation of AI-powered driving assistance systems, assistance on accident prevention	Electronic stability control and tail guarding systems in trucks, and other ADAS features
4	**Safe road users/enforcement**	Training of officials for active patrolling	Installation of IoT-based ATMS	Use of speed violation devices/ANPR/dynamic speed control systems	Ensuring implementation of all rules and regulations	Focus on data collection management systems/safety audits/post-crash investigations
5	**Awareness**	To start from schools, embedding road safety practices since childhood	Nation-wide programmes on overall road safety scenario	State-level programmes based on local issues or specific highways/zones	Awareness among local officers about types of accidents in a particular zone (micromanaged targeted intervention)	National conclaves/radio shows/podcasts/digital space/continuous study of scenarios/sharing of best practices and learning from the worst
6	**Emergency care**	Use of a hub-and-spoke model for post-crash response	Robust first responder training and availability of support kits at tolls and high-impact zones	Identification of high-impact zones/regular eye testing and health check-ups for drivers	Robust management at the golden hour, reducing response time	Mandatory life-saving training for all stakeholders

Priority action areas

Figure 11: Priority Action Plan



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Overview of the interventions required (short- and long-term) based on different stakeholder roles

Stakeholder	Immediate intervention required	Long term – holistic approach
Government	1. Identify black spots 2. Implement technology-based monitoring – data collection and analytics 3. Develop a micromanaged system – correct high-impact zones or corridors in terms of engineering and monitoring measures and/or speed limit interventions 4. Revise driver licensing system, which is oriented towards high-speed corridor driving in mixed traffic conditions, with advanced-level training and tests	1. Develop a state road safety action plan 2. Develop a national safety index 3. Develop a robust last-mile transportation system 4. Conduct prolonged and targeted road safety workshops/ seminars and training
Private/ industry	1. Mandate speed limiting and control devices 2. Enhance the safety features of vehicles, especially commercial vehicles 3. Implement a driver monitoring system for commercial vehicles	1. Facilitate knowledge-sharing platforms to exchange best practices in road safety 2. Promote use of emerging technologies such as artificial intelligence and IoT for smart traffic management and accident prevention
Government and private	1. Conduct road safety audits 2. Conduct awareness and training programmes	1. Integrate and share data for better management of rules and regulations on roads (integrate the road data of the government and private players in terms of sharing CCTV footage, etc., via digital intervention on a single platform)

The Road Ahead

State governments have a significant opportunity to enhance road safety by developing a comprehensive Road Safety Action Plan (RSAP). These plans would serve as strategic roadmaps for prioritising improvement in safety while enabling states to access dedicated funding and make well-informed investment decisions backed by clear evidence to stakeholders.

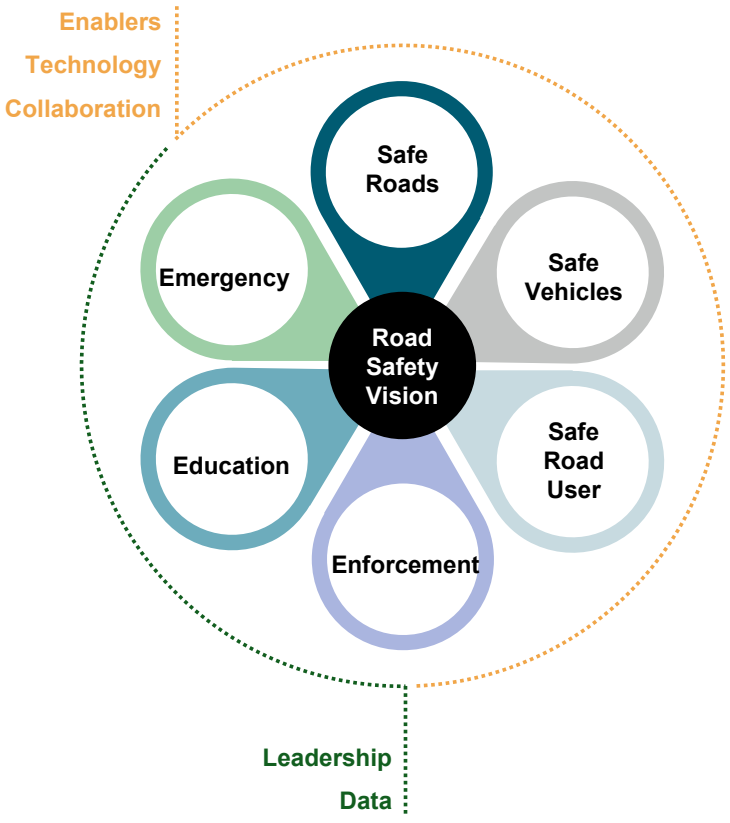
RSAPs can help promote road safety awareness, creating lasting partnerships that may benefit future projects, facilitating or enhancing collaboration among different disciplines and assisting local agencies to better leverage funding.

