ACCIDENT LOCATIONS ON INDIAN ROADS

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ABSTRACTION

To understand the abstraction of accident location on Indian roads, we can consider the different levels of abstraction that can be applied:

Macro-Level Abstraction: At this level, the focus is on the broader geographical context. It involves looking at accident data and statistics at a regional or national scale. Abstraction may include identifying accident hotspots or clusters in specific states, cities, or highway networks. This level of abstraction helps in understanding the overall patterns and trends of accidents across different regions in India.

Meso-Level Abstraction: This level involves a more localized analysis, focusing on specific areas or road segments within a city or region. It may include the identification of accident-prone intersections, stretches of roads, or specific road types (e.g., highways, urban roads). Meso-level abstraction helps in understanding the factors contributing to accidents in particular areas and assists in targeted interventions for improving safety.

Micro-Level Abstraction: This level of abstraction zooms in on individual accident locations, such as specific intersections, road segments, or spots where frequent accidents occur. It involves analyzing detailed accident reports, eyewitness accounts, or on-site investigations to understand the factors leading to accidents at those specific locations.

Micro-level abstraction helps in identifying site-specific factors, such as road design flaws, inadequate signage, poor lighting, or traffic congestion, that contribute to accidents.Spatial Abstraction: Spatial abstraction involves representing accident locations using geographic coordinates (latitude and longitude) or other spatial reference systems. Accurate mapping of accident locations on Indian roads helps in visualizing and analyzing the distribution of accidents spatially. It allows for identifying clusters, patterns, and spatial relationships between accidents and other factors, such as road characteristics, land use, or socioeconomic factors.

Categorization and Classification: Another aspect of abstraction is categorizing and classifying accidents based on various factors, such as accident severity, types of vehicles involved, types of road users affected, or causes of accidents. Categorization helps in understanding the specific characteristics and trends of different types of accidents, which can inform targeted interventions and policies.

These levels of abstraction can be applied collectively or individually depending on the specific analysis or research objective. By abstracting accident locations on Indian roads, policymakers, transportation planners, and researchers can gain insights into the patterns, causes, and potential countermeasures to improve road safety and reduce accidents.

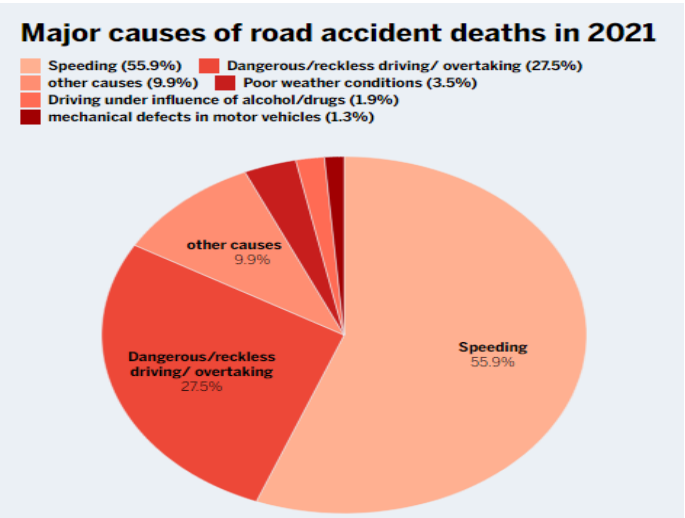
INTRODUCTION

India is home to the second largest road network in the world with a total road length of approximately 62.1 lakh kilometres. This massive network serves as the nation's lifeline transporting over 64.5% of all goods within the country in addition to being the preferred option for move of over 90% of India's passenger traffic. While roads remain synonymous with development and growth in the country, they have also been a nemesis for users with India also carrying the dubious distinction of leading the global tally of annual deaths and injuries on account of road accidents. An asymmetry exists between number of vehicles and deaths due to road accidents with India's one percent global share of number of vehicles accounting for almost 11% deaths due to road accidents. Road accidents continue to remain the leading cause of deaths, disabilities and hospitalisations in the country despite concerted efforts at all levels to contain these.

