GURUGRAM POLICE
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GURUGRAM VISION ZERO
SAFER STREETS SAVES LIVES

GURUGRAM

CRASH REPORT 2023

TOWARDS ZERO TRAFFIC DEATHS AND INJURIES

PREPARED AND EDITED BY

Raahgiri Foundation (www.raahgirifoundation.org), a non-profit trust, working towards the mission of improving the quality of life in India's cities and towns. Established in 2015, the Raahgiri Foundation emerged as a dynamic coalition, fostering innovation and collaboration among State Governments, City administrations, NGOs, Private sectors, and Funders.

The primary aim of this foundation is to actively **engage, demonstrate, and advance** models that contribute to the development of livable cities and communities. Committed to achieving Sustainable Development Goals (SDGs) 13, 11, 5, and 3, the foundation focuses on the following key aspects: Climate Change, Public Health, Road Safety, Inclusive Infrastructure, and Environmental Awareness, using tools and activities like Civic Participation, Capacity Building, Advocacy, and youth empowerment especially through our Raahgiri Day Program.

By strengthening urban capacities and resources, Raahgiri Foundation's aim is to achieve its mission of transform urban mobility & public spaces and create livable, accessible, and equitable cities. Raahgiri Foundation believes that the level of quality in citizenship, along with the quality of infrastructure and services, collectively shapes the overall quality of life.

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As we navigate the bustling streets of Gurugram, it is imperative that we prioritize the safety of ourselves and our fellow citizens. Our foremost duty is to ensure the safety and well-being of every individual in our community.

Road safety is not just a matter of following traffic rules; it's about safeguarding lives and preventing avoidable tragedies. Through proactive enforcement of traffic laws, public awareness campaigns, and collaboration with other stakeholders, we strive to create a safer environment on the roads. Our role extends beyond mere enforcement; we are committed to promoting a culture of responsible driving and pedestrian behavior. By working together with the public, we can significantly reduce the incidence of road accidents and make our streets safer for everyone. The Gurugram Crash Report, sheds light on the pressing issues surrounding road safety and highlights the need for immediate action to prevent further loss of lives. The data presented in this report motivates us to improve the current state of road safety in our city, It is essential for decision-makers, policymakers, and residents alike to understand the gravity of this situation and come together to address it.

Through collaborative efforts and a collective commitment to change, we can work towards creating safer roads and a more secure future for all.

Sincerely
Shri. Vikas Kumar Arora, IPS
Commissioner of Police
Gurugram

Road crashes have emerged as a silent epidemic in our society, yet each one is entirely preventable. It is imperative that we prioritize road safety as an essential component of community development, by saving lives through data-driven solutions, engineering interventions, education, stakeholder engagement, and law enforcement.

The primary objective of Gurugram crash report 2023 is to raise awareness among the appropriate stakeholders regarding the issues and strategies necessary to avert such incidents. This comprehensive report delves into the evidence-based causes, locations, and types of crashes occurring in Gurugram, while also addressing the identification and mitigation of blackspots throughout the district. Collaboratively, the district administration of Gurugram, in partnership with Raahgiri Foundation and Nagarro, is actively engaged in the Gurugram Vision Zero project, hosting monthly road safety meetings with key road-owning agencies. Through these efforts, coordinated decisions are made to implement corrective measures at identified blackspots, resulting in enhanced coordination and synergy among stakeholders, as well as the implementation of crucial infrastructure and road engineering interventions. The Gurugram crash report underscores the importance of the "6Es" approach— Education, Engineering, Enforcement, Emergency response, Engagement, and Evaluation— with the overarching goal of reducing road crash fatalities by 50%.

In 2023, the Gurugram Administration conducted capacity-building workshops and joint field visits with Gurugram Traffic Police, GMDA, PWD, and NHAI, marking significant progress in our shared mission.

I extend my heartfelt appreciation to all involved parties for their unwavering dedication and commitment to this critical cause. The Raahgiri Foundation's adoption of a scientific and evidence-based approach, coupled with their collaboration with civic agencies, has been instrumental in addressing faulty road engineering and mitigating accidents, deserving of our utmost praise.

Shri Nishant Yadav, IAS
Deputy Commissioner
Gurugram

Every life lost on our roads is a tragedy, and it is our solemn duty to do everything in our ability to prevent such occurrences. Ensuring the safety of our people on the roads is paramount, and the Gurugram Traffic Police is fully committed to this cause.

We recognize the urgent need for safe roads and streets in our district with designated pedestrian crossings, cycling lane, safe mobility of two wheelers and all our road users. Through initiatives like the District Road Safety Meetings and the Gurugram Vision Zero program, we are working tirelessly to identify and rectify the challenges faced by both our citizens and our department in ensuring road safety.

In 2023, the Gurugram Traffic Police issued 14 lakh challans and collected a revenue of 31 crore, specifically targeting drink-and-drive cases during night hours.

We also ensure that women in the city feel safe. Therefore, our team is working towards the verification of all auto drivers in Gurugram and has provided help line numbers 1095 and 1091, which are active at all times in case of emergencies.

However, we understand that enforcement alone cannot solve the complex issues on our roads. That's why we actively highlight areas with infrastructure gaps and work towards their resolution. With our personnel constantly present on the ground, we ensure that accurate information is shared with stakeholders to achieve informed decision-making.

This annual report on Gurugram Crashes serves as a valuable resource for administrators, policymakers, and civil society organizations involved in road safety. By working together and implementing evidence-based solutions, we can prevent road accidents and ensure that every journey is a safe one for our citizens.

Shri. Virender Vij
DCP Traffic, Gurugram

The only acceptable number for road crash deaths is zero. We do not accept deaths due to flight crashes, and we do not accept deaths due to train crashes. Then how can we accept deaths due to road crashes?

When we spend so much time and effort in the hospital system to reverse diseases and to fight for each and every life, how can we as a society turn a blind eye to road crash deaths and disabilities? Yet, India loses over 160,000 lives each year to road crashes.

Gurugram is a special city. It has one of the highest per capita incomes in India. It is one of the fastest growing cities in the country. It is a city where the administration, industry, media and citizens groups often come together to address the city's opportunities and challenges. If we have to win the battle against road crash deaths and disabilities, there is no better place to start than in Gurugram.

The Gurugram Crash Report is one such effort. To tackle an enemy, we must first understand it. This report is a step in that direction. The granularity of data and the analysis adds a story to the numbers. It lets the raw tragedy of each crash escape the fate of becoming just another dry statistic.

Manas Human
Co-Founder Nagarro

PREFACE

The Gurugram Crash Report offers a comprehensive examination of the critical issue of road crashes in the district of Gurugram. It serves as an vital resource for various stakeholders, including individuals, government officials, researchers, and policymakers, by providing valuable insights and data-driven recommendations to tackle the alarming rate of road-related fatalities and injuries.

In recent years, the rise in road crashes has emerged as a significant concern, claiming numerous lives and causing serious injuries to individuals and families. Recognizing the urgency of this matter, this report delves deep into the underlying causes of these crashes, understand their locations, identifying the most affected victims, and exploring effective strategies to mitigate such incidents while promoting a sustainable transportation network.

By prioritizing sustainable infrastructure and alternative mobility options, we can create a safer and healthier city, where dedicated cycling lanes, improved pedestrian walkways, and well-lit intersections facilitate safer travel for all. This report paves the way for that vision.

As we embark on this journey together, let us recognize the critical role we each play in safeguarding lives on the road. By understanding the insights and recommendations presented in this report, we can collectively work towards creating safer, more resilient communities where every individual can travel without fear of harm.

We extend our sincere gratitude to all those who have contributed to this report. Your dedication and commitment to this cause are invaluable, and it is our hope that this report will serve as a catalyst for positive change in road safety efforts across Gurugram and beyond.

Let's work together to make Gurgaon a model for sustainable and safe transportation.

Sarika Panda Bhatt
Co-Founder Raahgiri Foundation

ACKNOWLEDGMENT

We extend our heartfelt gratitude to all the individuals and organisations who have contributed to completing the Gurugram Crash Report 2023. This endeavour would not have been possible without their support, guidance, and cooperation.

First and foremost, we express our sincere appreciation to the District Commissioner (DC) administration, the Institute of Road Accident Data (IRAD) department, Gurugram Traffic Police, Gurugram Metropolitan Development Authority (GMDA), National Highway Authority of India (NHAI), and Gurugram Metropolitan City Bus Limited (GMCBL) for providing valuable data, insights, and assistance throughout the process. Their collaboration and efforts have been instrumental in enriching the content and analysis of this report.

We are grateful to Nagarro, our CSR partner, for their support in facilitating our work on this report, which contributed significantly to our mission of promoting road safety and preventing crashes. We also appreciate the collaboration of Plaksha University, whose expertise in data analysis, particularly in analysing pedestrian safety data using machine learning techniques, greatly enhanced the quality and depth of the report.

Special thanks go to our mentor, Advait Jani, whose guidance and encouragement were invaluable in shaping the direction and scope of this report, particularly in understanding pedestrian and cyclist safety infrastructure in the district.

Finally, we express our gratitude to all individuals, stakeholders, and participants who shared their knowledge, expertise, and perspectives during this project, shaping the content and recommendations of this report.

Together, this report will serve as a valuable resource for policymakers, stakeholders, and the community in their efforts to enhance road safety and prevent crashes in Gurugram.

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01 INTRODUCTION

Gurugram envisions a city that offers enhanced opportunities for residents to thrive professionally and personally. Drawing inspiration from the urban planning principles of Sir Patrick Geddes, who emphasized the pivotal roles of WORK, PLACE, and FOLK in human existence, Gurugram seeks to integrate workspaces, living spaces, recreational areas, and cultural hubs. The essential link connecting these facets is a robust transportation system. Amid rapid urbanization in the NCR's millennium city, there's a growing demand for an efficient transportation network. However, the current supply of services remains insufficient, leading to a significant reliance on private modes of transportation. This surge in motor vehicles has prompted increased construction of roads, bridges, flyovers, tunnels, and highways. Unfortunately, poor design and construction quality have elevated the risk of road crashes in the city.

1.1 ABOUT CRASHES

A road crash, refers to an incident involving one or more vehicles, or pedestrians on a road, resulting in damage to property, injury, or loss of life. Road crashes can occur for various reasons, including driver error, mechanical failure, adverse weather conditions, or infrastructure deficiencies. The severity of a road crash can range from minor fender-benders to more severe crashes causing significant injuries or fatalities.

The Haddon Matrix is a systematic approach to comprehensively analyse a site's safety. William Haddon developed this two-dimensional model in 1980, applying fundamental principles of public health to motor vehicle-related injuries. The first dimension categorizes the phase of injury into pre-crash, crash, and post-crash, while the second dimension considers the four factors of injury: human, vehicle/equipment, physical environment, and socioeconomic.

Completing the Haddon Matrix involves evaluating sites or crash details associated with a particular site or multiple sites. Once finalized, it provides valuable insights into potential safety issues, concerns, and possible solutions. This model is highly effective for pinpointing where and when to implement traffic safety countermeasures and planning the collection of crash-related data.

The significance of the Haddon Matrix lies in each cell, representing a distinct area where interventions can be identified and implemented to enhance transportation system safety.

For example, consider the Haddon Matrix constructed from a series of crashes in an urban area. In the top-left cell, which corresponds to pre-crash human factors, potential modifications to driver behaviour are identified to decrease the likelihood or severity of a collision. In the provided example table, these include issues such as poor vision or reaction time, alcohol consumption, speeding, and risk-taking.

Table 1: Haddon Matrix - Road crashes

	Human	**Vehicle/ Equipment**	**Physical environment**	**socio economic**
Pre-Crash	Poor Vision or reacting time, alcohol, speeding, risk taking	Failed breaks, missing lights, lack of warning systems	Narrow shoulders, ill-timed signals, poor road geometry, absence of lane markings and safe sight distance	cultural norms permitting speeding, red light running, DUI
Crash	Failure to use occupant restraints	Malfunctioning safety belts, poorly engineered air bags	Poorly designed guard rails	Lack of vehicle design regulations
Post Crash	High susceptibility, alcohol	poorly designed fuel tanks	Poor emergency communication system	Lack of support for EMS and trauma systems

The matrix presents a spectrum of potential issues that can be tackled through various counter measures, encompassing education, enforcement, engineering, emergency response solutions, Engagement and Evaluation—the 6Es of safety .

The FIR data from road crashes in Gurugram in 2023 reveals a significant threat to life and well-being, resulting in enduring physical, psychological, and financial challenges for individuals.

Addressing the challenge of road crashes necessitates a shift from car-centric urban planning to creating safe and accessible cities with dedicated, universally accessible infrastructure for pedestrians, cyclists, two-wheelers, and public transport. Critical steps include encouraging public transport usage, expanding bus routes, and developing secure pedestrian crossings at junctions. Prioritizing the protection of all road users, especially vulnerable members of society, is critical to achieving a transformation that enhances overall community well-being in Gurugram.

1.2 About Blackspots

The Ministry of Road Transport and Highways (MoRTH) defines a black spot on a National Highway as a 500-meter stretch where either five road crashes (involving fatalities or grievous injuries) occurred over the last three calendar years, or there were ten fatalities during the same period. While these criteria are officially designated for National Highways, a similar methodology has been applied to identify blackspots on other major and minor roads in Gurugram.

This identification process has revealed 36 black spots in the district. This report will briefly analyse these blackspots and their underlying causes and propose remedial measures to reduce crashes and fatalities.

Conducting thorough audits and adhering to audit guidelines is essential to curbing fatal rates in the area. Regular inspections prompt the administration to take pre-emptive measures to prevent future incidents. Close coordination between the audit team and road authorities is crucial to creating safer stretches within existing constraints.

Until a blackspot is rectified, immediate cautioning of road users is imperative to saving lives. Special attention must be given to the requirements of vulnerable road users. Providing clarity to road users and minimizing confusion should be a high priority.

1.3 World Trend in Road Crashes 2023

The Global Status Report on Road Safety 2023 reveals a slight decline in the annual number of road traffic deaths, totalling 1.19 million in 2023 from 1.3 million in 2022. However, the World Health Organization reports a significant economic toll, with many countries experiencing a 3% loss in GDP.

In response to these concerning statistics, the United Nations General Assembly has set a bold target to halve the global number of deaths and injuries from road traffic crashes by 2030. Tragically, road traffic injuries remain the leading cause of death among children and young people aged 5-29 years. Over half of these fatalities affect pedestrians, cyclists, and motorcyclists, particularly those residing in low and middle-income countries.

Figure 1: Worldwide crashes 2023

The Global Plan for the Decade of Action emphasizes the importance of a comprehensive approach to road safety. It advocates for ongoing enhancements in city planning, road infrastructure, and vehicle design, alongside the strengthening of laws and their enforcement. Moreover, the plan stresses the critical need for timely emergency care for the injured, which can save lives. Furthermore, the Global Plan promotes transport policies and road designs that prioritize safe walking, cycling, and public transport. By positioning these modes of transportation as healthy and environmentally sustainable, the plan aims to create safer and more sustainable urban environments for all.

1.4 National Trend in Road Crashes 2022

India leads globally in the total number of persons killed in road crashes, with China and the United States following closely behind.

In 2022, India witnessed a staggering 4,61,312 road crashes, resulting in 1,68,491 fatalities and 4,43,366 injuries. These figures reflect an 11.9% increase in crashes, a 9.4% rise in deaths, and a significant 15.3% surge in injuries compared to the preceding year. There is possibility of under reporting and as per the UN projections, India might have encountered 3 times more crashes than recorded.

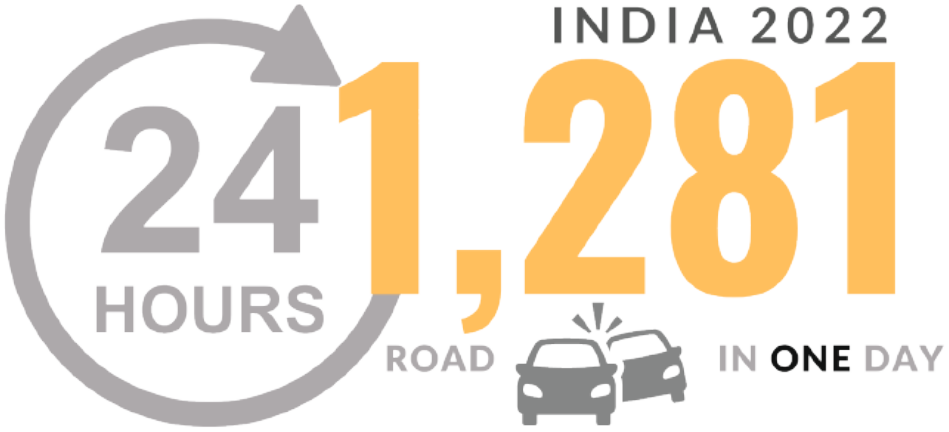


Figure 2: Number of Crashes in India in 24 hours

In 2022, India experienced more than 1200 road crash incidents every single day. If we look closely, this means that, in each hour 53 people are meeting with a road crash. These numbers are enough to raise the concerns for protecting our people on roads.

Figure 3: Number of crashes in India in 1 Hour

Looking at the fatalities, 1,68,491 people died in road crashes in one year, depictingg that every hour 19 people were dying on our roads. More than one-third of the people meeting with a road crash dies on the road.

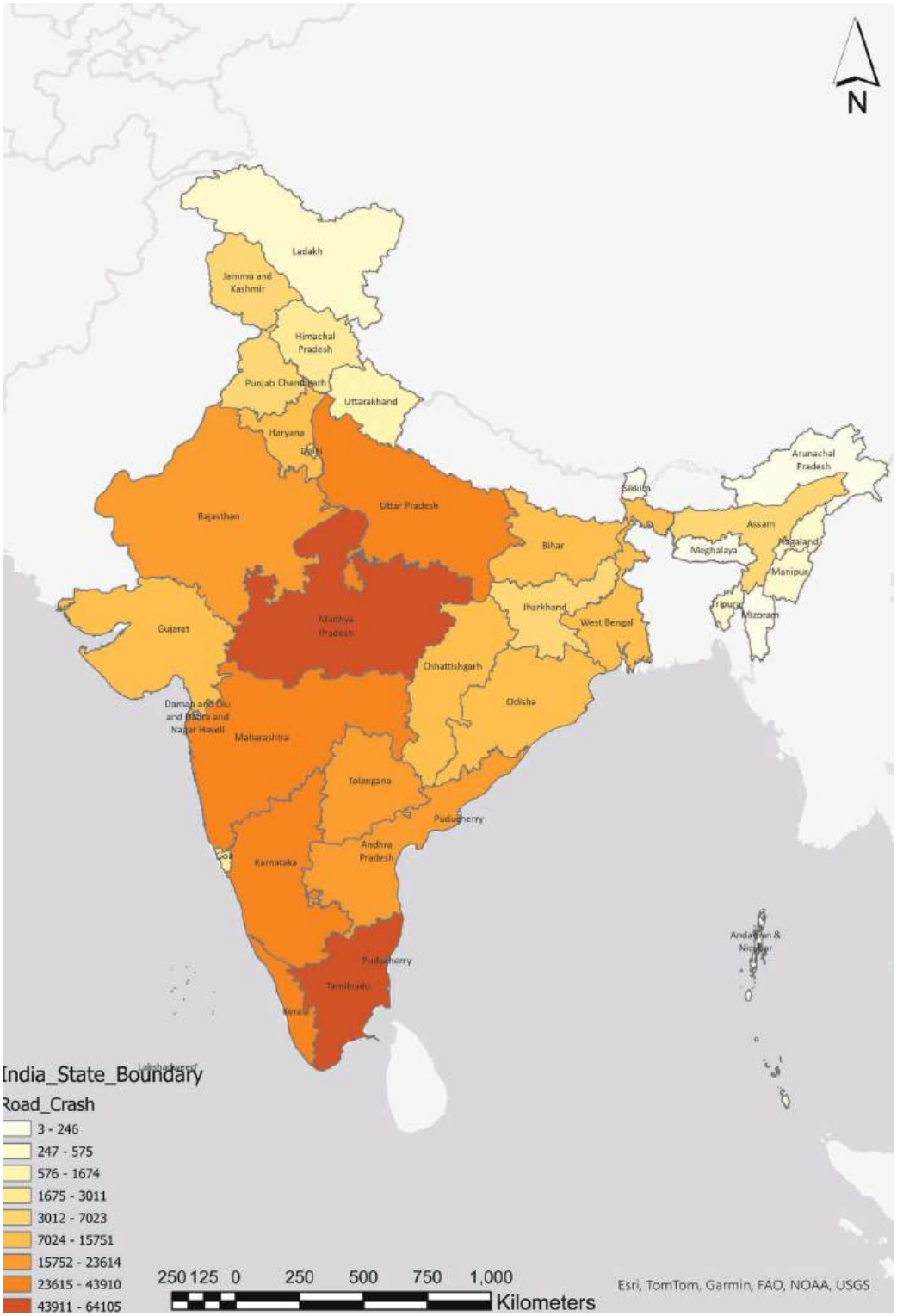
The data also shows that, on average, one person is killed in a road crash in every three minutes. This is an alarming situation and a wakeup call for all the authorities and concerned bodies to take actions in mitigating the road crashes.

Figure 4: Number of Deaths in India in 1 year

Figure 5: Number of Deaths in India in 1 hour

Figure 6: Number of deaths per minute, India 2023

Analysis of the crashes on different types of roads reveals that 32.9% of road deaths occurred on National highways having roughly 2.1% of the roads in India, and expressways, contributing to 36.2% of the total fatalities. State Highways witnessed 23.1% of crashes and 24.3% of fatalities, while the remaining 43.9% of crashes and 39.4% of deaths transpired on other roads. In 2022, young adults aged 18 to 45 comprised 66.5% of the victims, and individuals within the working age range of 18 to 60 constituted a staggering 83.4% of the total road crash fatalities.