The long-term benefits of a successful road safety strategy are as follows:

- Reduced deaths and serious injuries of commuters and the public in general: Implementation of RSAPs can reduce the number of fatalities/ injuries in traffic crashes.
- Improved health and well-being: By making roads safer, RSAPs can improve traffic flow, reduce congestion, minimise vehicular emissions and improve the overall health and well-being of individuals.
- Reduced costs: Cost savings can be realised from reduced loss of personnel, time off-duty (injured), damage to equipment and collateral damage to public highways and people.
- Increased economic productivity: By reducing the number of traffic crashes, RSAPs can help increase economic productivity through a reduction in lost productivity due to injuries and fatalities.
- Improved quality of life: RSAPs can help improve the quality of life for everyone by making roads safer.

Six pillars of the strategy framework underpin the RSAP.

Figure 12: Pillars of Road Safety



Source: Crisil Intelligence

Safe roads 	• Developing safety guidelines, standards for road project implementation as per the IRC, and other governing standards, rules and procurement guidelines • Coordinating with central and state road agencies and police departments for necessary road improvement strategies • Ensuring highways and key roads are built and maintained as per standards • Improving the design of roads and intersections, which can include making roads wider, adding more lanes and installing traffic-calming measures such as speed bumps and chicanes • Extending technical and financial support to the concerned agencies
Safe vehicles 	• Developing new technologies that can help prevent accidents, such as collision-avoidance systems • Requiring manufacturers to use safer materials in the construction of vehicles, such as those less likely to catch fire or explode • Encouraging the development of public transportation systems that can reduce the need for people to drive • Periodically monitoring vehicles through automated and tamper-proof vehicle inspection and testing centres
Safe road users 	• Educating road users about the importance of safe behaviour, which can include teaching them about the dangers of speeding, distracted driving, and driving under the influence of alcohol or drugs • Enforcing traffic laws, which can help deter people from breaking the law and putting themselves and others at risk • Providing better public transportation options, which can help reduce the number of people who need to drive and can make it easier for people to get around without a car • Deploying automated driver testing centres with an elaborate and stringent vehicle driving licence issuance system
Enforcement 	• Strengthening law enforcement measures to discourage traffic violations and ensure compliance with traffic rules and regulations • Increasing police presence, conducting regular patrols, and enforcing strict penalties for speeding, drunk driving and other traffic offences • Implementing automated traffic enforcement systems, such as speed cameras and red-light cameras

Promote public awareness and education 	• Launching public awareness campaigns to educate citizens about safe driving practices, pedestrian safety and the importance of road rules • Conducting targeted educational programmes in schools, colleges and workplaces to promote responsible road behaviour • Collaborating with community organisations, NGOs and media outlets to disseminate road safety messages effectively
Enhance emergency response systems 	• Strengthening emergency response systems by improving coordination among emergency services, hospitals and law enforcement agencies • Conducting training programmes for emergency personnel to enhance their skills in handling road accident victims effectively
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Control speed to curb accidents and fatalities by 70% 	• In the United States, more than half of deadly road accidents happen because of over-speeding. In the European Union as well, more than ~50% of road accidents are due to over-speeding. In India, where roads can be tricky, over-speeding leads to more than ~70% of road accidents, posing the greatest challenge to the country's road safety. • Over-speeding is a major problem globally, necessitating solutions such as vehicle over-speed control systems to make roads safer. Overcoming this challenge requires a holistic approach, including all types of interventions.
Speed management on Indian roads 	• Advanced driver training and qualifying tests • Mapping of behavioural aspects of drivers • Use of technology to curb speeding (penalise drivers and automatically control a vehicle's speed) • Rectification of black spots on a regular basis • Robust monitoring of high-impact zones • Vehicle health monitoring/ promoting awareness about regulations

A research report[1] indicated the death risk is 4-5 times higher in collisions between a car and a pedestrian/road worker on foot at 50 km/h compared with the same type of collision at 30 km/h. Considering this, there is a strong recommendation to reduce speed in urban areas.