India, the second-most populous country in the world, is well known for its diverse landscapes and bustling urban areas. However, India still needs to do a lot of work to increase traffic safety and prevent accidents. In India, traffic accidents are now a serious public hearth concern due to the significant number of deaths, injuries, and monetary losses they produce.

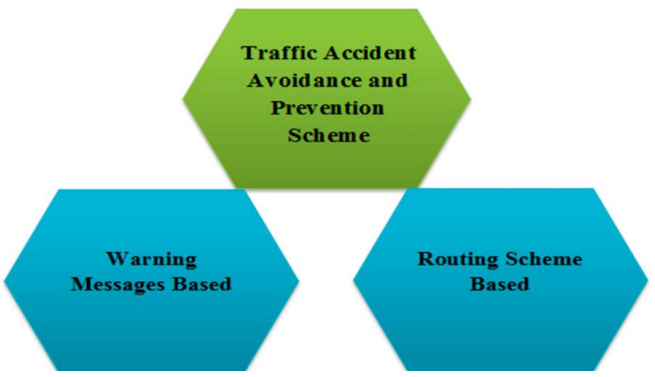
The objective of this study article is to provide a concise overview of accident sites in India while shedding light on the geographic distribution and primary causes of accidents. By studying the accident data and identifying the high-risk areas, policymakers, urban planners, and transportation authorities can get valuable insights to execute targeted interventions and enhance road safety measures. The study looks at a number of factors associated to accident sites, such as the differences between urban and rural areas, the types of roads, and how much traffic congestion affects accident frequency.

The findings of this study will contribute to the body of information already accessible on road safety in India and operate as a helpful resource for scholars, decision makers, and practitioners in the field. By obtaining a detailed understanding of accident locations and their contr ibuting factors, stakeholders can work together to improve transportation networks, safer driving conditions, and ultimately save lives. The overarching purpose of this study is to highlight the significance of accident scenes in India and the urgent need for solutions that are based on facts to address the country's growing road safety problems. India may strive to increase traffic safety and protect the wellbeing of its citizens by addressing the root causes and taking preventative measures.



II. LITERATURE SURVEY

The survey was conducted in 2019, according to this assessment of literacy. About 4,49,002 incidents occur over 62,15,797 kilometres, and 4,51,361 people die in accidents. The impact on accidents involving persons was significant as a result. Accidents are the human community's leading source of misery, according to this survey table.



Vehicular networks will play an increasing role in the Intelligent Transportation Systems (ITS) area and hence reduce road fatalities. Most ITS applications, such as road safety, fleet management, and navigation. These will depend on communication between the vehicle and the roadside infrastructure (V2I), or even directly between vehicles (V2V). The integration of sensoring capabilities on-board of vehicles, along with peer-to-peer mobile communication among vehicles, forecast significant improvements in terms of safety in the near future. Piedad G., Manuel F., Francisco J. M. [7] proposed a framework defines a smart system that automatically detects, notifies, and estimates the magnitude of 4 road accidents across vehicle networks on the basis of the principle of data mining and information inference.

The late arrival of an ambulance is the leading cause of death in road accidents. If aid comes quickly, more lives can be saved. In some cases, injuries are minor, but the ambulance's late arrival can result in casualties.

III.OBJECTIVE

The sites of accidents in India must be identified and studied in order to implement targeted actions and strategies to reduce casualties, increase road safety, and prevent accidents.

To study the causes of accidents and suggest corrective measures at potential location. To evaluate existing design. To compute the financial losses incurred. To support the proposed design and provide economic justification to the improvement suggested by the traffic engineer.

The objective of accident analysis is reducing incident rates by maintaining safe and healthy conditions and standards. Reducing property losses. Administering training programs that increase awareness of safety and health on a regular basis. Providing the necessary focus on the importance of health and safety programs in the workplace.