Map 1: State-wise Road crash criticality 2022

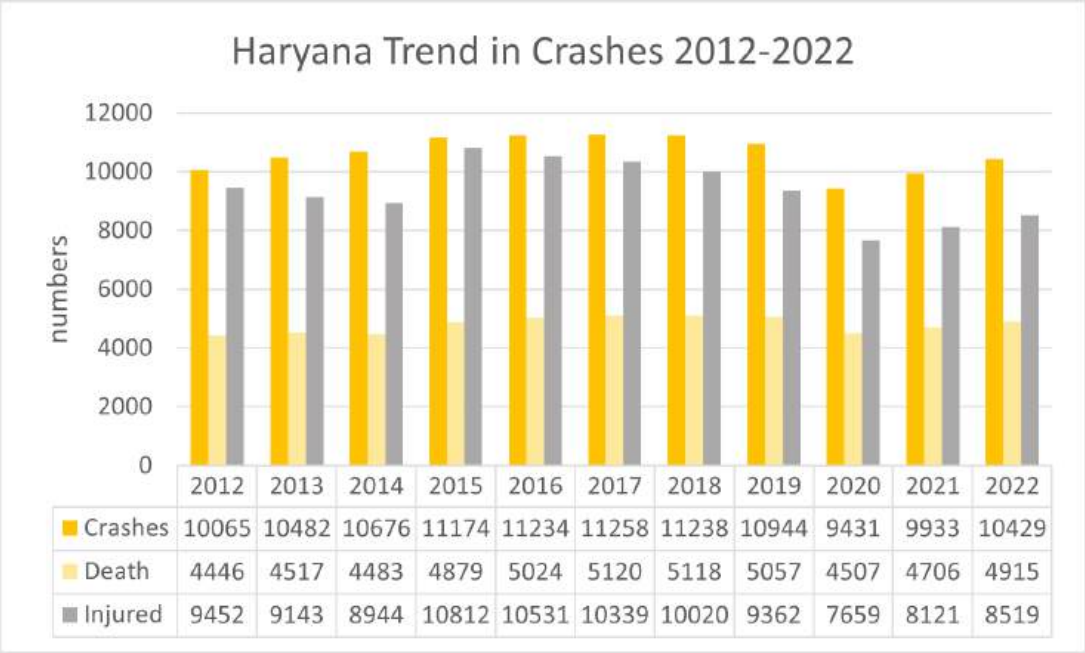
Additionally, two-wheeler riders claimed the highest proportion of total fatalities, representing 44.5% of individuals killed in road crashes in 2022. Pedestrian road users constituted the second-largest group, accounting for 19.5% of deaths.

The map shows the ranking of Indian states and Union Territories based on road crashes in 2022. Tamil Nadu holds the highest rank, reporting 64,105 road crashes, followed by Madhya Pradesh with 54,432 road crashes during the same period. Haryana occupies the 15th position, recording 10,429 crashes and 4,915 fatalities. Additionally, it ranks 7th with 16.5 deaths per lakh population, highlighting the severity of road accidents in the state.

Source: Annual report on Road accidents in India 2022 (MORTH).

1.5 Haryana Trend of Crashes

Haryana ranks as the 15th state in India in terms of road crashes. Over the past decade, the state has consistently recorded approximately 10,000 crashes annually. In 2022, there were 10,429 crashes, showing a marginal 3% increase from the 10,065 crashes recorded in 2012. However, fatalities increased by 10% during the same period, rising from 4,446 deaths in 2012 to 4,915 deaths in 2022. Conversely, injuries resulting from crashes decreased by 11% between 2012 and 2022 .



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Crashes	10065	10482	10676	11174	11234	11258	11238	10944	9431	9933	10429
Death	4446	4517	4483	4879	5024	5120	5118	5057	4507	4706	4915
Injured	9452	9143	8944	10812	10531	10339	10020	9362	7659	8121	8519

Figure 7: Haryana trend in Road crashes 2012-2022

Haryana accounts for 2.1% of India's total population but contributes to more than 2.9% of road traffic fatalities. Road traffic crash severity of state is such that, 47 people are killed in every 100 road crashes. However, only 10% of road share being allocated to National Highways, they account for 32% of crashes in Haryana. State highways, covering 7% of the road network, experience 21% of crashes, with the remainder occurring on other category roads. The vulnerable road users, including two-wheelers, cyclists, and pedestrians, account for 69% of fatalities in the state. To flattering the curve, Haryana Vision Zero (HVZ) program, an initiative of Haryana Government, launched by Hon'ble Chief Minister of Haryana, Shri Manohar Lal Khattar on 2nd May 2017 at Gurugram. Haryana became the first state of India to adopt Vision Zero Program based on safe system approach. Since the launch of the HVZ program, it is observed that Haryana saved 1525 lives between 2017 and 2019, estimated by extrapolating the trend of road traffic fatalities in a 'business as usual' scenarios. Economically, government has also saved Rs. 1,824 million worth of expenditure by the successful implementation of the HVZ program. The road safety scenario in Haryana was transformed during HVZ program.

The state has a projected population of 3 crore in 2022, and 30,000 KM of roads and it is equipped with 177 traffic police stations , 11 trauma care centres, and 425 ambulances. However, there is a requirement for 300 trauma centres in the state and 175 more ambulances. Emergency aid provided to road crash victims in Haryana reveals that 60% received first aid, while 75% were transported to the nearest hospital within the golden hour.

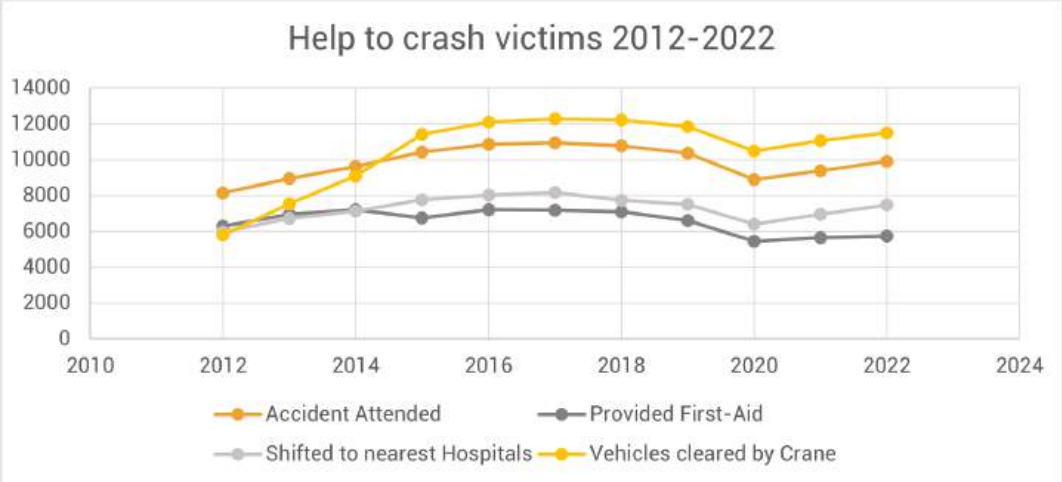
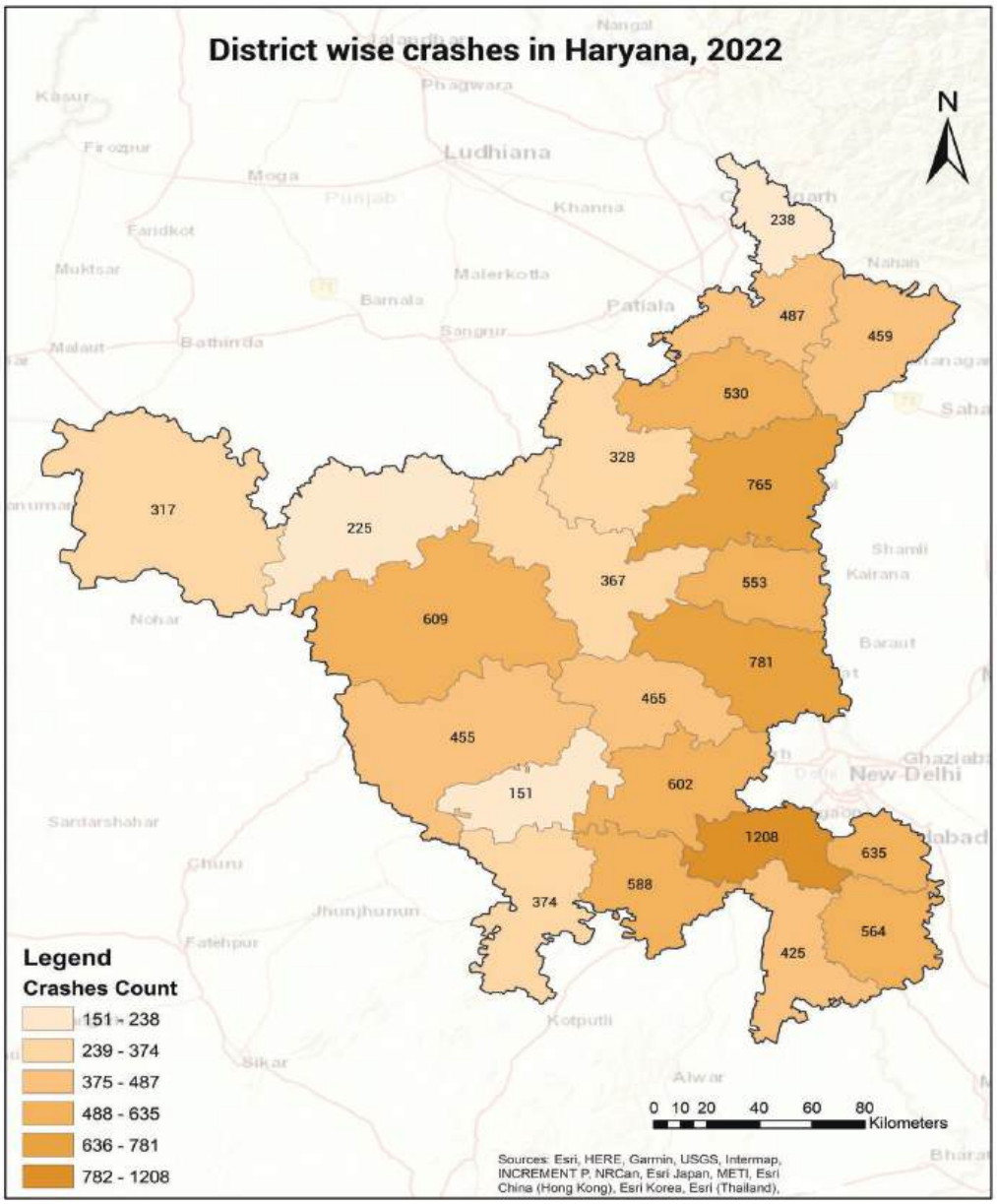


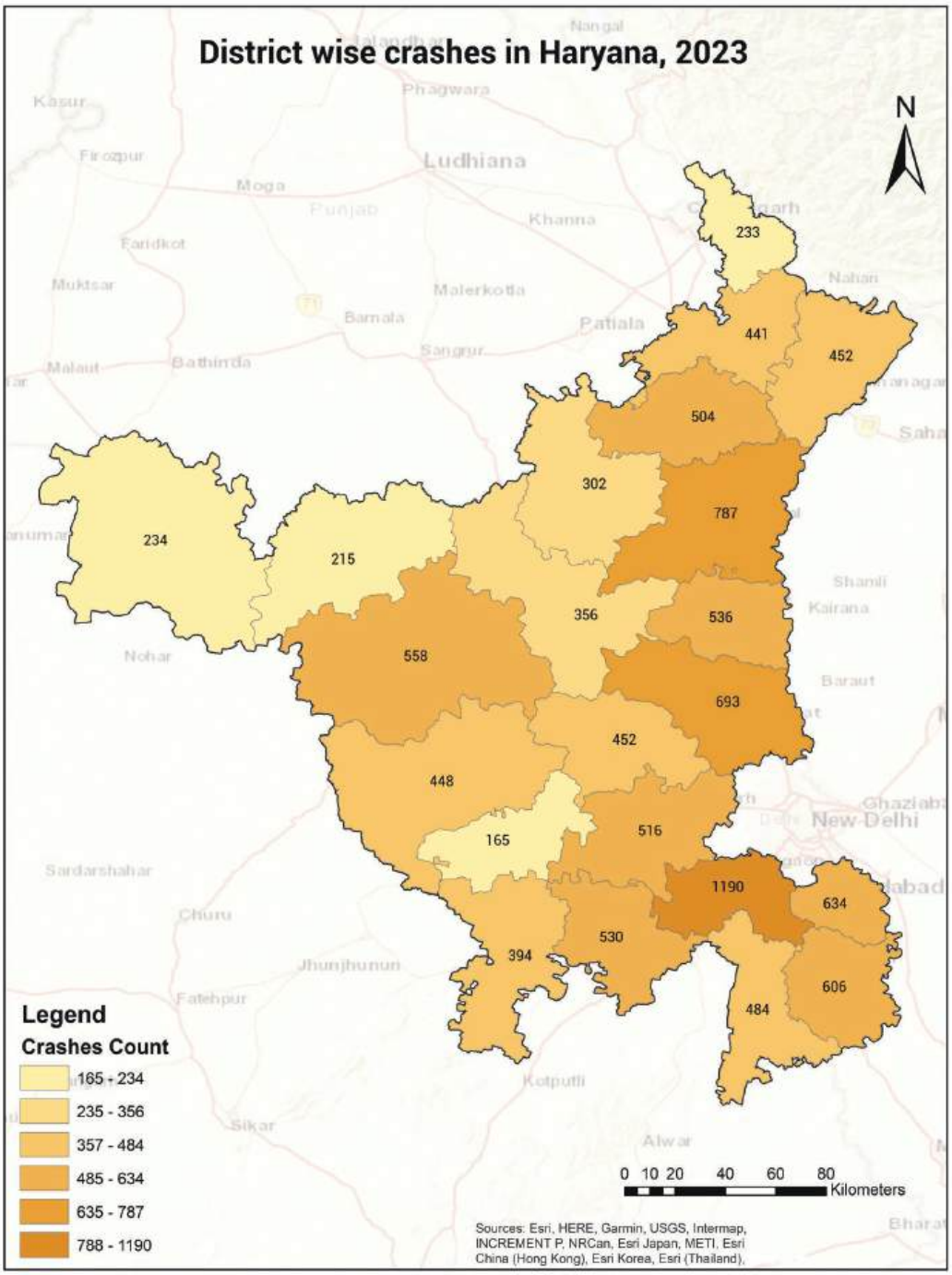
Figure 8: Haryana trend in help received to victims 2012-2022

Criticality of districts (2022 and 2023)

In terms of district-wise criticality, Gurugram stand out with the highest crash and fatality rates, followed by Karnal and Panipat.



Map 2: District wise comparison of road crashes in Haryana 2022



Map 3: District wise comparison of road crashes in Haryana 2023

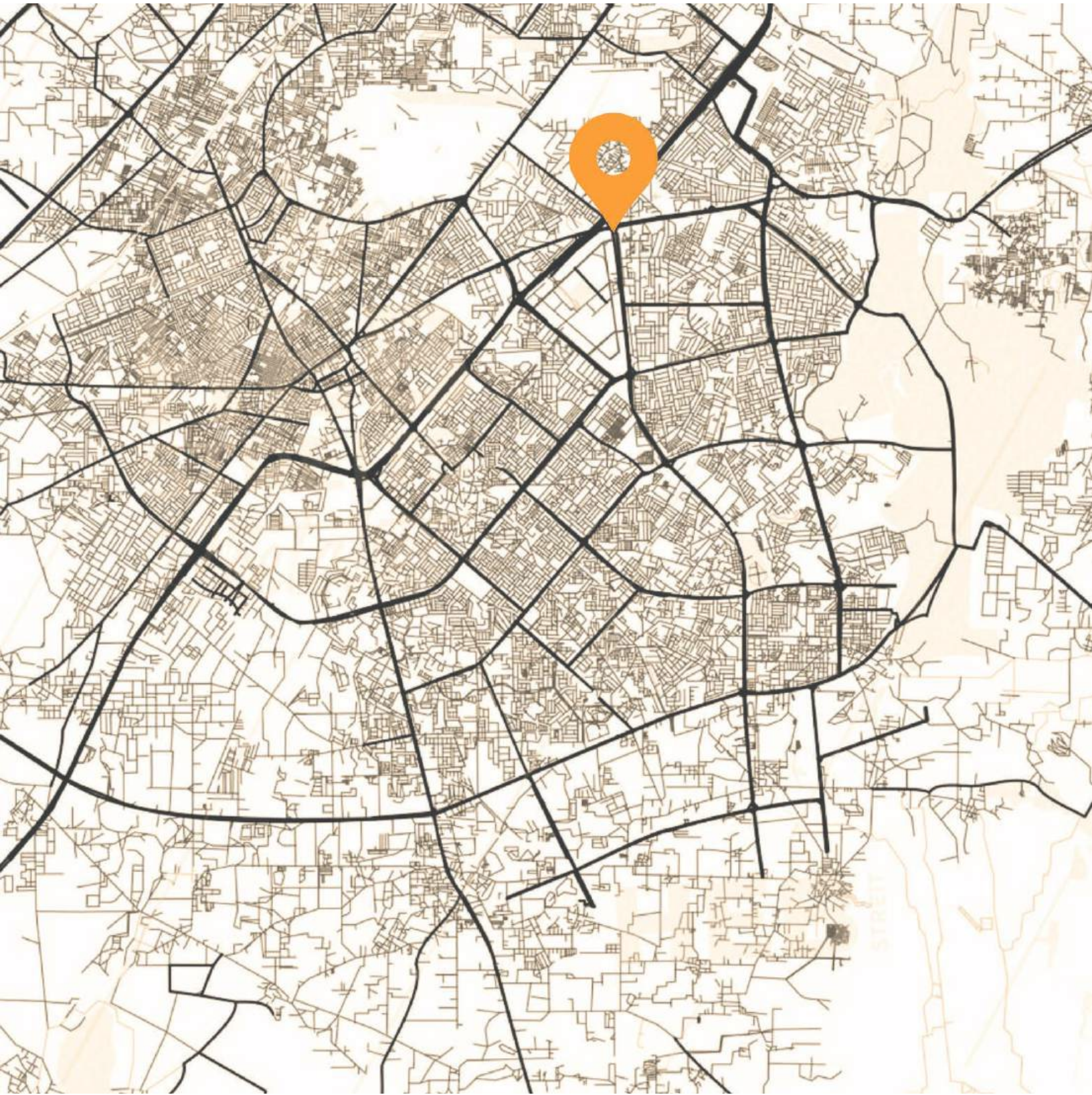
These districts experience high crash rates primarily because they offer significant employment opportunities, leading to increased travel to and from these cities. Consequently, the risk of crashes rises due to higher traffic volumes and various other factors. This report will detail the specific causes of crashes in the Gurugram district.

In contrast, the lower crash data in other districts can be attributed to several factors. Non-metropolitan cities or those farther from the national capital may report fewer incidents due to less rigorous reporting mechanisms. Additionally, these areas often have lower motor vehicle registration rates, which naturally leads to fewer crashes. As the number of vehicles increases, so does the likelihood of accidents.

While walking and public transport are the most sustainable and safest modes of commute, the rapid growth of our cities often outpaces the implementation of proper safety interventions. This mismatch exacerbates the risk of road crashes, highlighting the urgent need for comprehensive road safety measures.

Responding to this challenge , the Gurugram Vision Zero initiative was launched in 2021 under Chief Minister Manohar Lal Khattar's leadership, aiming to eliminate road fatalities in the district. The recent data of Haryana Road crashes 2023 shows that Gurugram still remains the district with highest crashes. The trend of crashes is similar in Haryana but the synergies need to be diverted to stop or minimize the number of crashes by applying immediate interventions on ground.

02 CITY & SERVICES



2.1 About Gurugram

Gurugram is one of the rapid growing cities in the state of Haryana and it is also part of the National Capital Region (NCR) of India. The city had a population of 10.08 lakh as per 2011 India census.

Gurugram has now emerged to become a city with the third highest per capita income in India. Popularly known as Millennium City, Gurugram has the presence of about 250 of the Fortune 500 companies. Maruti Suzuki Limited was the first company that set up a manufacturing unit in the city in 1970s manufacturing cars. DLF Limited and other real estate companies acquired vast stretches of land in the city in 1980's. Today, Gurugram has emerged as one of the most important offshoring centres in the world, providing outsourcing solutions in software, IT, service and sales through delivery facilities and call centres. The integrated approach in the Industrial Policy of the Government to develop industrial infrastructure, has boosted up the industrial sector growth in Gurugram with nearly 260 large and medium scale industrial units and 8,000 small-scale units located in the area.

2.1.1 Demography of Gurugram

As per the Gurugram CMP (2020), the population (2019) for Gurugram- Manesar Urban Complex (GMUC) study area is estimated as 16.82 lakh. It is expected to grow to 42.5 lakh by 2031 as per Final Development Plan 2031. There are 8.34 Lakh male and 7.72 Lakh female in the district. The sex ratio is 854 females for 1000 male while the literacy rate is 84.7%. The study area is 338 km2 excluding defence land. The proposed overall gross population density of GMUC area is 126 PPHa.

2.1.2 Road Infrastructure of Gurugram

An inventory of about 953 km of road network consisting of expressway, arterial, sub-arterial and collector streets was carried out. It is observed that right-of -way of about 31% of roads are less than 15m while only 26% of roads has more than 45m. Further 32% each of the road network is two lane and four lanes. Speed and delay studies reveal that about 51% of total network lengths have speeds less than 30 kmph whereas 11% of the lengths have speed greater than 60 kmph.