To estimate the expected change in the number of crashes, two empirical models have been used – the power model and the exponential model (which considers the initial speed). The power model provides a good representation of the relationship between speed and crash risk and is easy to apply. As a rule of thumb, it shows a 10% increase in mean speed leads to a 20% increase in all injury crashes, a 40% increase in fatal and serious crashes and a 40% increase in fatal crashes. Accordingly, a 10% decrease in mean speed leads to a 20% decrease in injury crashes and a 40% decrease in fatal crashes. This means that even small changes in driving speeds can have a substantial effect on road safety.

To decrease road trauma, i.e., fatalities and injuries, interventions are required to reduce speed on roads and to reduce differences in speed.

Section control (using measurement of average speed over a section of a road to detect a driver's failure to comply with the speed limit there) is a relatively new measure. It appears to be very effective in not only reducing speed but also contributing to more homogenised traffic flow and increased traffic capacity.

Interventions required to reduce speed and significantly decrease fatalities:

Speed control/ monitoring system in vehicles 	• The combination of an ADAS and navigation system can be used for real-time speed monitoring. The navigation system can continuously provide real-time data inputs to the ADAS for controlling the vehicle speed based on the inputs.
Automatic speed adjustment 	• If the vehicle exceeds the speed limit, the ADAS can override the vehicle's manual settings and lower its speed to the maximum permissible limit.
IoT-based automatic vehicle speed control system 	• Unlike regular speed detectors, which simply identify instances of excessive speed, an IoT-based system uses advanced radio frequency (RF) sensors and intelligent control technology. It not only detects speeding but also takes immediate action by wirelessly communicating with the vehicle's onboard systems to automatically regulate its speed. The system uses a radio frequency identification (RFID) module to control the speed of the vehicle. The RFID receiver should be installed inside the vehicle, and the RF transmitter is placed at the start and end of the prohibited regions. The system then compares and keeps track of the speed. When a vehicle's speed exceeds the allowed limit, it automatically adjusts its speed to fit the zone[2].

1 Speed and Crash Risk, Research Report, International Traffic Safety Data and Analysis Group (IRTAD), published by the International Transport Forum, 2018. The International Transport Forum is an intergovernmental organisation with 59 member countries. It is politically autonomous and administratively integrated with the OECD.
2 IOT based automatic speed control system, International Journal of Research Publication and Reviews, Vol. 4, no. 10, pp 2,219-2,223, October 2023

	• The system can be a solution in high-risk and high-density areas such as schools, hospitals and crossings. In the area-based speed control of vehicles using RF transmitter and receiver modules, the transmitter is installed in defined areas where the speed limit of the vehicle must be controlled. The transmitter transmits a signal, and the receiver should be installed within the vehicle to control speed. Whenever the vehicle enters the mapped area, the speed of the vehicle is decreased and kept constant until the vehicle leaves that area.
Speed calming system (SCS) – behavioural change 	• The system uses behavioural science principles to improve traffic safety. The SCS detects various traffic violations common in India and displays the violator's vehicle registration number (VRN) on an electronic signboard. This provides immediate visibility, encourages immediate corrective action and fosters a sustainable positive behavioural change in the driver, leading to calming of traffic.
Expert-level driver training and psychometric testing before issuing driving licences 	• The testing assesses and evaluates the capabilities/ skills of the driver/ operator under the various circumstances that arise while driving on the road. It features an anticipation test, judgement test, reaction test, aptitude test and colour blindness and vision test. Along with these, advanced-level driver training and testing need to be made accessible to the masses, especially in the case of commercial vehicles, using latest video analytics and simulation technology. Such training and testing should be mandated for issuing driving licences, rather than learning organically and receiving a driving licence on reaching the permissible age for driving. • Curbing speed through the adoption/ installation of the above-mentioned technology systems would have a bearing on costs across stakeholders – manufacturers, regulators and citizens. Hence, setting up dedicated speed control funds to finance the adoption/ installation of these technologies in the initial stages will be crucial.

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