Accidents on Account of Road Environment Factors

- Road Features
- Road Junctions and Type of Traffic Control
- Ongoing Construction Works
- Speed Breaks
- Poor Lighting
- Lack of Adequate Road Signs
- Sidewalks
- Neighborhood Environment

Accidents on Account of Human Factors

- Violation of Traffic Rules
- Invalid Driving License
- Non-Use of Safety Devices – Helmets and Seat Belts
- Triple Riding
- Distracted Driving
- Negligent Parking
- Not Crossing Roads at Pedestrian Crossings
- Road Rage

Accidents on Account of Human Factors

- Accidents in Over-Age Vehicles
- Overloading

Causes of Road Accidents in India

Road traffic injuries are the eighth leading cause of death globally. In its study highlighting the larger share of Low and Middle Income Countries in road accident fatalities, the World Bank underscores a distinct co-relation between socio-economic status and road use patterns in low and middle income countries such as India. The report states that daily wage workers and those employed as casual labourers in informal activities are more prone to be defined as vulnerable as compared to workers engaged in regular activities. It is often the poor, especially male road-users of working age that constitute the vulnerable road users (VRU) in India where VRUs share road space with other less vulnerable users with their income level having a direct bearing on the mode of transportation used and resultant risk faced by them on that account. Numerous factors can be attributed to be the causative factors of road accidents and can be broadly classified into road environment factors, human factors and vehicular factors

Why in News?

As per the Minister of Road Transport and Highways the Indian road accident scenario, with 415 deaths and many injured every day, is more severe than Covid-19.

Present Situation:

Over 1.5 lakh people died from road accidents in 2021, and this has been the trend for several years.

According to National Crime Records Bureau (NCRB) data from 2021, driving under the influence of drugs/alcohol contributed to 1.9% of deaths from accidents.

Further, nearly 90% of deaths on the road were due to speeding, overtaking, and dangerous driving.

According to the World Bank's data from 2019, India ranked first among the top 20 countries for road accidents.

Causes:

Infrastructural Deficits: Pathetic conditions of roads and vehicles, poor visibility and poor road design and engineering – including quality of material and construction, especially a single-lane with a sharp curve.

Negligence and Risks: Over speeding, driving under the influence of alcohol or drugs, tiredness or riding without a helmet, driving without seatbelts.

Distraction: Talking over mobile phones while driving has become a major cause of road accidents.

Overloading: To save on the cost of transportation.

Weak Vehicle Safety Standards in India: In 2014, crash tests carried out by the Global New Car Assessment Programme (NCAP) revealed that some of India's top-selling car models have failed the UN (United Nations)'s frontal impact crash test.

Lack of Awareness: Regarding the importance of safety features like airbags, Anti lock Braking system etc

OUTCOMES

Road accidents can result in a wide range of physical injuries, from minor cuts and bruises to severe injuries such as broken bones, spinal cord injuries, traumatic brain injuries, and amputations. These injuries can impact a person's health and well-being, leading to long-term disabilities and reduced mobility

1. Improved emergency response: Locating accident hotspots can help with the more effective use of emergency response resources. By strategically positioning ambulance services, establishing reachable helplines, and improving communication infrastructure, the response time to accidents can be shortened. This might be able to save lives by offering the injured folks urgent medical attention.

2. Cost savings. Accident locations can be improved for financial gain. The strain on healthcare systems can be lessened by lowering the incidence of accidents and the resulting injuries. Additionally, fewer accidents mean fewer claims, insurance payouts, and legal expenses, which could translate into savings for both individuals and society at large.

3. By addressing accident-prone regions, it is possible to reduce the number and severity of injuries sustained in traffic accidents. By implementing safety measures including speed limit enforcement, crash barriers, improved lighting, and pedestrian- friendly infrastructure, injury risks can be lowered.

4. It's important to keep in mind that achieving these goals necessitates a comprehensive approach that involves citizen involvement, government action, and ongoing monitoring and assessment. The specific outcomes of optimising accident locations in India would depend on the effectiveness and application of these techniques in each region.

These are the challenges in reducing the accidents in India. And we should take in mind these challenges to overcome the incredible accidents. The below is the bar graph that represents the accidents that are occurred over the year 2018 to 2021. This graph helps us to analysis the distribution of accidents over the specific number of years.