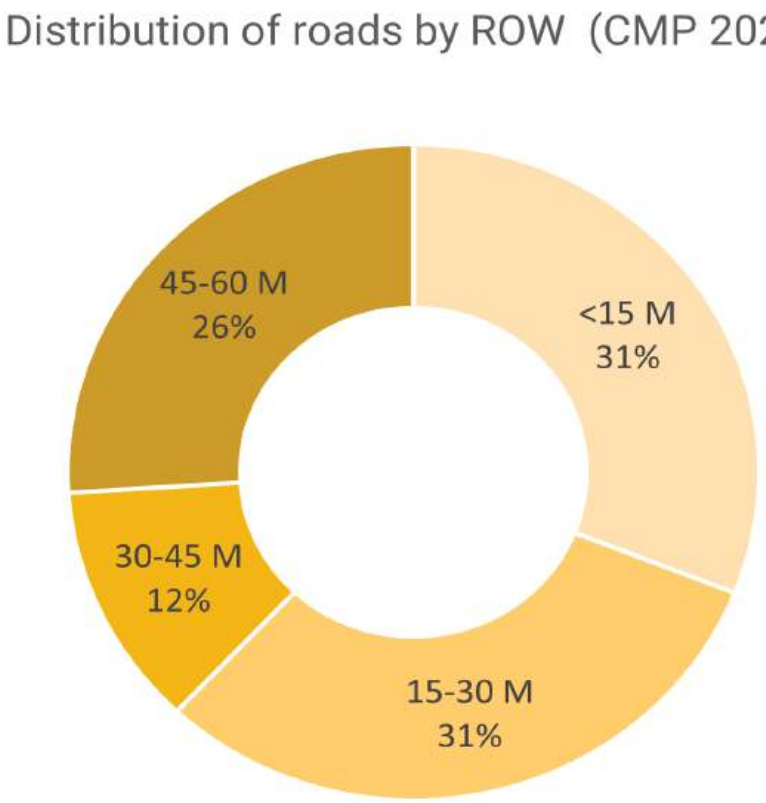


Figure 9: Distribution of roads by ROW (CMP 2020)

The distribution of modal shares reveals that public transport accounts for 9%, while auto-rickshaws (IPT) constitute 13%, car users make up 14%, and two-wheelers represent 28%. However, pedestrians and cyclists make up the largest portion at 36%. Despite this significant share, there is a noticeable lack of focus on building infrastructure to support these non-motorized modes of transportation. Additionally, there is a need to understand the reasons behind the low modal share of public transport, considering it is a sustainable mode of transportation after walking and cycling.

Table 2: Modal share distribution of Gurugram 2020

Source CMP 2020	
Modal share of Gurugram	
Public Transport	9%
IPT	13%
Cars	14%
Two wheelers	28%
Pedestrians + Cyclists	36%

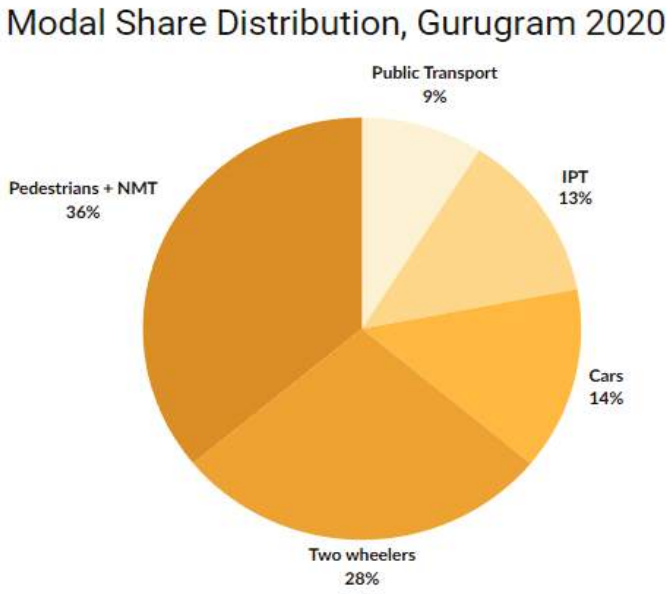


Figure 10: Modal share distribution in Gurugram 2020

Traffic details

A total traffic volume of 4,47,519 passenger car units (PCUs) enter and 4,49,722 PCUs leave Gurugram daily at 11 outer cordon locations. Traffic desire pattern analysis reveals that out of the total intercity (external) traffic movement, almost 75% of traffic is destined from external areas to internal areas and vice versa followed by 25% from external-to-external areas (through). The estimated population of the study area in 2019 is 16.82 lakh. The average household size in the study area has been estimated as 3.8 persons. The average household monthly income is Rs 24,652 and about 10% of the average household income is incurred on transport expenses. About 65% of households own private two wheelers while 23% own cars.

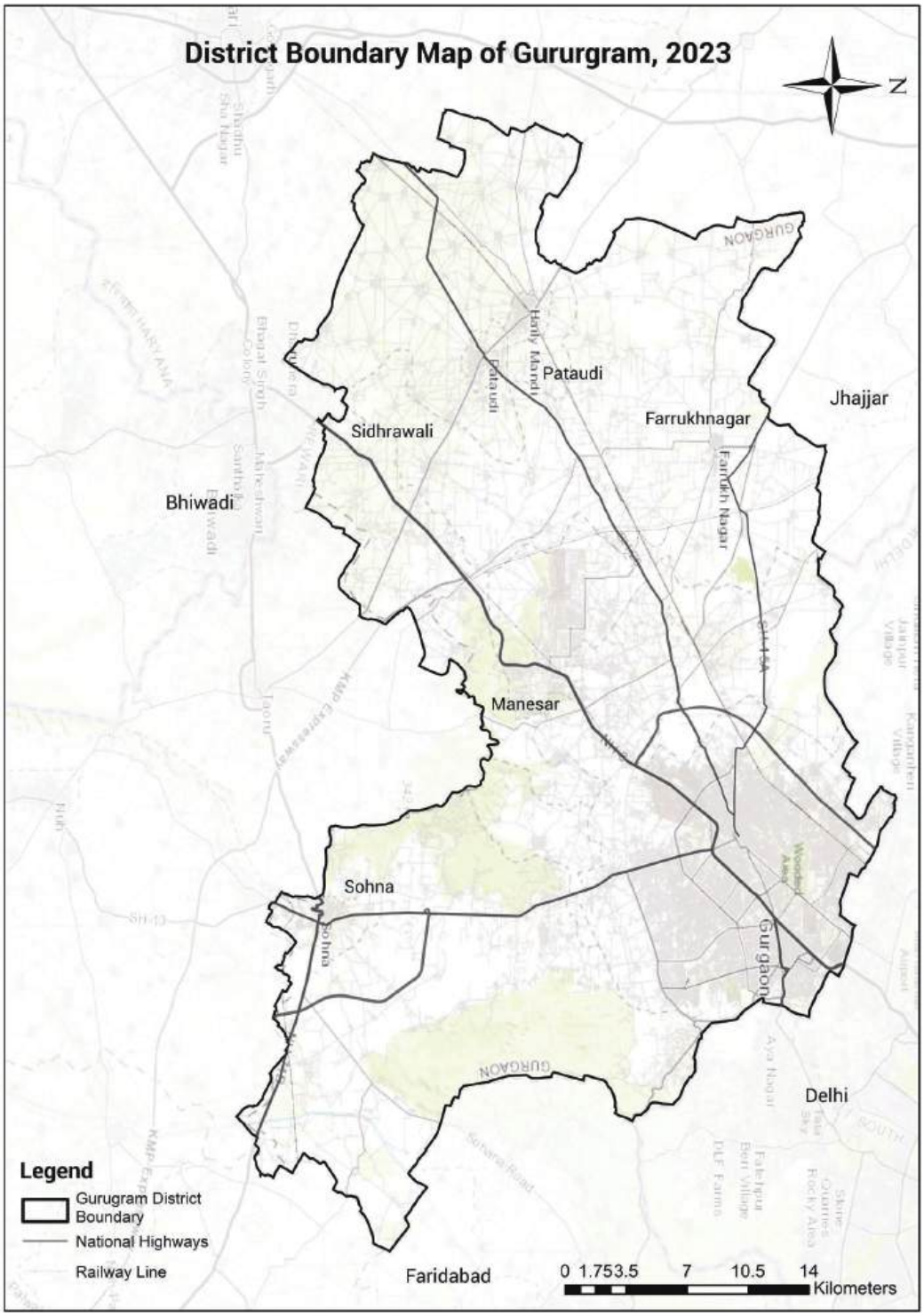
An estimated 21.88 lakh intra-city motorised trips are performed daily in the study area. The per capita trip rate (PCTR) including walk trips is 1.90 while it is 1.30 without walk. Of the total trips including walk, 33% trips are made by walk while 9% trips are by public transport.

About 57% of the trips are performed for work purposes followed by 29% for education related travel. For trips excluding walk, 14% of trips are by public transport while the share of two wheelers and cars are 41% and 20% respectively. Overall, the average trip length is 6.8 km. The mode wise average trip lengths vary across different modes of transport namely 7 km for buses, 5.5. km for two wheelers and 9.1 km for cars respectively. The two wheelers are predominantly used for intra-city travel while cars to some extents are used for inter-city commuting. Owing to poor intra city bus services, there is huge dependence on personalised modes of transport leading to traffic congestion and poor quality of environment.

2.1.3 Admin boundaries

There are multiple institutions involved in development and operation of urban transport services. GMDA also known as Gurugram Metropolitan development authority is responsible for mobility planning and management of major roads coming in its jurisdiction. There are two corporation agencies in the district, MCG (Municipal corporation of Gurugram) and MCM (Municipal Corporation of Manesar) which has the authority to mobilize the movement of traffic on its roads as well as build the services like drainage network, storm water network of the roads for better level of services. (source: GMDA).

The district boundary and other major roads have been highlighted in the Map 3. There are majorly 4 national Highways – NH48, NH-248A NH-248BB, NH-352W and 3 expressways – NE4 and KMP expressway and Dwarka expressway crosses the district. There are few state highways SH-15A, SH-132-133, SH-136, and SH-137 undertaken by Pwd division (B and R). The other major and minor roads are owned by GMDA, MCG and MCM.



Map 4: Gurugram District Map

2.2 Relation between Motor Vehicles and Crashes

The number of active private vehicles in the district has surged from 5,885 vehicles in 2013 to 140,900 vehicles, raising significant concerns regarding road safety and highlighting issues related to the lack of public transport and last-mile connectivity. This exponential growth has prompted the need for wider roads, high-speed roadways, and expressways within the city. In addition to this, the active commercial vehicles in Gurugram are 1,11, 592 vehicles including Motor car, bike, goods carrier, three wheelers, tractors, cabs, buses, ambulances, vans, firefighting trucks etc. The commercial vehicle registration has been increased to 46% since 2018.

The crashes have also shown an increase in 135% in Gurugram from 2018 to 2023. The data is horrifying as it highlights the fact that the greater number of vehicles we are inducing on roads, the threat to life in terms of road crashes is increasing at a much faster pace.

Table 3: Registration of Motorised vehicle in Gurugram District 2013-2023

MOTOR VEHICLES REGISTERED IN GURUGRAM DISTRICT 2013-2023					
Year	**Private Cars**	**M/Cycles Scooters**	**Others**	**otal Motor Vehicles**	**% increase**
2013	1245	4252	388	5885	
2014	1,288	4,270	403	5961	1%
2015	1,543	4,851	271	6665	12%
2016	2,800	8,936	315	12051	81%
2017	21,141	34,709	737	56587	370%
2018	39,030	62,635	1,932	103597	83%
2019	42,269	67,751	2,404	112424	9%
2020	32,232	43,463	1,854	77549	-31%
2021	43,321	45,853	2,135	91309	18%
2022	58,492	60,053	2,223	120768	32%
2023	67,572	70,840	2,494	140906	17%

The graph illustrates the trajectory of vehicle registration in Gurugram, showing a peak in 2017 followed by a dip in 2020 due to pandemic and further there is a growth in new vehicle registrations. Two-wheeler registrations have consistently surpassed those of motor car vehicles by twice the registrations until 2021, when the trend indicates a convergence in registration numbers between the two categories.

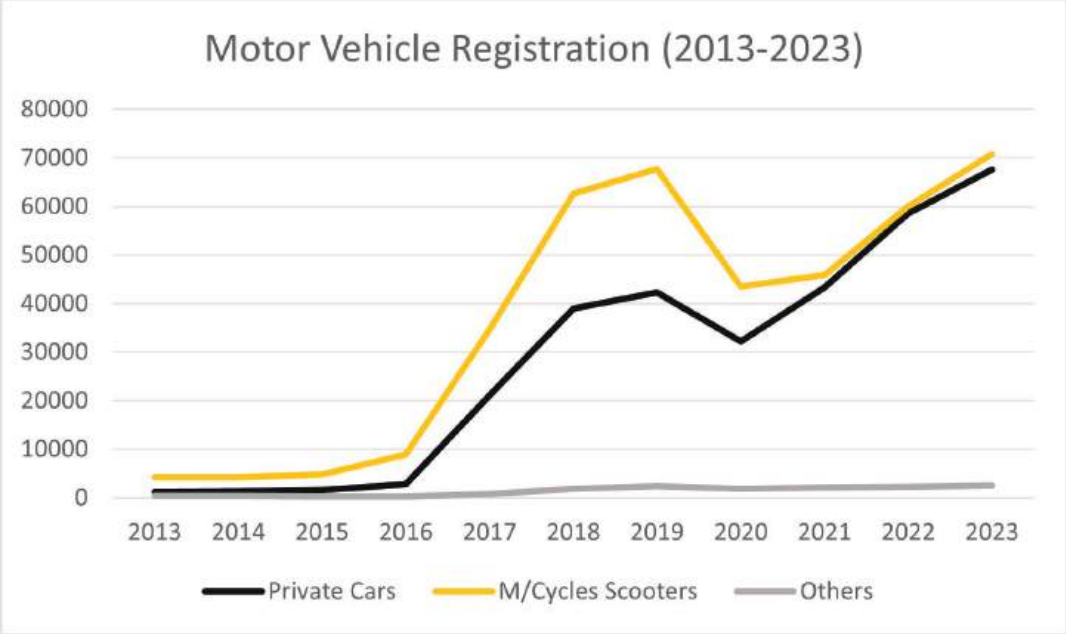


Figure 11: Motor vehicle registration 2013-2023

The year wise understanding of crash severity with respect of vehicle registration and projected population on road is highlighted below:

Table 4: Relation between Population, Motor vehicles, and Crashes 2013-2023

Year	Projected Population	Total Motor Vehicles	Crashes	Fatalities	Death Rate		Crash Severity*
					\One lakh population	\10,000 vehicles	
2013	12,87,297	5885	No Data	No Data	No Data	No Data	No Data
2014	15,24,785	5961	No Data	No Data	No Data	No Data	No Data
2015	17,36,263	6665	No Data	No Data	No Data	No Data	No Data

2016	19,52,751	12051	No Data	No Data	No Data	No Data	No Data
2017	21,55,898	56587	443	461	21.38	81.47	104.06
2018	22,60,761	103597	450	465	20.57	44.89	103.33
2019	23,63,906	112424	969	403	17.05	35.85	41.59
2020	24,03,906	77549	262	170	7.07	21.92	64.89
2021	24,60,000	91309	955	447	18.17	48.95	46.81
2022	25,90,000	120768	1040	404	15.60	33.45	38.85
2023	27,10,000	140906	1190	439	16.20	31.16	36.89

*(Note: - * Accident Severity: Road Accident deaths per 100 accidents.)*

The table above shows that in 2023 the new registration of motor vehicles was 16% higher than 2022 and approximately 14% of the crashes were increased in the city. The crash severity, 2023 was 36.89,which is less than 2020 where 67.89 persons were dying in every 100 crashes. According to the projected population figures of the district, approximately 27-28% of the population actively owns vehicles, with over 50% of these vehicles being two-wheelers. Despite this significant presence of vehicles on the road, there has been a decreasing trend in the death rate per lakh population from 2017 to 2023. However, in 2023, the data reveals that 16 individuals are losing their lives on Gurugram roads per one lakh population, and for every 10,000 vehicles on the road, 31 individuals succumb to road crashes. The severity of road fatalities in 2023 is alarming, with 36 individuals losing their lives per 100 crashes, indicating a high risk of fatalities on the roads.

Table 5: Monthly ownership of vehicles 2023

Month	Private Cars	M/Cycles Scooters	Others	Total Motor Vehicles
January	6476	4421	160	11057
February	4534	4605	220	9359
March	5911	5395	201	11507
April	5335	5328	203	10866

May	*5989*	*5514*	*196*	*11699*
June	*5511*	*5087*	*294*	*10892*
July	*4181*	*4825*	*190*	*9196*
August	*6557*	*6806*	*245*	*13608*
September	*5377*	*6768*	*188*	*12333*
October	*5699*	*6477*	*183*	*12359*
November	*6343*	*7287*	*179*	*13809*
December	*5659*	*8327*	*235*	*14221*
Total	*67572*	*70840*	*2494*	*140906*

The active vehicles in the district are approx. 9-10 lakh with the projected population of 2023 in Gurugram as 27.1 lac people (https://www.census2011.co.in/census/district/225-gurgaon.html). This makes 33% of the district population has motor vehicles. Hence, 1 in 3 persons have a motor vehicle in the district.

However, there is still 2/3rd of the population dependant on the public transport mode and walking/ cycling infrastructure, which needs to be developed for ease of mobility and better accessibility in the district.

Table 6: Relation between monthly ownership of vehicles and crashes 2023

Month wise registration and crashes of vehicles in 2023						
Month	**Private Cars**	**Crashes involving cars**	**M/Cycles Scooters**	**Crashes involving Two wheelers**	**Others**	**Total Motor Vehicles**
January	6476	46	4421	34	160	11057
February	4534	41	4605	41	220	9359
March	5911	64	5395	49	201	11507
April	5335	67	5328	53	203	10866
May	5989	65	5514	67	196	11699

June	5511	46	5087	46	294	10892
July	4181	75	4825	63	190	9196
August	6557	55	6806	42	245	13608
September	5377	78	6768	65	188	12333
October	5699	62	6477	64	183	12359
November	6343	60	7287	67	179	13809
December	5659	76	8327	48	235	14221
Total	67572	735	70840	639	2494	140906

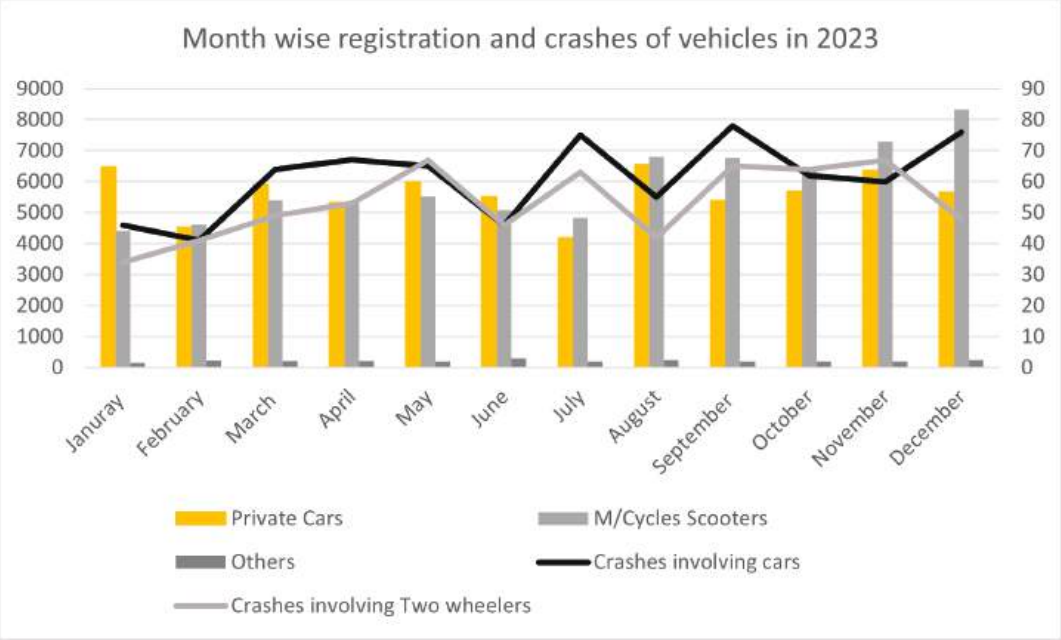


Figure 12: Month wise registration and crashes of vehicles in 2023

At first glance, there doesn't seem to be a clear correlation between the number of registered private cars and the number of crashes involving cars. Some months with higher registration numbers, like January and August, have relatively high crash counts than two-wheelers, while others, like February and June, have lower crash counts despite varying registration numbers. Data also shows that in month of July and September 2023, approximately 80 car users were involved in crashes whereas

the two- wheeler involvement was higher in November with approx. 65 crashes. However, only 15% of the two wheelers are causing crashes and 85% of them are either injured or exposed to fatal crashes. In case of four wheelers specially car/jeeps/van/taxi there are 70% of the vehicles responsible for causing crashes on roads.