CHALLENGES

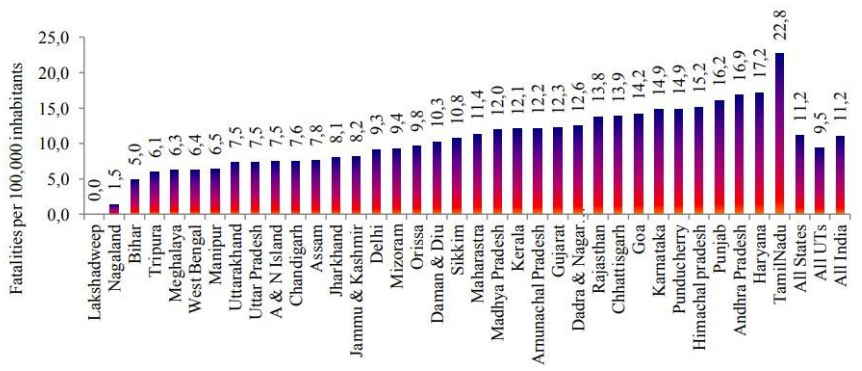


Fig. Road Accident Fatality Risk in Indian States and Union Territories in 2013

1. Traffic congestion and infrastructure strain: Accidents often lead to traffic congestion, particularly in urban areas, as they block roadways and impede the flow of vehicles. Congestion not only causes delays and frustration for motorists but also hampers emergency response times. Moreover, road accidents can damage infrastructure, such as road surfaces, signage, and guardrails, requiring repairs and maintenance.

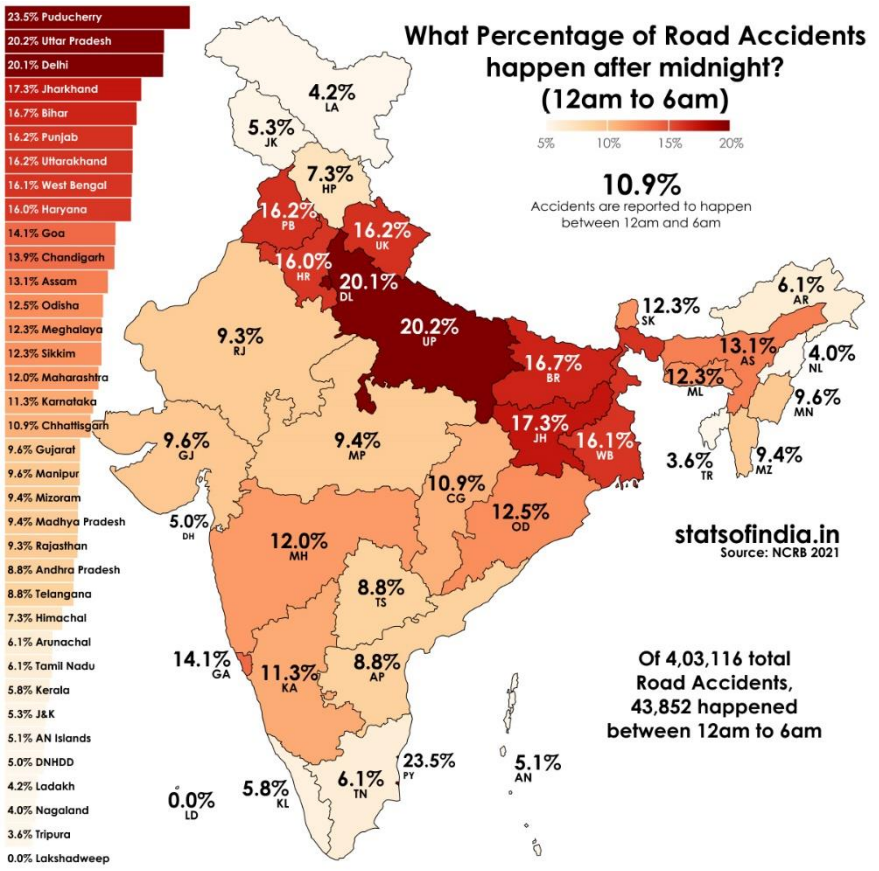
2. Economic impact: Road accidents have substantial economic consequences for individuals, communities, and governments. The costs associated with medical care, rehabilitation, and vehicle repairs or replacement are considerable. Additionally, accidents often result in loss of productivity due to injuries or fatalities, as well as traffic congestion and delays, which affect the overall economy.