2.3 Condition of Road Infrastructure (CMP)

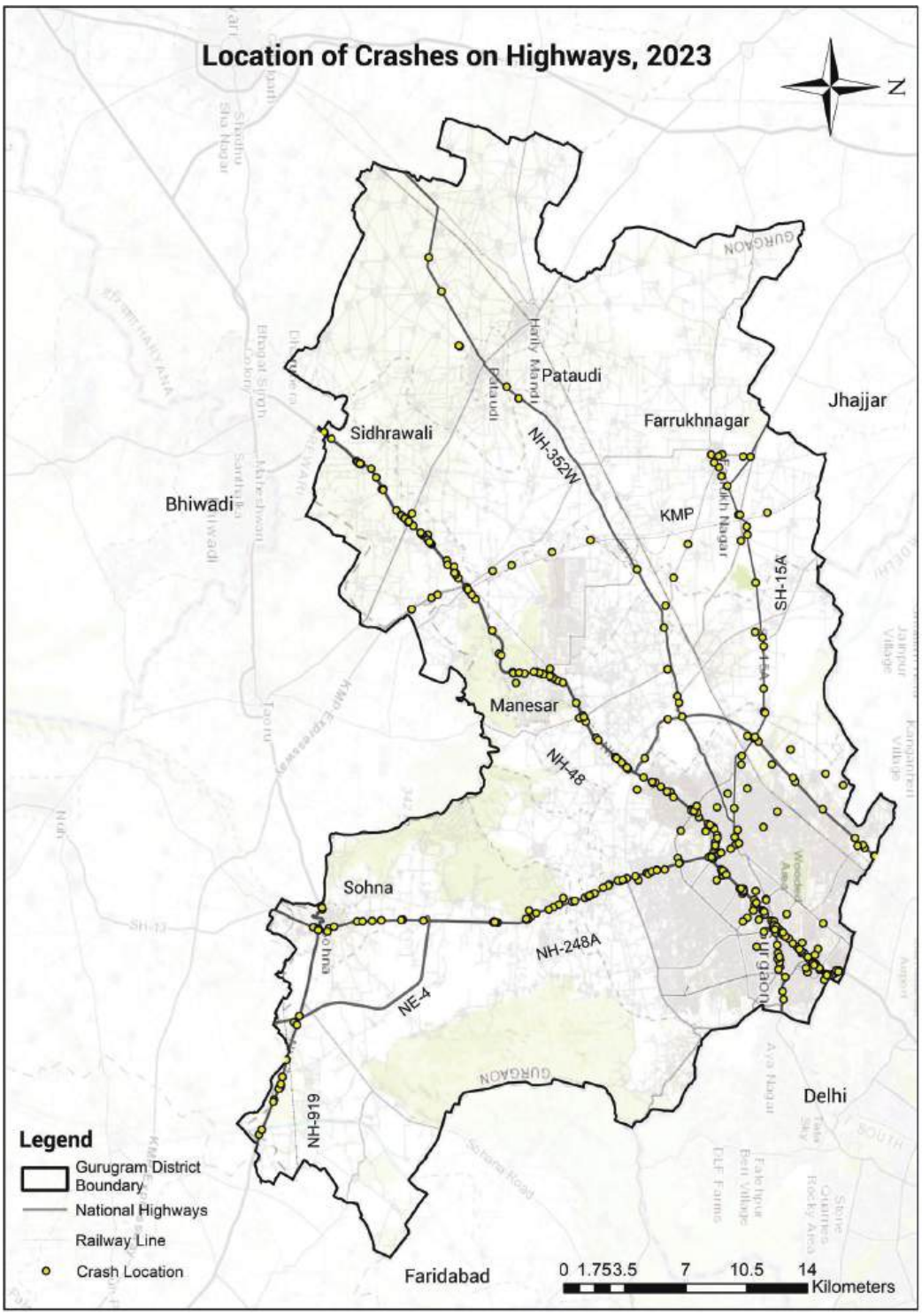
Infrastructure plays a vital role in providing the safe accessibility to the citizens. The existing infrastructure has 953 KM of road length. In 2019 data, Gurugram is one of the few cities in Haryana and India with multiple Expressways. It accounts for 4.9% of the entire network with an 8-lane carriageway apart from service roads and an 80-120 m wide ROW. However, there are 34.8% of the deaths only on National highways in 2023. Gurugram has 121 km of arterial roads and 191 km of sub-arterial roads of ROW 30 m or above. The rest of the 62.3% of roads are classified as Collector Roads, whereas the local roads are not taken into consideration for network development.

The main National Highway (NH – 48), also known as Delhi Jaipur Expressway, runs through the heart of GMUC and bifurcates it. It is approximately 32 km long. A 15-km stretch of Western Peripheral Expressway passes through the notified area, whereas an 18-km long Dwarka Expressway is under construction, which makes the tally 65 km. Other major arterial roads in the GMUC are Mehrauli Gurgaon (MG) Road, Basai Road, Pataudi Road, Faridabad Road, Old Delhi Road and Sohna Road. Few of them are reclassified into NH and SH. Golf Course Road and Golf Course Extension Road are two important arterial roads apart from the above-mentioned.

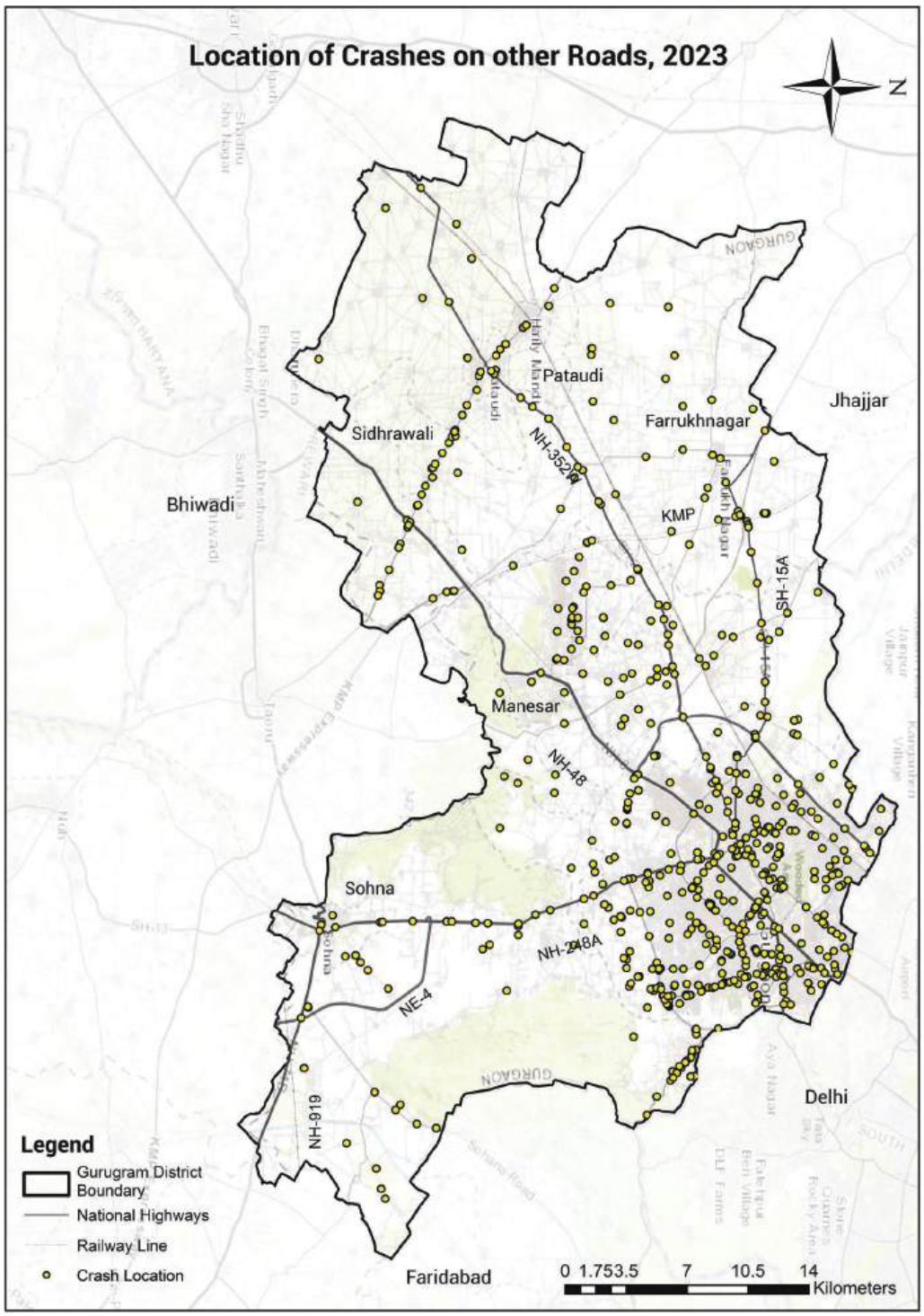
Although the district has wide highways and roads but it fails to cater the demand of transportation in the city. The rising concern is about the number of crashes which are increasing in the city with more length of wider and bigger roads. Our focus should not be on creating more roads but on creating safe roads for all road users.

Table 7: Distribution of Primary Road network length

S.no	Road Hierarchy	Length (km)	Share of Primary Network
1	Expressway	47	4.90%
2	Arterial	121	12.70%
3	Sub-Arterial	191	20.00%
4	Collector	593	62.30%
5	**Total Primary network**	**953**	**100.00%**



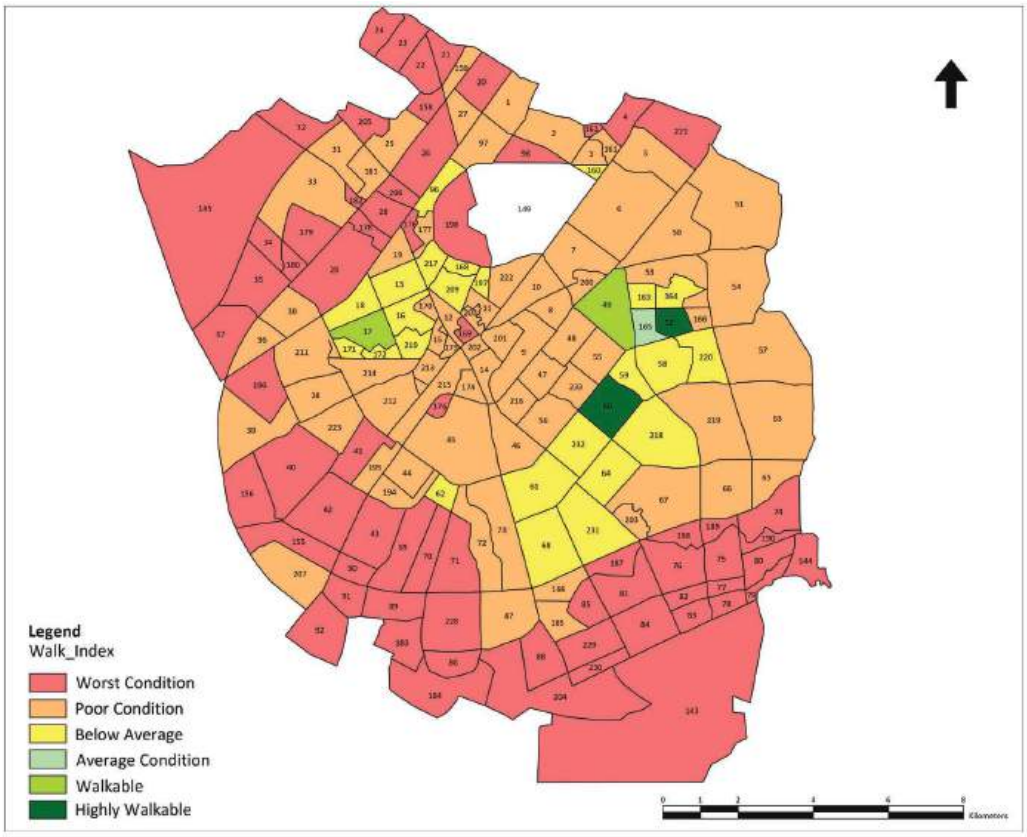
Map 5: Location of crashes on Highways and Expressways



Map 6: Location of crashes on other roads

2.3.1 Condition of Footpath and pedestrian crossings

As per CMP 2020, footpath is only on 14% of the roads in the district which is not maintained nor built as per standards. The map below highlights the walking index in the city with red colour highlighting the worst condition and the green pockets highlighting the highly walkable condition in the city. While it's challenging to assess the universal accessibility of these footpaths.



Map 7: Walkability index- sector wise in Gurugram

As per the study conducted by Plaksha University, 2023 there are 363 pedestrian crossing on secondary roads of the city covering 223 kms. According to the IRC standards, there should be pedestrian crossing in every 80-250 meters for a residential area and between 80-150 meters in commercial area. Therefore, there is 60% lack of pedestrian crossings in the city, even if we consider them to be at 250 meters at par.

The quality and functionality of infrastructure is retained only when it is designed as per the requirement of users and maintained regularly. This may include constructing seamless and inclusive paths, levelled pavements with sufficient space, user information, providing well-lit spaces, enforcing the encroachments and many more.

Looking at the images below, there are still many places in the city with no road markings, absence of pedestrian crossings and un-encroached footpaths, lack of safety hazards on roads, pothole free surface of the road or adequate height of the footpath from the road level. These attention to the details makes a lot of difference in the user experience on the road.

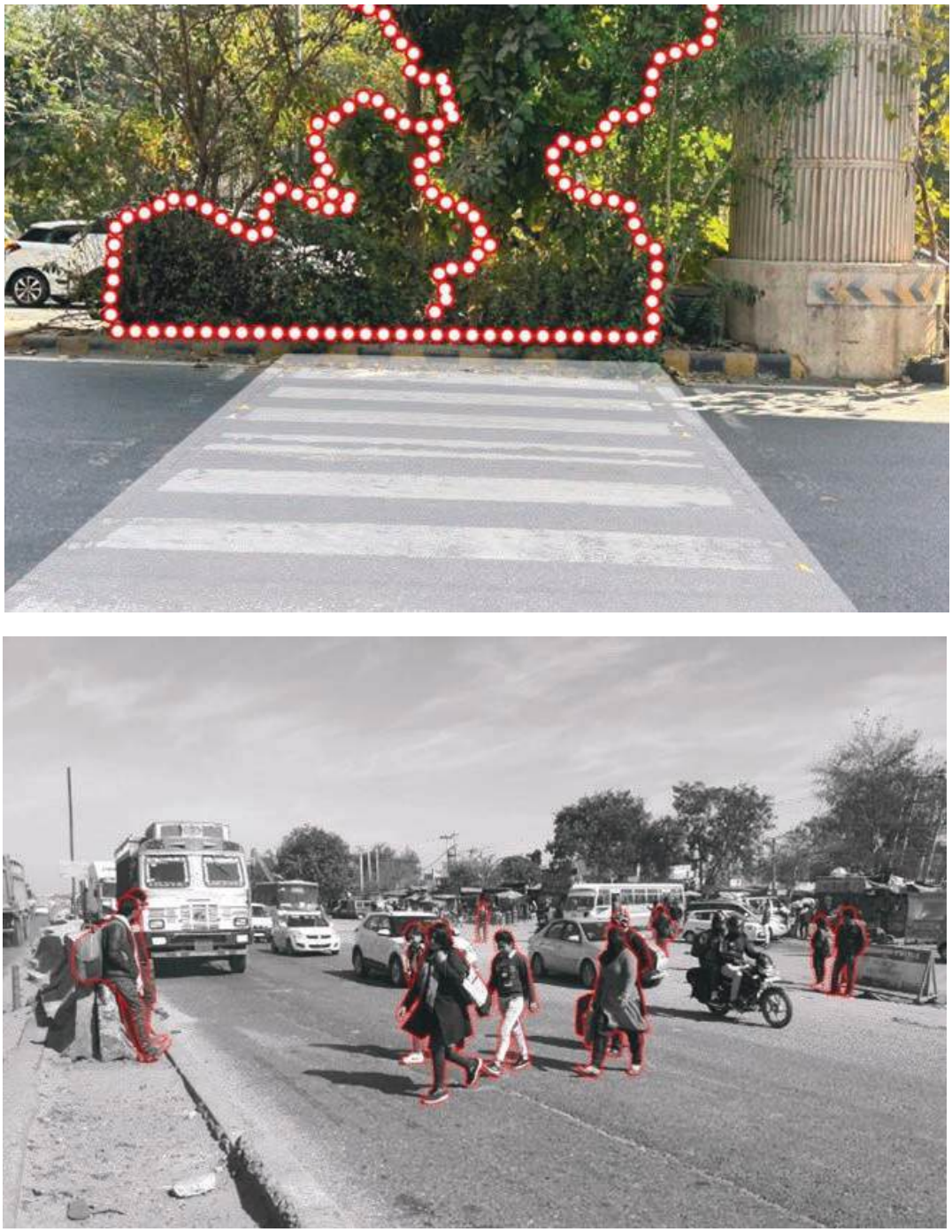


Figure 13: Images showing absence of pedestrian crossings at required location

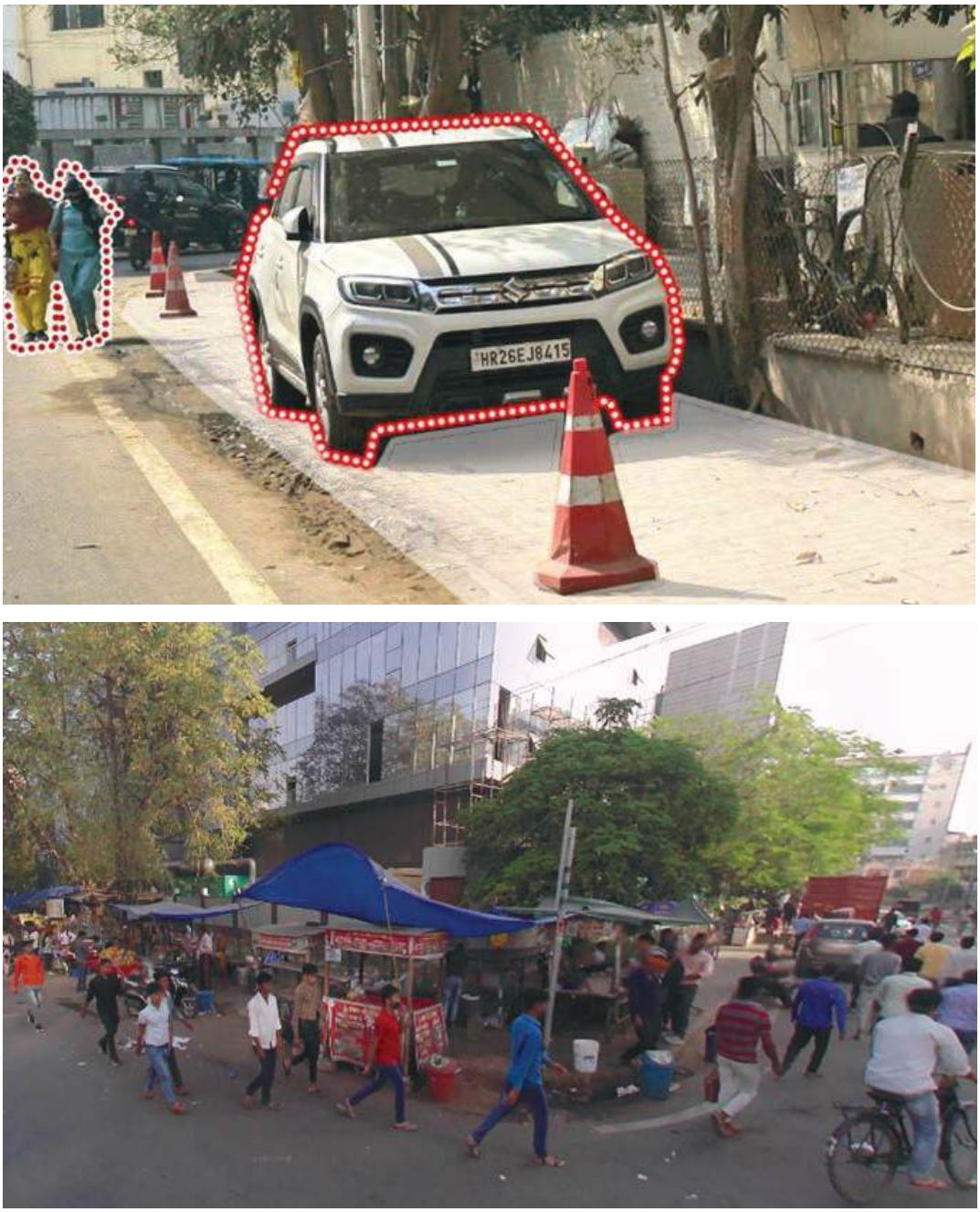


Figure 14: Encroached footpaths by vendors and car parking

If the infrastructure is delivered in the best quality, there will be less estimated arrival time and people will tend to use the road/ footpath or cycle track more than usual. If the roads are in disrepair, the footpaths are constantly encroached upon, and the cycle tracks are poorly maintained, it will create a sense of insecurity and obstacles, hindering the smooth movement of people. Thereby keeping the space underutilized.

Condition of Public Transport: As per the study by DIMTS in 2017, the total daily passenger demand generated for the city of Gurugram is 96,363 passengers with buses plying on 37 routes. There are around 300 bus stops operational in the city with the common origination point from city centre that is Bus Stand having coverage in all the directions. As per the benchmark, a city needs 60 buses per lakh population and with a city of 27 lac citizens there is a need for 1600 buses in total. The city lacks in organized public transport for local/intra -city transport. As an initiative by the Government, 40 CNG buses have been introduced recently for intra-city movement and on Delhi-Gurugram route. About 100 private minibuses are operated from Gurugram bus stand to various towns/villages in the vicinity such as Najafgarh, Bahadurpura, Maruti Udyog, IMT Manesar, Pataudi, etc. About 125 interstate buses operate between Gurugram and various States/cities daily. Interstate and local minibuses are operated from the bus terminal located near Fountain Chowk, is in the heart of the city. Total city buses operating in the city are 150.

Intra-city public transport system of the city is road based, with limited penetration of Metro system into the city, mainly provided by buses and Intermediate Public Transport (IPT) modes. Intermediate Public Transport (IPT) modes are compressing of all shared based modes. The IPT system comprises of auto rickshaws, e-rickshaws, Bolero and Tata Magic and is preferred over public bus system due to better connectivity, frequency, reliability and pricing. The total IPT route length is estimated to be 117 K.M. These modes operate on major hubs like metro stations, IFFCO chowk, Bus Stand and Rajiv Chowk. Six- seater auto rickshaws are operating on many routes in the city.