3. Burden on healthcare systems: Road accidents place a significant burden on healthcare systems, especially in cases of severe injuries. Emergency medical services, hospitals, and rehabilitation facilities need to be adequately equipped and staffed to handle the influx of accident victims. The demand for medical resources can strain healthcare systems, affecting the availability and quality of care for other patients as well.

4. Social and cultural implications: Road accidents can have broader social and cultural implications. They contribute to a climate of fear and uncertainty among road users, affecting their confidence and behavior on the roads. Moreover, accidents can strain social relationships and communities, leading to increased distrust and feelings of insecurity among residents.

5. Emotional and psychological impact: Road accidents can have a profound emotional and psychological impact on those involved. Survivors may experience post-traumatic stress disorder (PTSD), anxiety, depression, and other mental health issues. Witnessing or being involved in a severe accident can leave lasting psychological scars on individuals, affecting their quality of life and well-being.

6. Loss of life and injuries: The most significant challenge posed by road accidents is the loss of human life and the resulting injuries. Road accidents can lead to fatalities, causing immense grief and loss for the victims' families and friends. In addition, survivors of accidents may sustain severe injuries, leading to long-term disabilities and physical or psychological trauma.



HARDWARE IMPLEMENTATION

Implementing solutions for road accidents often involves a combination of hardware and software models. While software models primarily handle data analysis, simulation, and decision-making, hardware models provide the necessary physical infrastructure and equipment for accident prevention, detection, and response. Here are some examples of hardware models commonly used in road accident implementations:

1. Emergency Response Equipment: Emergency response equipment such as ambulances, fire trucks, and rescue vehicles equipped with medical supplies, hydraulic tools, and specialized equipment are critical for prompt response to accidents. They facilitate the rapid transport of injured individuals to hospitals and enable rescue operations in critical situations.

2. Roadside Signs and Signals: Proper signage and signaling systems are crucial for accident prevention and driver guidance. This includes traffic signs, signal lights, lane control signs, and variable message signs. Well-placed and visible signage helps drivers navigate safely and reduces the likelihood of accidents caused by confusion or lack of information.

3. Intelligent Transportation Systems (ITS): ITS encompasses various hardware components, such as sensors, detectors, and communication devices, that are integrated into the transportation infrastructure. These devices can collect data on traffic flow, speed, and vehicle presence, which can be used to detect accidents, trigger alerts, and optimize traffic management.

4. Traffic Cameras: Surveillance cameras placed at key locations along roads can capture real-time video footage, which can be used for monitoring traffic conditions, detecting accidents, and assisting in incident management. These cameras can provide valuable visual information to aid in accident investigation and analysis.

5. Vehicle Safety Technologies: Vehicle manufacturers have incorporated numerous safety features to reduce the risk of accidents and minimize their impact. Examples include anti-lock braking systems (ABS), electronic stability control (ESC), collision warning systems, adaptive cruise control, lane departure warning systems, and automatic emergency braking. These technologies are designed to assist drivers and mitigate the effects of potential accidents.

It's worth noting that the choice of hardware models depends on the specific objectives and requirements of the road accident implementation. Collaboration between transportation engineers, hardware manufacturers, and software developers is often necessary to ensure seamless integration between hardware and software components, creating a comprehensive system for accident prevention, detection, and response.

CONCLUSION

Road accidents have become a leading cause for fatalities and injuries globally with India being the leading country in this regards. The huge loss of life and attendant economic losses are highly avoidable and require urgent measures to be adopted for effective mitigation. The BRO, as a premier road construction agency, is responsible to ensure that road safety provisions on all its roads are made to international standards and are aligned towards not just reducing accidents but also preventing them altogether. Spreading awareness on the aspects of road accidents and road safety requirements must become a key agenda for the BRO thereby enhancing the scope of the organisation’s contribution to Nation Building.

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