It was observed that more than 50% of the overall total trips in Gurugram are within 5 km which can potentially be either undertaken by walk or by non-motorized modes. Also, the most sustainable mode of transport will always be walking and cycling therefore there is also a need to build more cycle tracks and NMT infrastructure in the city. The estimated infrastructure required to build the cycle track is 800 km and the ROW above 24m roads will have 2.5m to 5m cycle tracks based on availability and ROW less than 24m will have 2.1m minimum cycle track as per CMP 2020.

03 ALL ABOUT CRASHES

Road Crashes are rising concerns in Gurugram, with a notable increase of 168% in crashes over the past seven years. While data for minor crashes was not recorded in 2017 and 2018, but a closer examination of the years 2021 to 2023 reveals a consistent upward trend in crash rates within the district. In 2021, there were 944 crashes reported, increasing to 1040 in 2022, and further escalating to 1190 in 2023.

Comparing 2023 to the preceding year, there has been a 14% rise in crashes, with total injuries increasing by 15% and road deaths by 8%. Notably, pedestrian deaths have seen an 8% increase, two-wheeler deaths have surged by 16%, while fatalities involving four-wheelers have witnessed a 35% decline.

In 2023 alone, there were 1190 reported crashes, resulting in 439 deaths, representing 36% of total fatalities. The total number of injuries, ranging from severe to minor, amounted to 1020, involving 85% of individuals affected. These individuals have suffered both financial and physical losses due to crashes.

Pedestrian deaths, comprising nearly 12.5% of total crashes, account for 34% of fatalities, making it the second-highest victims in road deaths. Meanwhile, two-wheeler deaths constitute the highest proportion at 43.5% of total fatalities.
This data, extracted and evaluated from FIR entries on the Harsamay portal, has been updated by the Traffic Police of Gurugram.

Table 8: Yearly Trend of crashes in 2017 to 2023

S.no	Crash data	2017	2018	2019	2020	2021	2022	2023	% increase (2022 and 2023)	Total
1	Total Crashes	443	450	969	262	955	1040	1190	14.423	5273
2	Total Injuries	201	193	792	171	845	886	1020	15.124	4108
3	Total deaths	461	465	403	170	447	404	439	8.663	2720
4	Pedestrian's death	188	202	157	66	118	137	149	8.759	1017
5	Cyclist's death	19	17	19	5	12	12	12	0.000	96

6	Two wheeler's death	181	165	138	63	156	164	191	16.463	1058
7	Four wheeler's death	45	49	20	17	47	57	37	-35.088	272
8	Others	28	32	71	18	44	34	50	47.059	

Note:

- The data recorder in the year 2017 to 2018 included only fatal and serious crashes and no minor crashes were recorded.
- The data recorded from year 2019-2023 included fatal, serious and minor crashes.
- Total crashes in the year 2020 were recorded low due to Covid-19 nationwide lock down but the severity of crashes was higher than 2022 and 2023.

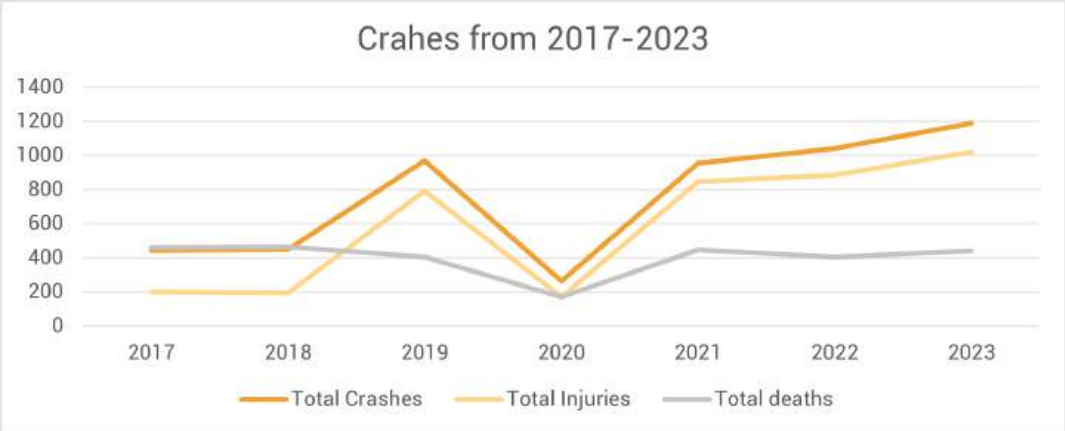


Figure 15: Yearly Crash data 2017-2023

The chart above illustrates a noticeable decline in road crashes during 2020 due to the COVID-19 pandemic. However, following the reopening of offices and workplaces, the crash rate has exhibited a steady increase.

A comparison of the month-by-month data from 2019 to 2023 reveals a significant surge in crashes and fatalities in October and September of 2023. In 2022, only March exceeded 100 crashes, with August registering the highest number of deaths at 46. Whereas, in 2023, March, May, July, September, October, and December all witnessed over 100 crashes each. With office culture fully operational in April 2023, there has been a gradual increase in crashes observed every month thereafter. The months like May and September witnessed high crashes due to seasonal factors.

Table 9: Monthly Trend of crashes in 2017 to 2023

Monthly Trend of crashes in 2017 to 2023:

Year	2017		2018		2019		2020		2021		2022		2023	
Months	C	D	C	D	C	D	C	D	C	D	C	D	C	D
January	32	34	41	40	43	43	40	46	76	36	79	22	83	29
February	35	36	35	36	36	35	37	36	72	31	85	27	81	33
March	48	50	29	33	40	33	32	29	82	34	110	37	101	34
April	34	37	51	56	66	28	14	2	66	25	82	35	96	38
May	43	47	42	45	105	33	28	12	63	33	88	26	114	43
June	28	28	32	31	102	32	20	8	71	26	83	32	78	29
July	44	46	41	41	113	43	20	10	75	32	82	35	109	28
August	38	39	39	40	99	36	16	6	86	27	95	46	98	43
Septem-ber	24	25	42	44	99	31	18	6	76	33	95	34	115	50
October	22	23	30	30	93	30	18	9	107	107	82	32	117	38
November	42	43	34	34	92	30	6	1	93	34	75	31	93	35
December	53	53	34	35	81	29	13	5	88	29	82	42	105	39
Total	443	461	450	465	969	403	262	170	955	447	1038	399	1190	439

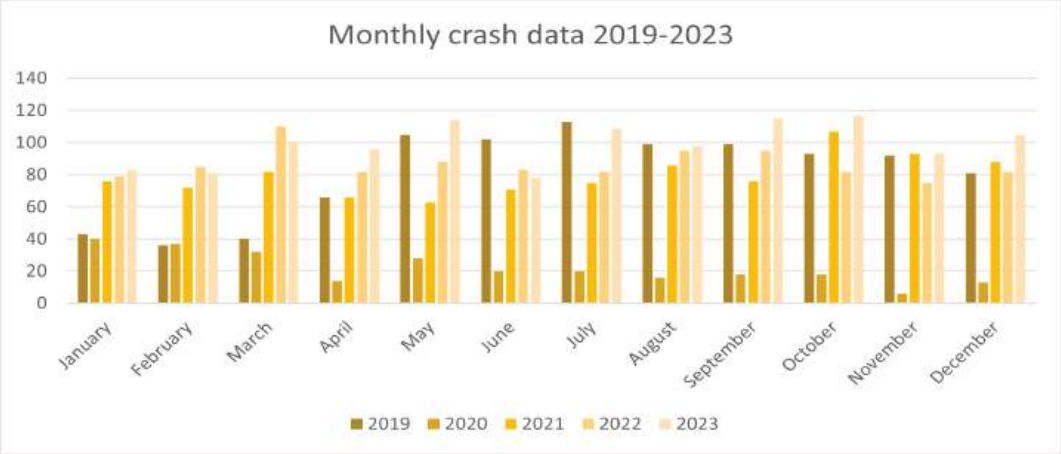


Figure 16: Monthly Crash data 2019-2023

Looking at the trend in fatalities, there is a dip in few months but the rise has been observed in the month from August to December

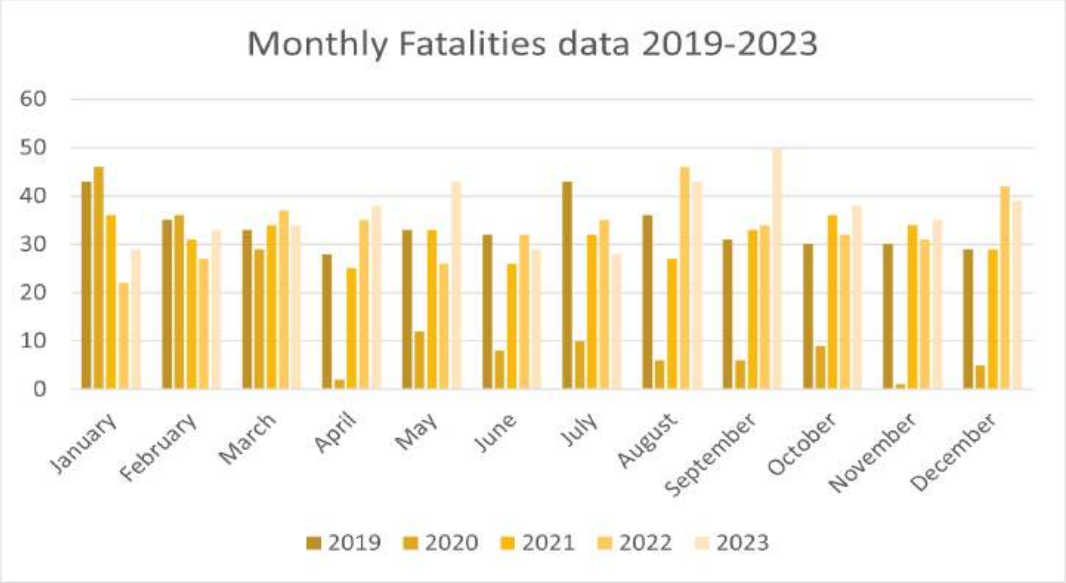


Figure 17: Monthly Fatalities 2019-2023

September 2023 marked an all-time peak in fatalities, with 50 deaths occurring within 30 days, closely followed by May and December of the same year. In 2022, fatalities were higher in August and December due to seasonal effects.

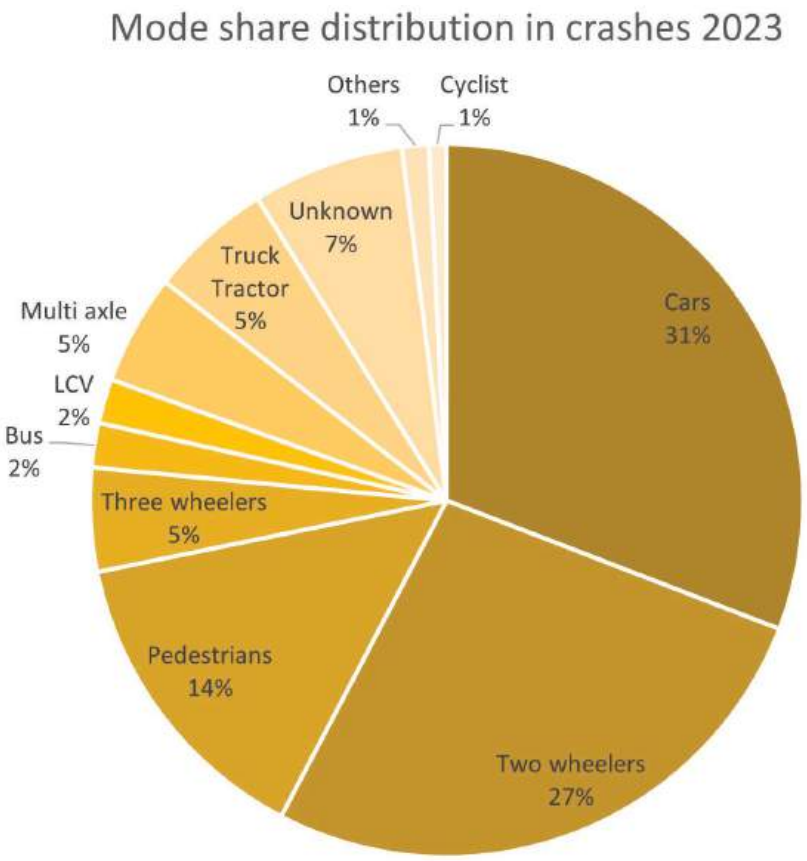


Figure 18: Mode share distribution of Crashes 2023

The data highlights the contribution of different modes of transportation in road crashes, whether as the accused or victim vehicles. Car users account for the highest mode share involved, comprising 31% (735) of the total, followed by two-wheelers at 27% (639) and pedestrians at 14% (336). However, a detailed breakdown of accused and victim vehicles would provide a clearer understanding of the situation. As 70% of these 735 car users are accused vehicles and 15% of 639 two wheelers are accused vehicles which means a larger share of two-wheeler are victims in the road crashes. However, 14% of the pedestrians involved in crashes are all victim users.

While improvements in infrastructure and adherence to good driving practices have the potential to reduce crashes and fatalities, the current scenario indicates that public transport and cyclists' experiences fewer crashes on the roads.

Based on the provided data, it is evident that the most vulnerable road users in Gurugram are two-wheelers and pedestrians, as they are susceptible to both fatal and non-fatal crashes.

3.1 Causes of crash

There are several causes of road crashes in the city. When referring to the "causes of crashes," it means the various factors or circumstances that lead to or contribute to road crashes or collisions. These causes can encompass a wide range of human, environmental, and mechanical factors that, individually or in combination, result in crashes on the road. Identifying and understanding these causes are crucial for implementing effective measures to prevent crashes and enhance road safety.

It starts with these major categories

1.Poor Road conditions

a. Crashes due to poor road geometry
b. Blind Curve
c. Absence of crash barriers
d. Absence of footpaths
e. Absence of pedestrian crossings
f. Absence of cycle track
g. Absence of traffic signals
h. Absence of pelican lights
i. Absence of night illumination
j. Absence of hazard markers and night reflectors
k. Absence of speed controlling infrastructure
l. Absence of appropriate sign boards

2.Environment

a. Weather conditions
b. Open manhole
c. Crashes due to heavy traffic

3.Animal

a.Animal Menace

4.Human Error

a.Traffic Violations
b.Distraction to Driver
c.Fallen from vehicle
d.Inattentive turn
e.Restless Driver
f.Under influence of drugs/ alcohol
g.Accident due to high speed

5.Poor Vehicle

a.Vehicle defect
b.Tyre burst
c.Vehicle burned after collision
d.Caught fire without any collision

Addressing these causes often involves a combination of education, enforcement of traffic laws, infrastructure improvements, and advancements in vehicle safety technology. It's important for individuals to be aware of the potential risks and to adopt safe driving practices to minimize the likelihood of crashes. Additionally, efforts at the societal and regulatory levels play a significant role in creating a safer road environment for everyone.

3.1.1 Causes of Crashes 2023 (As Per IRAD)

As per the IRAD data for 2023, there were 113 crashes reported under poor road conditions which led to 35 fatalities and 75 grievous injuries, which accounts for 9% of the crashes. The crashes reported by poor condition of vehicle were 47 crashes causing 31 deaths making it only 3% of the crashes. However, crashes listed under environmental causes were high as 410 crashes and 167 deaths making it 34% of the crashes. Although the data is under reported but the authorities need to take serious actions to avoid any risk of life to our road users.

Table 10: Causes of Crashes as per IRAD 2023

S.no.	Causes of crashes	Total crashes	Total deaths	Total serious injuries
A. Vehicle				
1	Vehicle defect	42	25	23
2	Tyre Burst	3	1	0
3	Vehicle burned after collision	2	5	1
4	Caught fire without any collision	0	0	0
Sub total A		47	31	24
B. Road				
5	Road condition	90	29	57
6	Blind Bend / Curve	22	6	15
7	Non Provision of Parapets/ Crash Barrier on Outer Curve	1	0	3
Sub total B		113	35	75
C. Environment				
8	Heavy traffic	121	34	66
9	Accident due to Weather condition	289	133	135
10	Open / Uneven manhole	0	0	0
Sub total C		410	167	201
Under Investigation/ Observation		257	100	106
No data		363	105	145

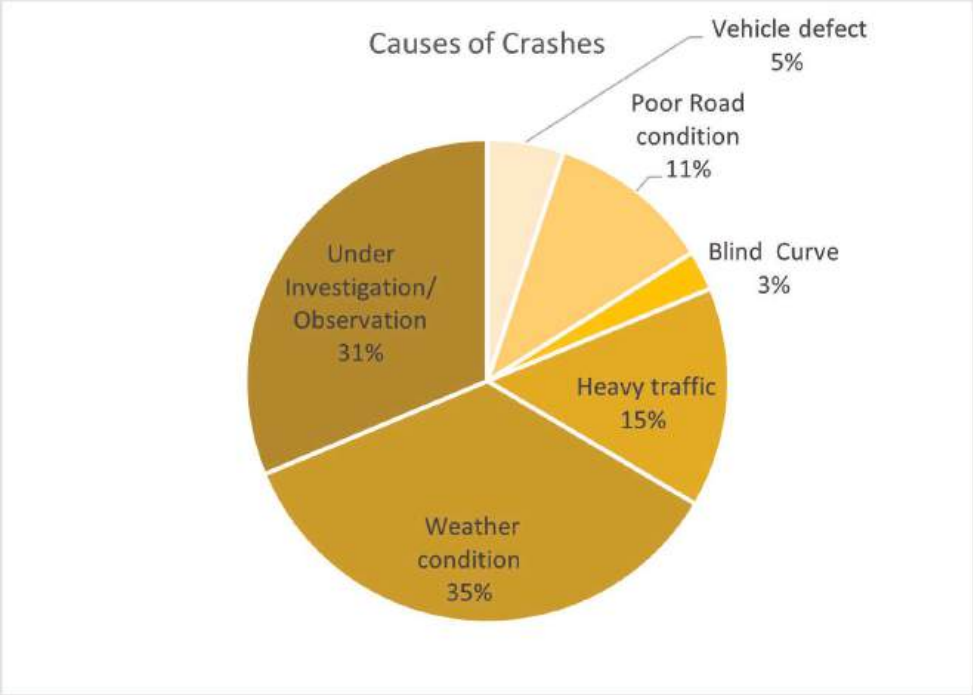


Figure 19: Causes of Crashes 2023

3.1.2 Crashes under weather conditions

The table below highlights the details of crashes under weather conditions.

Table 11: Crashes under weather conditions

	Weather conditions	Total crashes Fatalities	Persons Involved Grievous Injury	
1	Sunny / Clear	623	227	334
2	Mist/ Fog	143	78	50
3	Cloudy	76	31	47
4	Light Rain	18	6	4
5	Heavy Rain	6	0	3

6	Flooding of causeway/Rivulets	2	1	0
7	Hail/Sleet	2	1	1
8	Snow	5	3	8
9	Smoke/Dust	35	12	21
10	Strong Wind	2	1	1
11	Data Not Available	278	79	82
TOTAL		**1190**	**439**	**551**

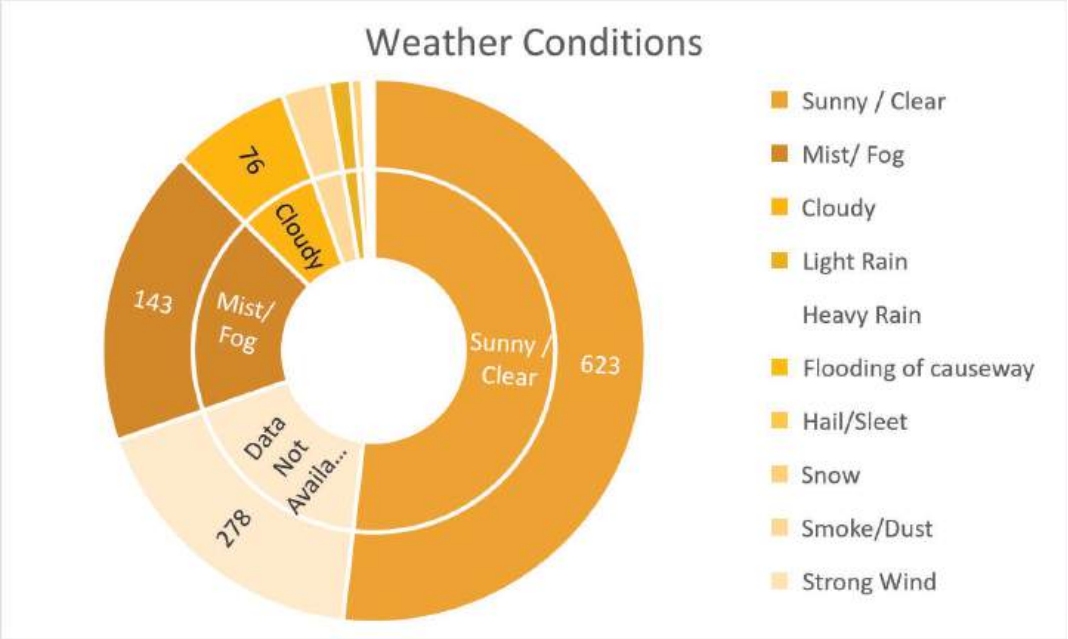


Figure 20: Causes of crashes due to weather conditions

There were 52% of the crashes occurred in a bright sunny day but 12% occurred in a fogy and misty weather conditions and 2% of the crashes were due to smoke or dust in the air. However, these cases may provide the detail of existing weather condition at the time of collision and does not signifies it as a cause for the crash.

3.1.3 Crashes Due to Traffic Violations

There are several laws defined by traffic police, and often because of human error the crashes are caused leading to injuries or deaths on road. In 2023, approximately 79% of crashes were attributed to vehicle over-speeding, while 14% were due to rough driving. However, interpreting this data poses challenges, particularly regarding the definition of over-speeding. As, it remains unclear whether the accused vehicles were exceeding the speed limit or simply driving at high speeds within legal limits, yet still causing fatalities.

Table 12: Causes of Crashes due to breaking of traffic laws

Row Labels	Total Crashes	Total Fatalities
Approaching from Wrong Side	25	7
Drink & drive	6	0
Other	17	6
Over speeding	935	321
Rough driving	175	81
Unknown	14	14
Wrong parking	18	10
Grand Total	1190	439

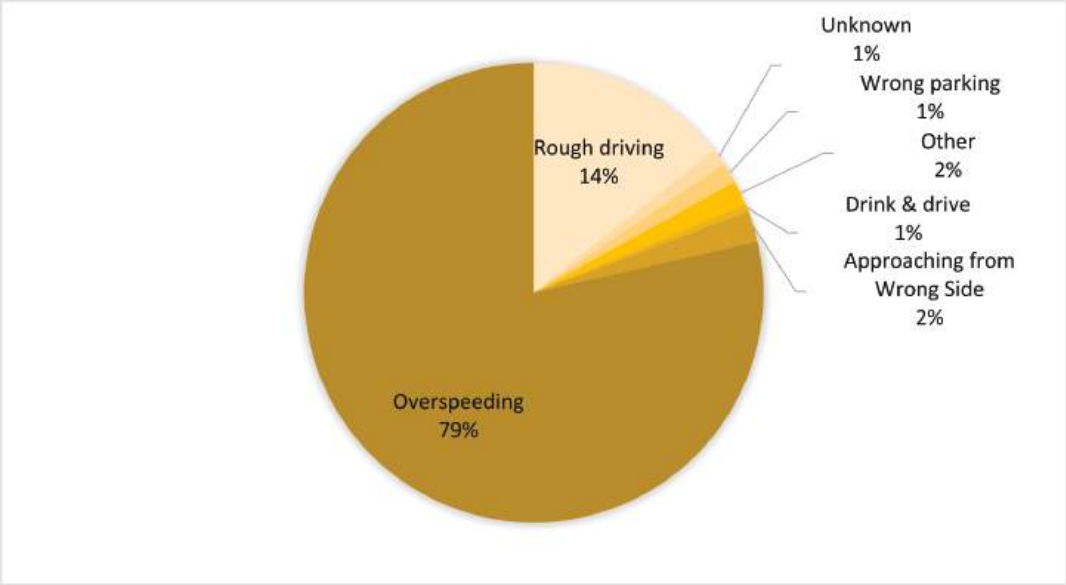
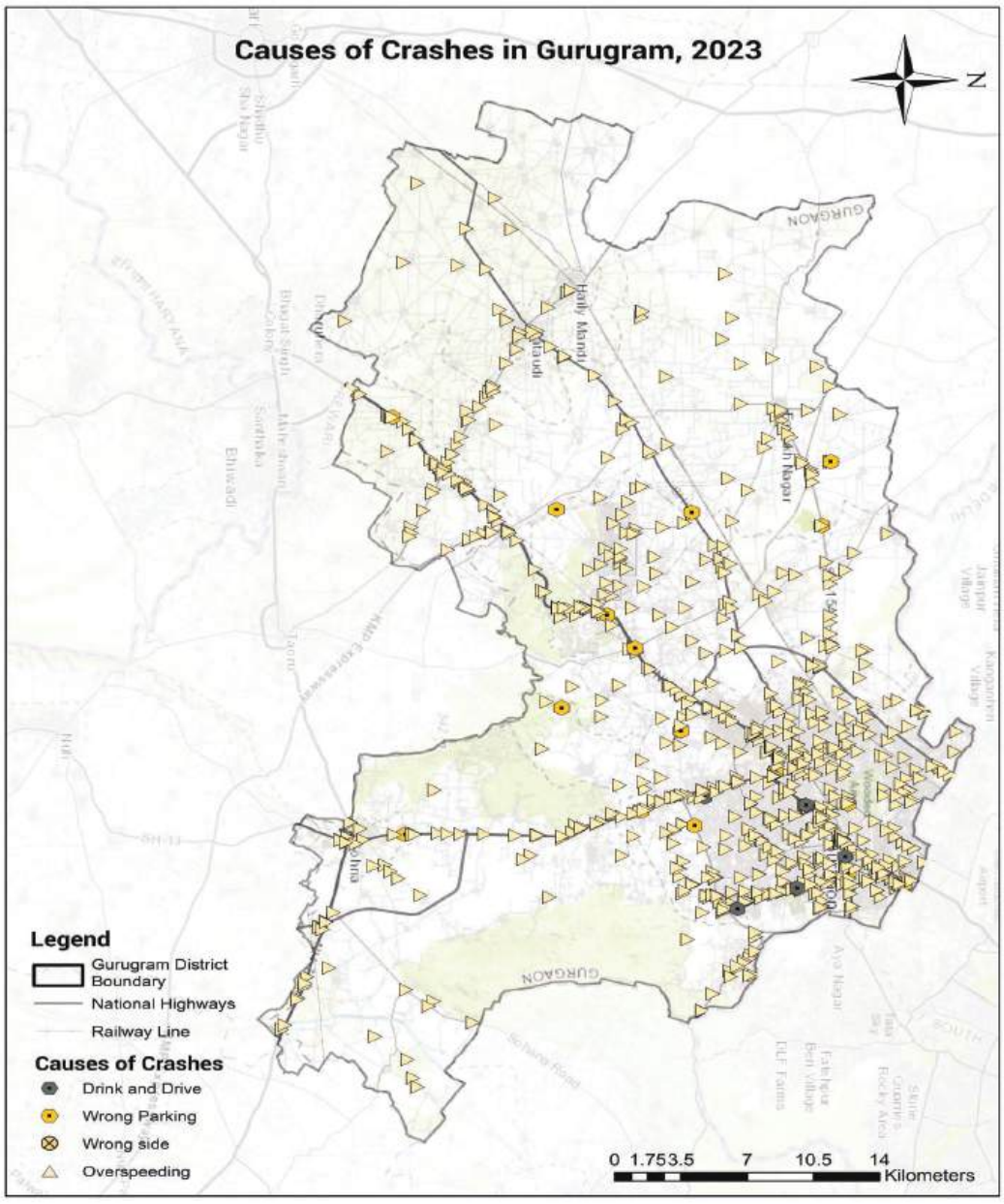


Figure 21: Causes of Crashes due to breaking traffic laws

The map below highlights the cause of crash caused by human error. The drink and drive cases can be identified in central Gurugram primarily on Golf course road, the over-speeding cases can be seen on major roads and highways, wrong side driving cases near sidhravali cut, Pataudi road, near Shankar chowk and SPR road.



Map 8: Causes of Crashes due to Human error 2023

3.2 Victims of Crash

"Road crash victims" refers to individuals who have been adversely affected or harmed as a result of a road traffic accident. These victims may include those who have sustained injuries, experienced psychological trauma, or, in more severe cases, lost their lives due to a collision or incident on the road. The term encompasses a broad range of individuals, including drivers, passengers, pedestrians, cyclists, and other road users who have suffered the consequences of a road crash. The focus on road crash victims underscores the importance of road safety measures and initiatives aimed at preventing crashes and minimizing the impact on people's lives.

In India the number of road fatalities were 1,68,491 and for the fourth consecutive year the number of road crash victims largely constituted young people in the productive age group. Young adults in the age group 18-45 accounted for 66.5% of the road crash victims. Under the Motor Vehicle Amendment Act 2019, compensation rates for victims of Hit and Run incidents have been increased to Rs. 2,00,000 from the previous Rs. 25,000. According to data from the Integrated Road Accident Database (IRAD), victims have been categorized as drivers, passengers, and pedestrians. The table below presents details on individuals involved as drivers in crashes.

Among male drivers, the most vulnerable age group is under 18 years, accounting for 38% of deaths, highlighting the severity of road crashes among young people. This is followed by individuals aged 25-35, with 28% of deaths, indicating this age group as the most vulnerable gender on roads. Female involvement as drivers in road crashes is notably low, at only 2%.

Table 13: Age and Gender of victim

Victims		Total person killed in crashes		Total person involved in non-fatal crashes		Total persons involved in crashes		
Drivers		Male	Female	Male	Female	Male	Female	ND
A	Less than 18 years	108	2	229	7	337	9	440
B	18 - 25 years	23	1	71	1	94	2	4
C	25 - 35 years	80	1	164	5	244	6	13

D	35 - 45 years	39	0	105	2	144	2	14
E	45 - 60 years	28		43	0	71	0	1
F	60 - 70 years	1		6	0	7	0	1
G	70 - 80 years	0		1	0	1	0	0
SUB TOTAL		**279**	**4**	**447**	**15**	**898**	**19**	**492**

Source: IRAD 2023

Note: The numbers are relatively higher because the data records the death after admitting in the hospital.

3.2.1 Age and Gender Of Passengers Involved In Crashes

The table below provides insights into passenger involvement in crashes and the most vulnerable category is the age group of 25-35 years, with 31% of males involved in crashes, whether fatal or non-fatal. Interestingly, female involvement in crashes as passengers is higher at 30%, compared to their involvement as drivers.

Table 14: Age and Gender of Passengers as victim users

Victims		**Total person killed in fatal crashes**		**Total person involved in non- fatal crashes**		**Total persons involved in crashes**		
Passengers		**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**ND**
A	Less than 18 years	3	2	11	7	14	9	0
B	18 - 25 years	17	3	24	7	41	10	0
C	25 - 35 years	31	5	35	15	66	20	0
D	35 - 45 years	13	1	18	13	31	14	0

E	45 - 60 years	6	6	14	9	20	15	0
F	60 - 70 years	4	2	0	4	4	6	0
G	70 - 80 years	0	1	1	1	1	2	0
I	Data Not Available	25	8	10	5	35	13	0
SUB TOTAL		**99**	**28**	**115**	**61**	**212**	**89**	**0**

3.2.2 Age and Gender Of Pedestrians In Road Crashes

The highest mortality among pedestrians occurs in the age group of 35-45 years, accounting for 25% of fatalities. However, individuals aged 25-35 years are more commonly involved in non-fatal pedestrian crashes, comprising 34% of such incidents. While fatalities among pedestrians above the age of 80 years are observed, there is minimal fatal involvement of individuals below the age of 18 years in pedestrian crashes. Female involvement in pedestrian crashes is at 18%.

Table 15: Age and Gender of pedestrians victim

Victims		**Total person killed in fatal crashes**		**Total person involved in non- fatal crashes**		**Total persons involved in crashes**	
Pedestrian		**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
A	Less than 18 years	7	3	11	6	18	9
B	18 - 25 years	17	5	16	5	33	10
C	25 - 35 years	22	2	38	5	60	7
D	35 - 45 years	28	1	19	5	47	6
E	45 - 60 years	17	2	19	7	36	9

F	60 - 70 years	4	1	5	2	9	3
G	70 - 80 years	4	1	5	2	9	3
H	80 years and above	4	1	5	2	9	3
I	Data Not Available	9	1	6	1	15	2
SUB TOTAL		**112**	**17**	**111**	**35**	**236**	**52**

3.2.3 Victim Vehicle and Crime Vehicle

The relationship between a victim vehicle and an accused vehicle in a road crash refers to how they are connected or involved in the collision. This relationship helps determine the liability and responsibility for the accident. Here are some common scenarios:

1. Single-Vehicle Crash: In this scenario, only one vehicle is involved in the collision, and it is both the victim and the accused vehicle. This may occur due to factors such as driver error, road conditions, or mechanical failures.

2. Multi-Vehicle Crash: In this scenario, multiple vehicles are involved in the collision, and each vehicle can be both a victim and an accused vehicle depending on the circumstances. For example, a rear-end collision where one vehicle strikes the rear of another could result in the leading vehicle being the victim and the following vehicle being the accused.

3. Hit-and-Run: In a hit-and-run scenario, the victim vehicle or pedestrian is struck by another vehicle whose driver flees the scene without providing assistance or exchanging information. The fleeing vehicle is considered the accused vehicle.

4. Pedestrian or Cyclist Involved: If a pedestrian or cyclist is struck by a vehicle, the vehicle involved is considered the accused vehicle, and the pedestrian or cyclist is the victim.

5. Contributory Negligence: In some cases, both vehicles involved may share responsibility for the crash due to contributory negligence, such as if both drivers were driving recklessly or disobeying traffic laws.

Understanding the relationship between the victim vehicle and the accused vehicle facilitates the fair allocation of responsibility but also aids authorities in devising effective solutions to prevent recurrent collisions involving these vehicles. By analyzing the dynamics between the victims and accused vehicles, authorities can identify patterns and trends in collision occurrences. This enables them to implement targeted interventions, such as traffic management measures, infrastructure improvements, and public awareness campaigns, aimed at mitigating the risk of future crashes involving these vehicles.

For complete detail refer to Annexure A: Table 1

The figure illustrates the relationship between accused and victim vehicles in road crashes. Among all road users, two-wheelers emerge as the most vulnerable, with over 50% of crashes involving them being caused by cars, jeeps, vans, or taxis. Alarmingly, 24% of these crashes result in fatalities.

Similarly, pedestrians face significant risks, with 45% of them being hit by cars, jeeps, vans, or taxis. Of these incidents, 38% lead to fatal outcomes. Notably, in crashes involving cars, the majority of accused vehicles are cars, jeeps, vans, or taxis, comprising 49% of all crashes. However, the fatality rate in these crashes is comparatively lower, at 12%, when compared to incidents involving two-wheelers or pedestrians.

In cases involving three-wheelers, car users are also prominent accusers, contributing to 50% of crashes and 35% of fatalities. This underscores the diverse dynamics of road crashes and the need for targeted interventions to enhance road safety for all road users.

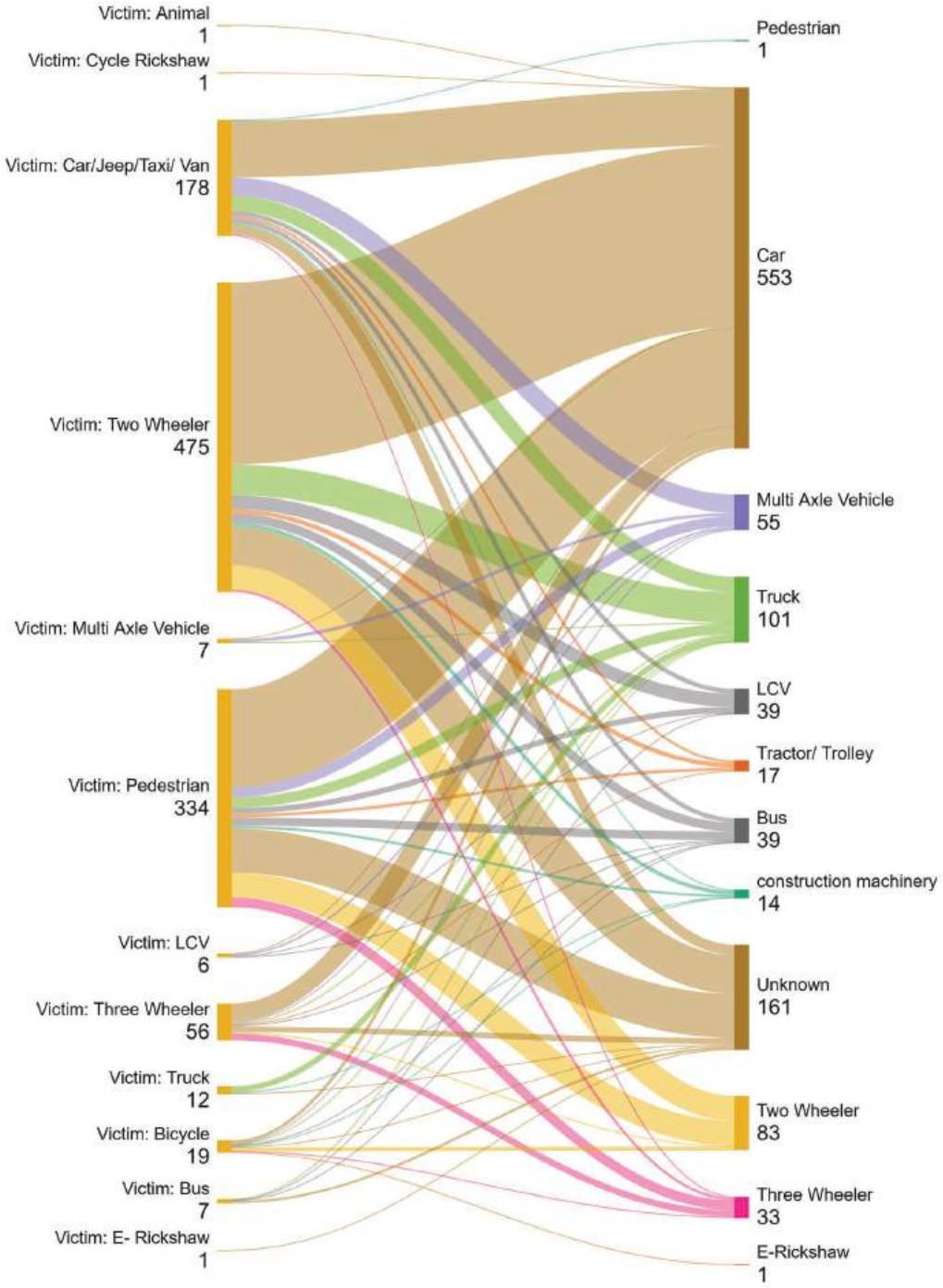


Figure 22: Relation between Victim user and Accused Road users

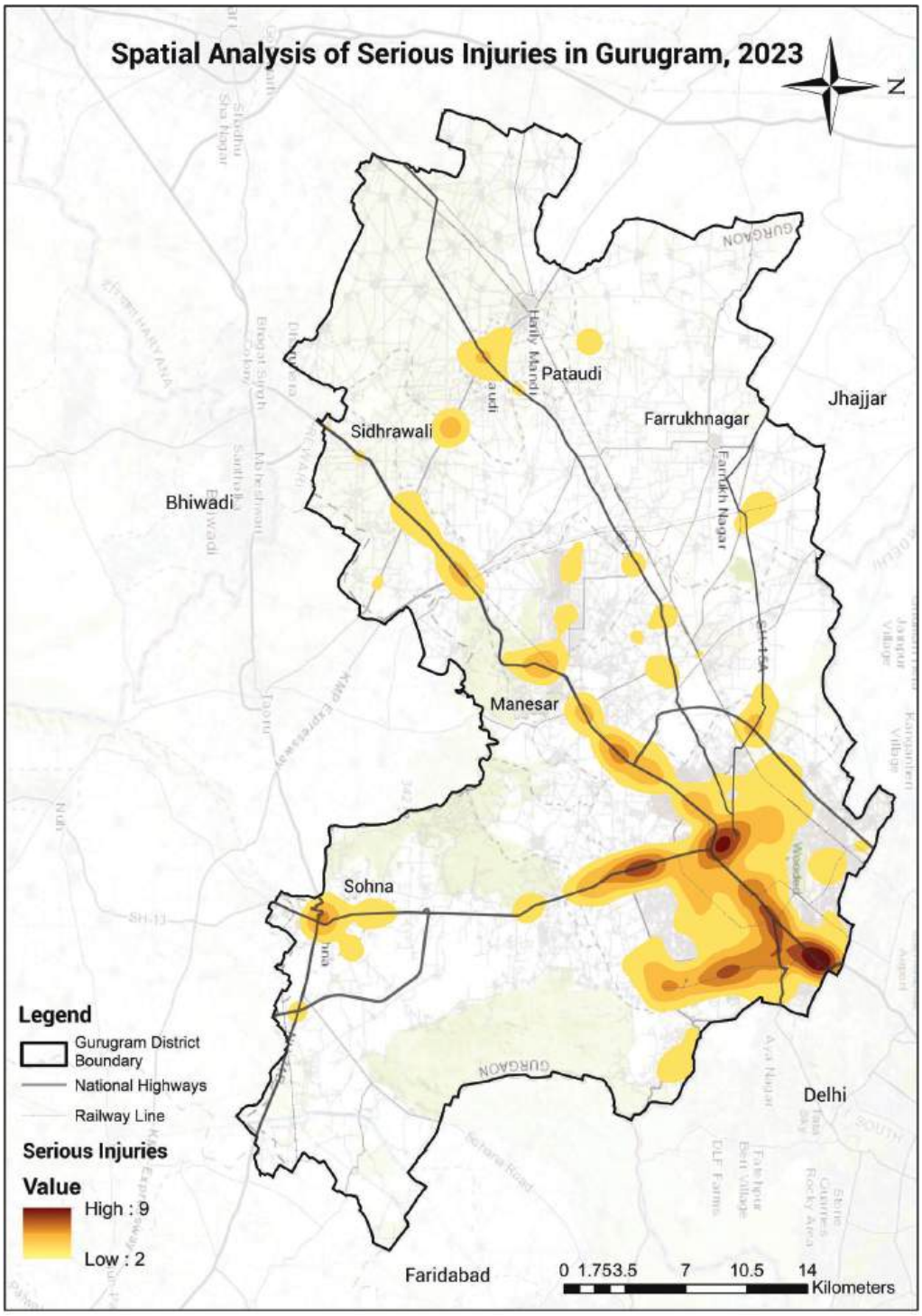
3.2.4 Victims classified by cause of Serious injuries

The information provided below will assist in formulating targeted interventions for each category of road users. As indicated, the primary cause of fatalities among bicyclists, pedestrians, and even two-wheelers are collisions with vehicles that are traveling at high speeds.

However, out of 551 serious injuries recorded, a staggering 85% of crashes were attributed to vehicles over speeding. Two-wheelers bore the brunt of these incidents, accounting for 54% of crashes, followed by pedestrians at 25%. These injuries impose a significant burden on victims and their families, extending beyond physical harm to encompass mental, financial, and social well-being. By directing efforts towards reducing crashes resulting in serious or minor injuries across different locations, we can proactively prevent these areas from becoming hotspots with high fatality rates.

For complete detail refer to Annexure A: Table 2

The heat map 9 shows the location of severe injuries and analysis reveals significant clusters of such incidents occurring at Rajiv Chowk, the stretch between Iffco Chowk and Sarhaul Toll, and along Golf Course Road.



Map 9: Spatial Analysis of serious injuries 2023

3.2.5 Most vulnerable road users identified

The study above shows that in Gurugram, the most vulnerable road user turns out to be Two-wheelers and pedestrians. Table highlights the number of crashes caused by accused vehicles towards two-wheelers.

Table 16: Relation between two-wheelers and accused vehicles

Vehicle	Number of crashes	Fatalities	Serious injuries
Two-Wheeler (Victim Vehicles)	**556**	**288**	**268**
Car/Jeep/Van/Taxi	279	152	1579
Bus	14	6	9
Light Commercial Vehicle	21	20	6
Multi Axle Vehicle	57	20	30
others	10	1	5
Three-Wheeler	25	11	19
Truck/Tractor/Trolley	54	28	17
Two-Wheeler	38	26	20
Unknown	58	24	3

The diagram below shows the relation between victim and accused vehicles for the same. The data depicts that 50% of the crashes are caused by car users and 10% by unknown users which are mostly listed under hit and run cases. The heavy vehicle count comprising Multi axle vehicles, trucks and trolleys together cause 20% of the crashes to two-wheeler users.

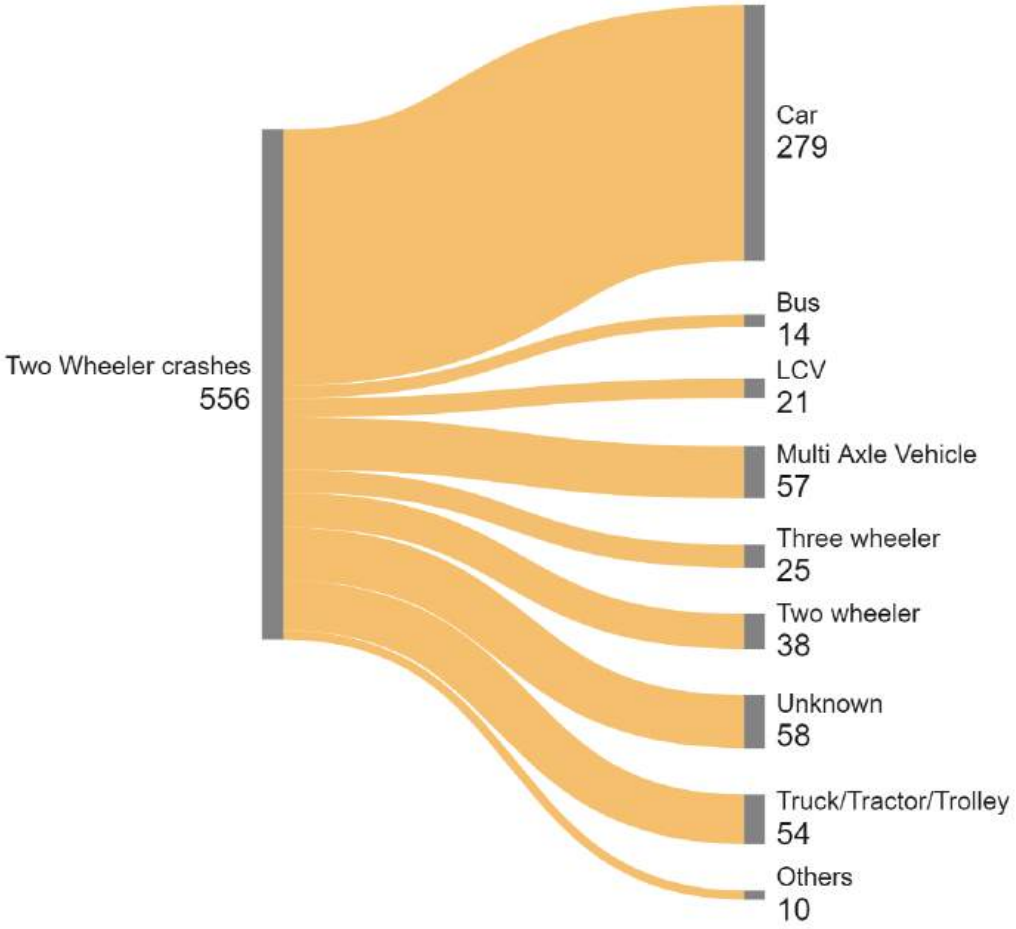
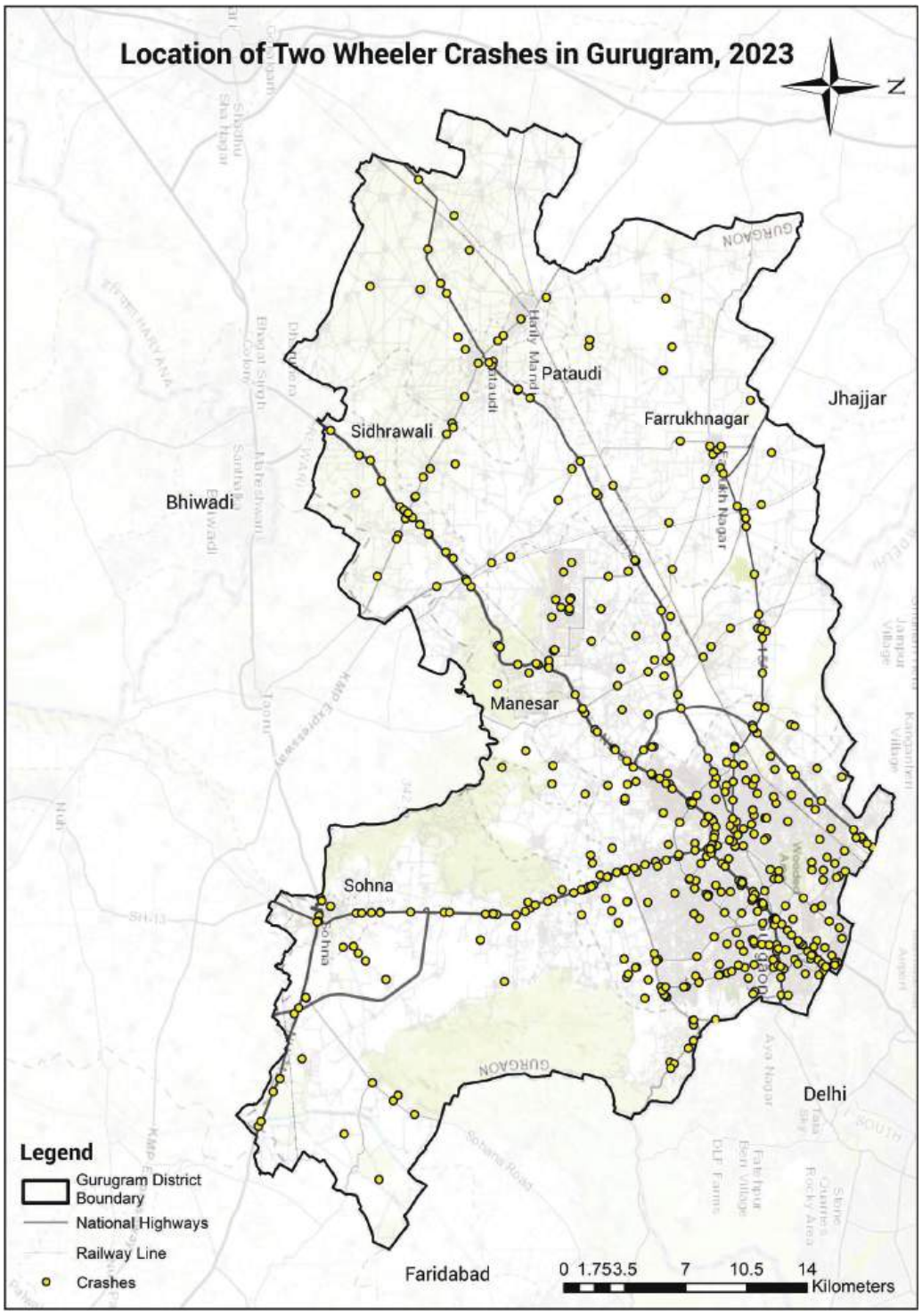


Figure 23: Relation between Two wheelers and Accused vehicles



Map 10: Location of two-wheeler crashes 2023

Two-wheeler crashes are mostly happening on high-speed corridors like National highways, and state highways as evident from the map above. Few locations like: Rajiv Chowk, Sohna road, Bilaspur chowk, Golf course road and MG Road also shows high crash count of two wheelers.

The table below highlights the pedestrian crashes caused by other accused vehicles and the major accused vehicle is car users causing 50% of the crashes and 57% of deaths to pedestrians.

Table 17: Relation between pedestrians and accused vehicles

Vehicle	Number of crashes	Sum of fatalities	Sum of serious injuries
Pedestrian (Victim)	**334**	**138**	**87**
Bus	13	7	2
Car/Jeep/Van/Taxi	150	79	43
Construction Machinery	4	2	0
Light Commercial Vehicle	9	5	1
Multi Axle Vehicle	16	4	4
Three-Wheeler	15	9	5
Tractor/Trolley/ Truck	21	8	3
Two-Wheeler	38	13	24
Unknown	68	11	5

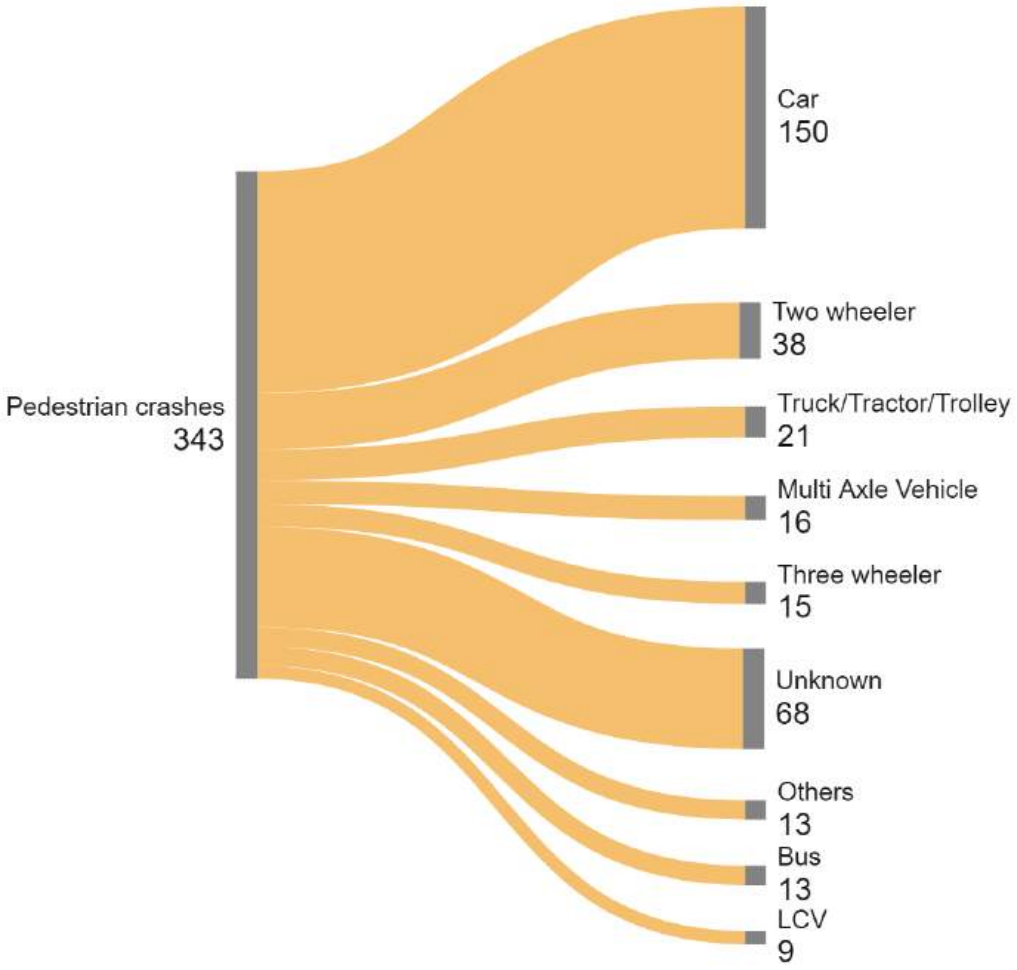
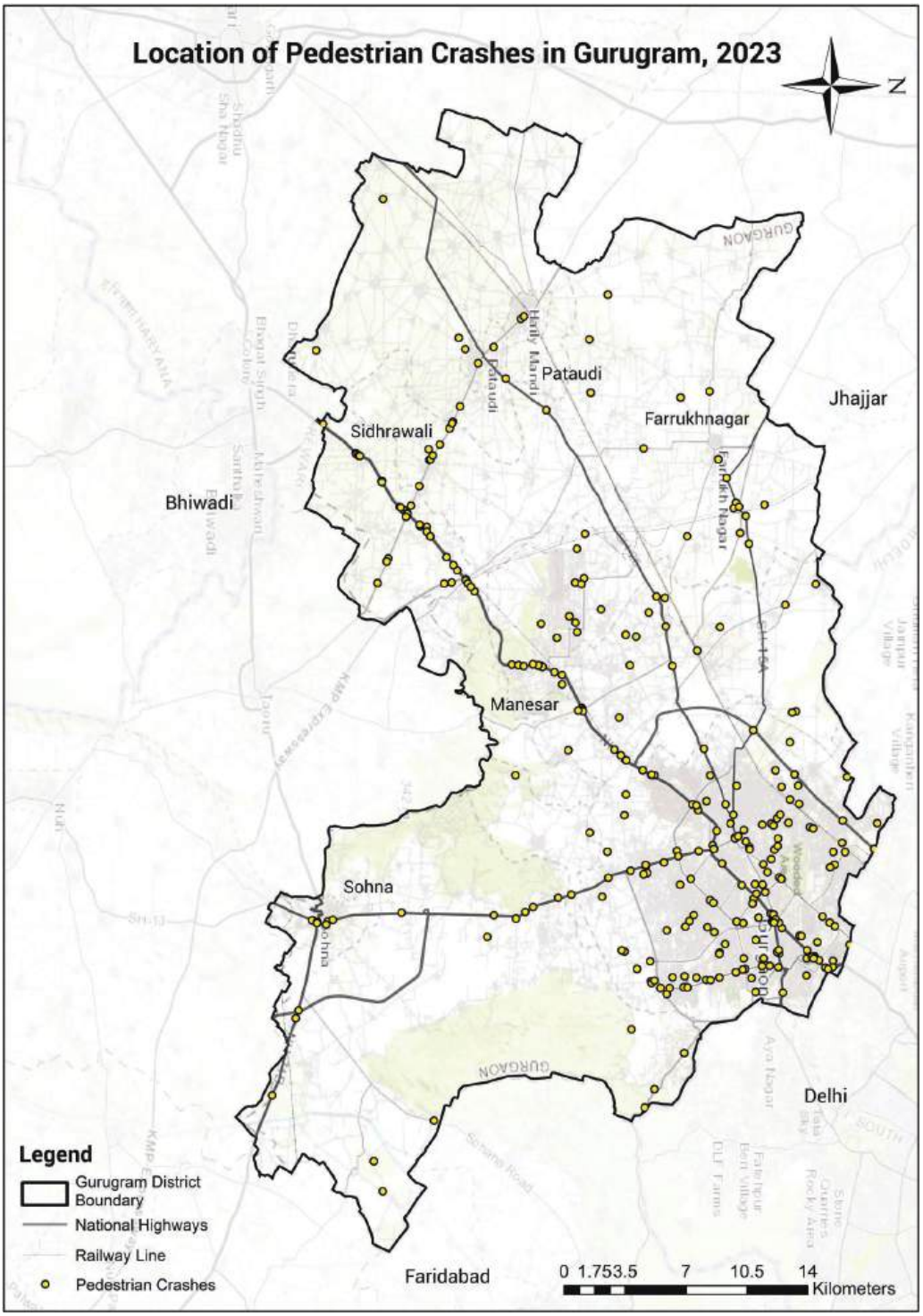


Figure 24: Relation between pedestrians and accused vehicles

As evident from the map below, pedestrians are mostly vulnerable on National highways, Sohna road, Golf course road and few intersections like Farukk Nagar, Iffco chowk, and Sohna chowk on jail road in Old Gurugram. These locations depict the need to implement user centric infrastructure catering to pedestrian needs. There can be measures such as safe pedestrian crossing, safe pedestrian walkways and refuge spaces. By focusing on targeted interventions aimed at the most vulnerable road users, authorities can significantly reduce the number of fatalities on our roads.



Map 11: Location of pedestrian crashes in Gurugram

3.3 Accusers in a crash

In the context of a collision or crash, the accused vehicles are typically those whose actions or negligence have led to the occurrence of the incident. Determining the responsible or accused vehicle is an essential part of accident investigations conducted by law enforcement or relevant authorities.
However, it's crucial for authorities to delve into the root cause of collisions stemming from gaps in infrastructure. Accused vehicles typically aren't intentionally causing crashes; from their perspective, it's often deemed an accident. Thus, it's essential to determine which authority should be held responsible for such life-threatening incidents. Understanding the shortcomings in our data collection, it can be challenging to pinpoint the true cause of a crash. While human error may play a role in some cases, we must question whether our roads are designed to accommodate user needs and mitigate their mistakes, or if they primarily cater to dominant vehicles on the road. Identifying the party at fault helps in establishing liability, and ensures appropriate measures to address the consequences of the road crash.The most accused vehicles have been car users and heavy vehicles comprising Multi axle vehicles, trucks and trolleys and construction machinery.

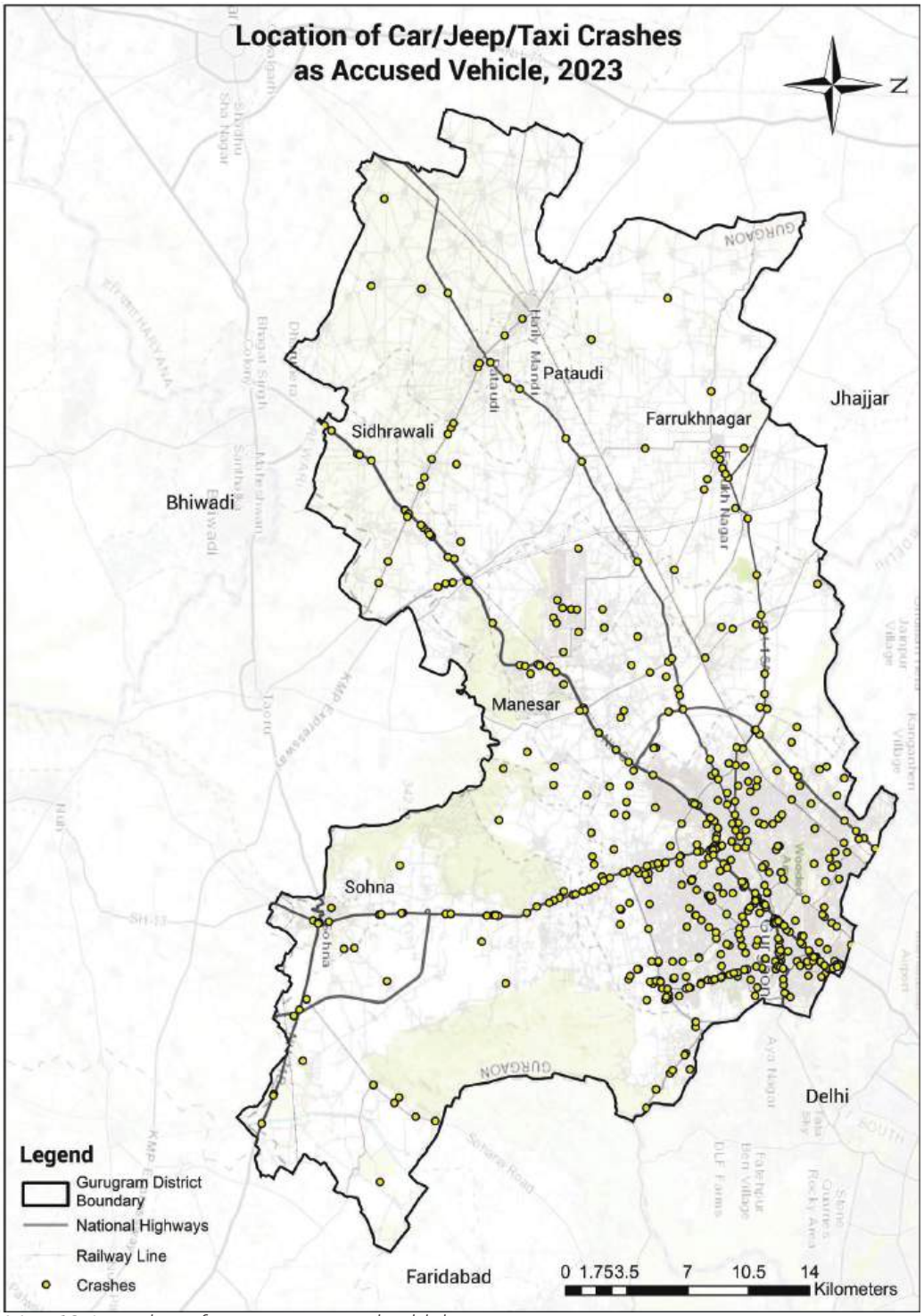
3.3.1 Car Users as accused vehicles

The table below highlights the crashes caused by car users.

Table 18: Relation between cars and victim vehicles

Accused/ Victim vehicle	Number of crashes	Fatalities	Serious injuries
Car/Jeep/Van/Taxi (Accused)	**554**	**290**	**252**
Bicycle	5	3	0
Car/Jeep/Van/Taxi	86	41	31
Other	8	3	2
Pedestrian	150	79	43
Three-Wheeler	28	12	19
Two -Wheeler	277	152	157

The two wheelers and pedestrians were the two most affected victims by car users.



Map 12: Location of cars as accused vehicles

3.3.2 Unknown vehicles as accused vehicles

Table 19: Relation between Unknown road users and victim vehicles

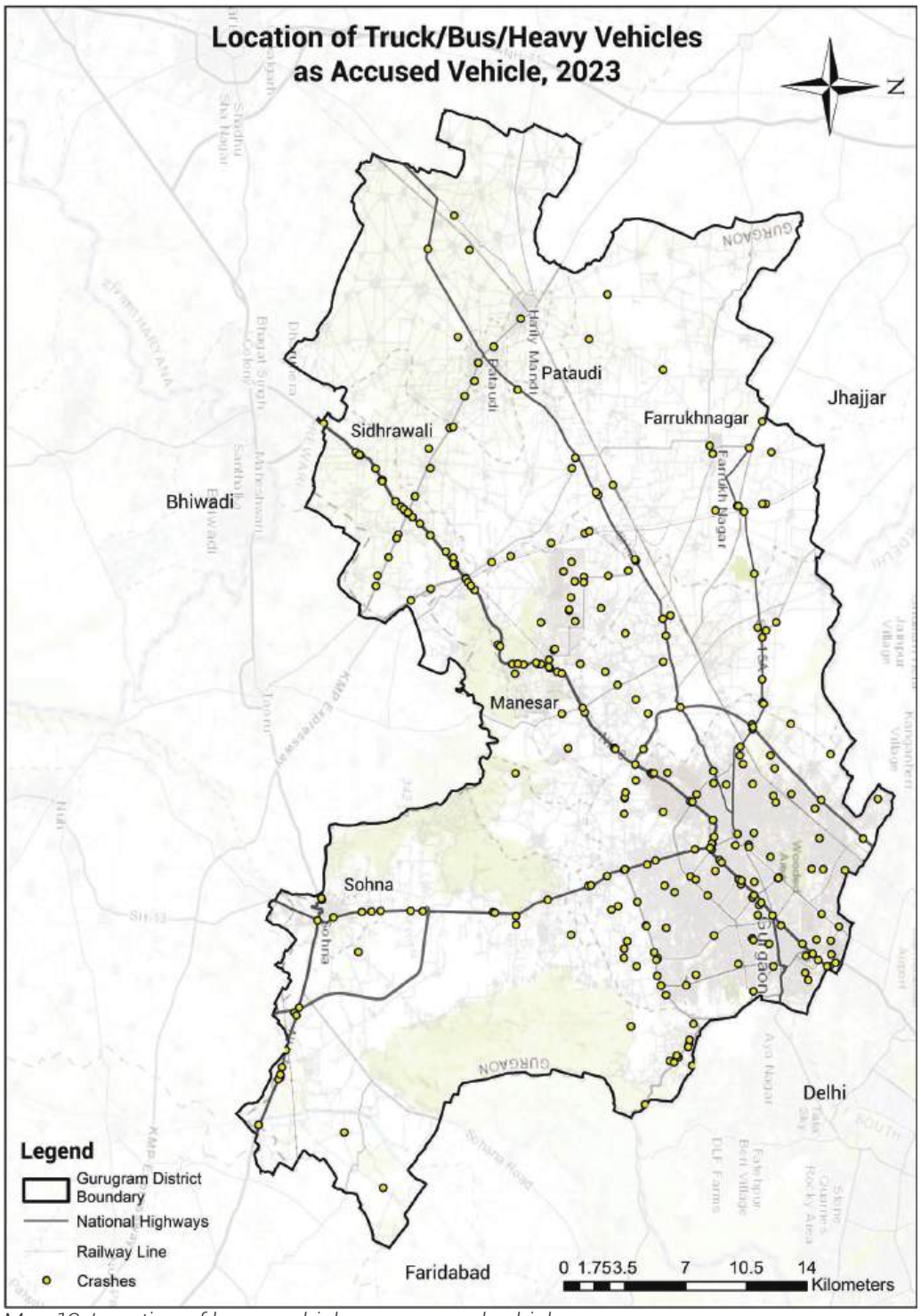
Accused/ Victim vehicle	Number of crashes	Fatalities	Serious injuries
Unknown (Accused)	**162**	**45**	**17**
Bicycle	2	0	0
Bus	4	2	1
Car/Jeep/Van/Taxi	16	5	8
Other	3	1	0
Pedestrian	67	11	5
Three Wheeler	9	2	0
Tractor/ Trolley/ Truck	3	0	0
Two Wheeler	58	24	3

There are many crashes and deaths caused by unknown vehicles too, which needs to be addressed and the enforcement department can be made stronger that no case can be reported within this category.

3.3.3 Heavy vehicles as accused vehicles

Table 20: Relation between Heavy vehicles and victim vehicles

Accused/ Victim vehicle	Number of crashes	Fatalities	Serious injuries
Heavy vehicles (Accused)	**112**	**42**	**59**
Bicycle	1	1	0
Car/Jeep/Van/Taxi	28	16	21
Light Commercial Vehicle	3	0	1
Multi Axle Vehicle	5	0	0
Pedestrian	16	4	4
Three Wheeler	2	1	3
Two Wheeler	57	20	30



Map 13: Location of heavy vehicles as accused vehicles

The heavy vehicles are also responsible for 9% of the crashes in the district, and the major victims are two-wheelers and four-wheelers on the road. The maps show highways and major roads as the primary location of Heavy vehicles crashes which can be inferred because of no truck lay bays at regular intervals, improper entry and exit designed on highways and poor night reflectivity on trucks and these roads.

3.4 Location of crashes

In a city like Gurugram there are several junctions and street which are vulnerable to road users. Through data and analysis, the critical points can be identified on which the deaths, or serious injuries are happening on regular basis.

The long-term measures recommended by MoRTH should be resolved in the shortest time slot and short term measured should be resolved within 3 months of identification of blackspots Based on site inspection, preliminary survey etc. the type of interventions required may be identified and accordingly the action for taking corrective measures i.e. short-term measures and Long-term Measures may be initiated at Regional Office Level. Depending upon the site condition/requirement the corrective measures may require Short Term Measures only, and in some cases Long Term Measures including Cautionary Measures&/or Short-Term Measures. The suggestive items/measures and guidelines to be followed for rectifications of black spots are as under:

Short term measures :

1. The suggestive items/measures:

(i) Pedestrian facilities like Zebra crossings

(ii) Crash barriers/ railings

(iii) Solar light

(iv)Junctions improvement

(v) Road signs inter-alia speed limits sign, pavement/road markings, delineators, studs/ cats' eye.

(vi) Traffic calming measures including rumble strip

(vii) Repairing/maintenance of unsafe road/appurtenance including filling of berms/ shoulder on National Highways

(viii) Restriction of certain types of vehicles, one-way streets, reversible lanes, bus lanes, restriction on movement of different types of vehicles by time/ by lane etc. specially in urban areas.

Long term permanent measures :

Based on inspection, survey etc. if it is concluded that the spot requires long term measures, a detailed estimate may have to be prepared for the same. In such situations some of the short-term measure as mentioned in above para and following cautionary measures may also be carried out.

2. The signages for cautionary/alerting road users may be as under:

(i) Cautionary accident black spot signs at both ends

(ii) Solar red blinking signals at both the ends

(iii) Rumble strips together with rumble strip sign

(iv) "Restriction ends" sign

(v) Traffic Calming Measures

(vi) Footpaths and pedestrian crossings

(vii) Building Cycle track

(viii) Reducing the speed limit of the road

3.4.1 Location of Police stations w.r.t Crashes

The table 21 highlights the number of crashes and fatalities encountered as per police stations jurisdiction.

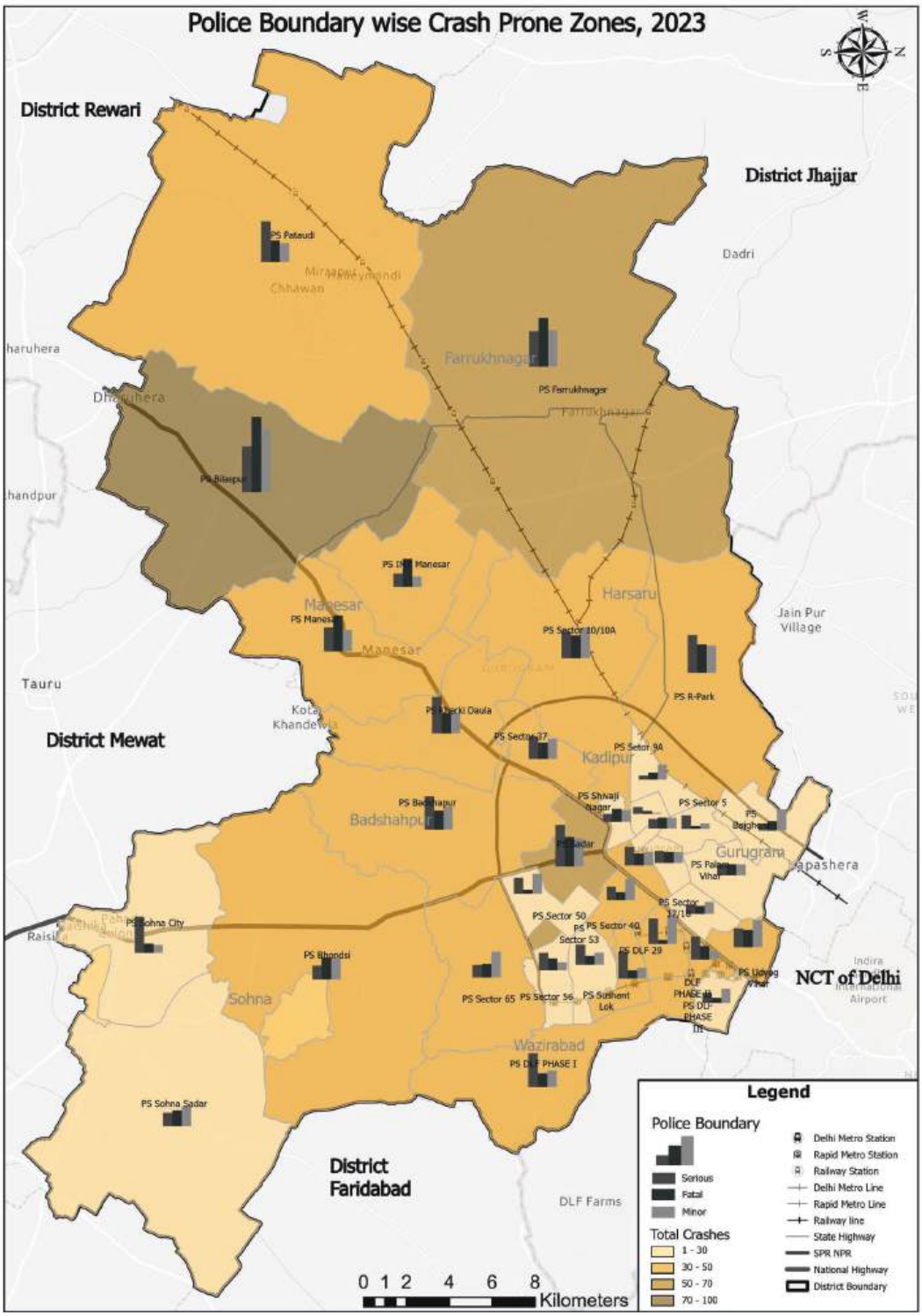
Table 21: List of police stations- Crashes wise

Police stations	Count of Crashes	Sum of fatalities	Sum of Total Serious	Sum of Total Minor
Bilaspur	104	60	33	43
Furrukh Nagar	65	40	25	28
Gurgaon Sadar	62	19	30	26
Khedki Daula	55	23	33	18
Pataudi	50	20	30	20
Badshahpur	49	13	27	22
DLF PHASE-1	49	13	26	15
Sector 10	48	14	24	22
DLF	47	6	20	25
Manesar	40	22	19	14
Udyog Vihar	40	11	17	18
Rajendra Park	38	18	21	12
Sector 65	38	13	16	15
Industrial Sector 7 Manesar	37	21	12	14
Bhondsi	36	17	11	17
Sector 37	34	12	16	16
Sohna	33	14	19	16
Sector 40	30	9	15	17
Civil Line	29	8	11	15
Shivaji Nagar	28	8	10	6
City Sohna	26	8	19	6

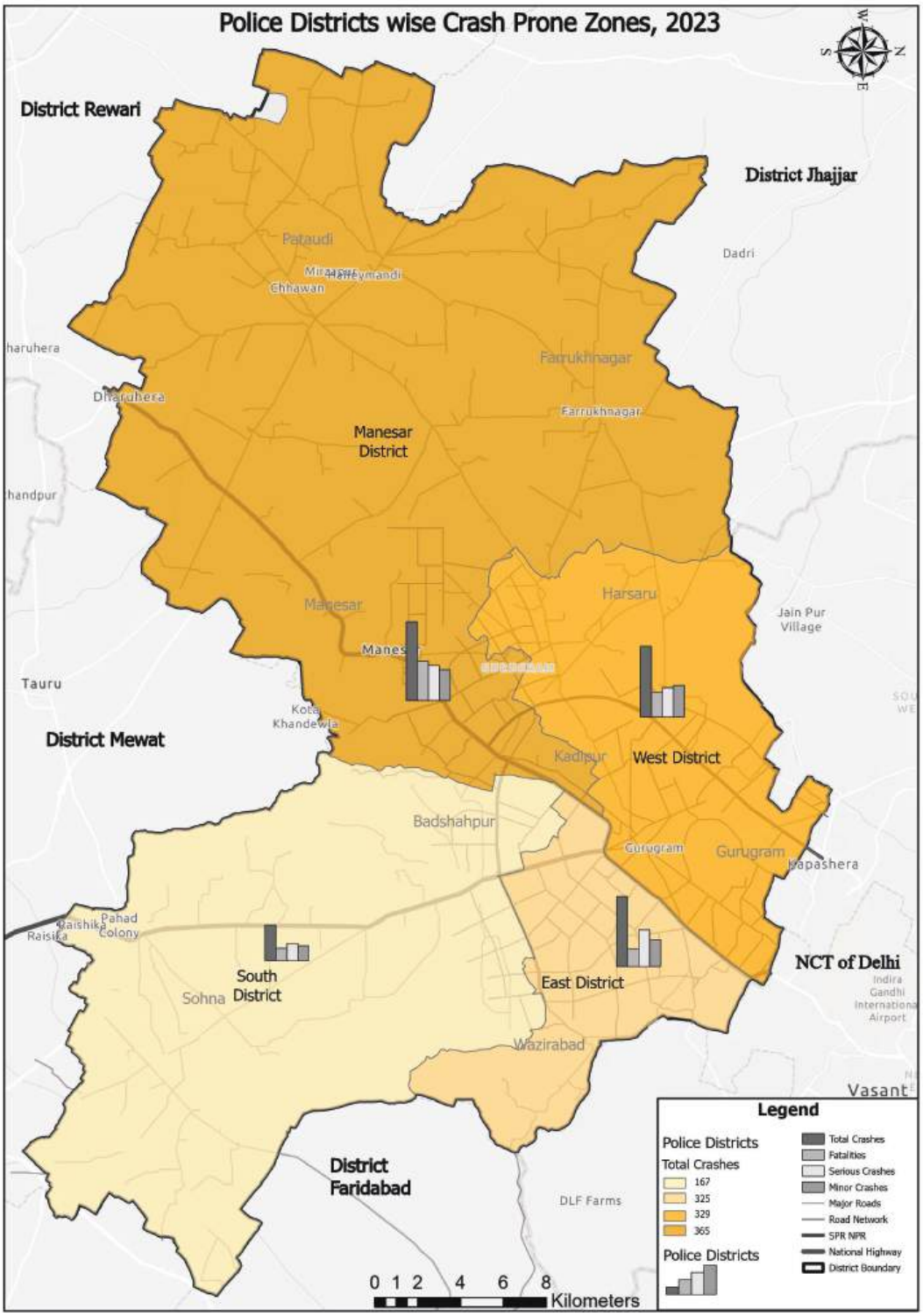
Sector 53	26	9	17	8
Sushant Lok	26	4	12	8
DLF PH 3	24	7	10	11
Palam Vihar	23	7	10	11
DLF II	22	8	12	4
Sector 50	19	1	14	13
Sector 56	19	5	8	4
Sector-17/18	19	6	9	6
Sector 5 Gurugram	18	4	8	10
Bajghera	16	7	2	15
Sector 9A	15	3	4	5
Sector 14	13	5	5	4
Gurgaon City	8	3	5	3
New Colony	4	1	1	2
Total	**1190**	**439**	**551**	**489**

In Gurugram district, there are a total of 35 police stations that have reported road crashes. Among them, Bilaspur Police station alone recorded 104 crashes resulting in 60 fatalities within a year, highlighting a significant concern that requires urgent attention. Other major police stations experiencing high crash rates include Farukhnagar, Khedki Dhaula, Gurugram Sadar, and Badshahpur.

The police stations should take prompt and decisive actions to address the causes of crashes within their respective jurisdiction. Traffic police officers, in particular, are well-positioned to address these issues effectively, given their frontline roles and immediate access to information regarding road crashes.



Map 14: Road crashes – Police Boundary 2023



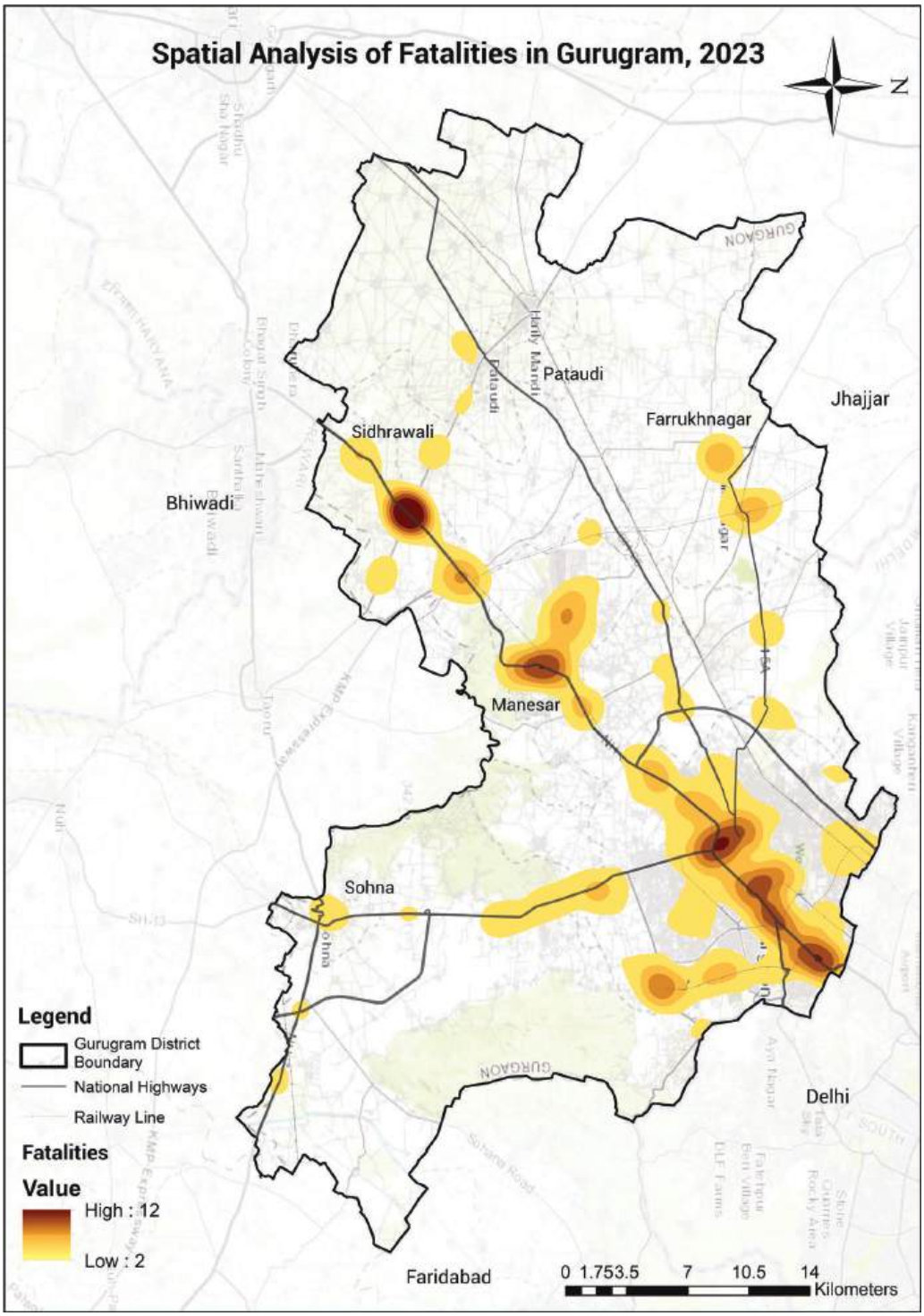
Map 15: Road crashes – traffic police district boundary 2023

The map 15 highlights the police district boundaries with respect to crash prone zones. The Manesar police district falls with maximum crashes and fatalities followed by west district, east district and south district.

3.4.2 Spatial Analysis of fatalities

The spatial location of fatalities shows a critical spots in the district that needs to be addressed on urgent basis by all stakeholders. The places like Bilaspur chowk, Rajiv chowk to Sarhaul toll on Nh 48, Manesar intersection, Golf course road and emerging places like Farruk nagar and Sohna. In 2023, there were 439 fatalities and 45% of these fatalities were on National highway comprising just 2.1% of the roads.

Understanding the precise locations and underlying causes of these crashes is imperative to prevent fatalities and similar accidents. Without intervention, these areas can become hazardous zones. By addressing these issues proactively, we can prevent disabilities and ultimately work on saving lives.



Map 16: Spatial analysis of fatalities 2023

3.5 Time of crashes

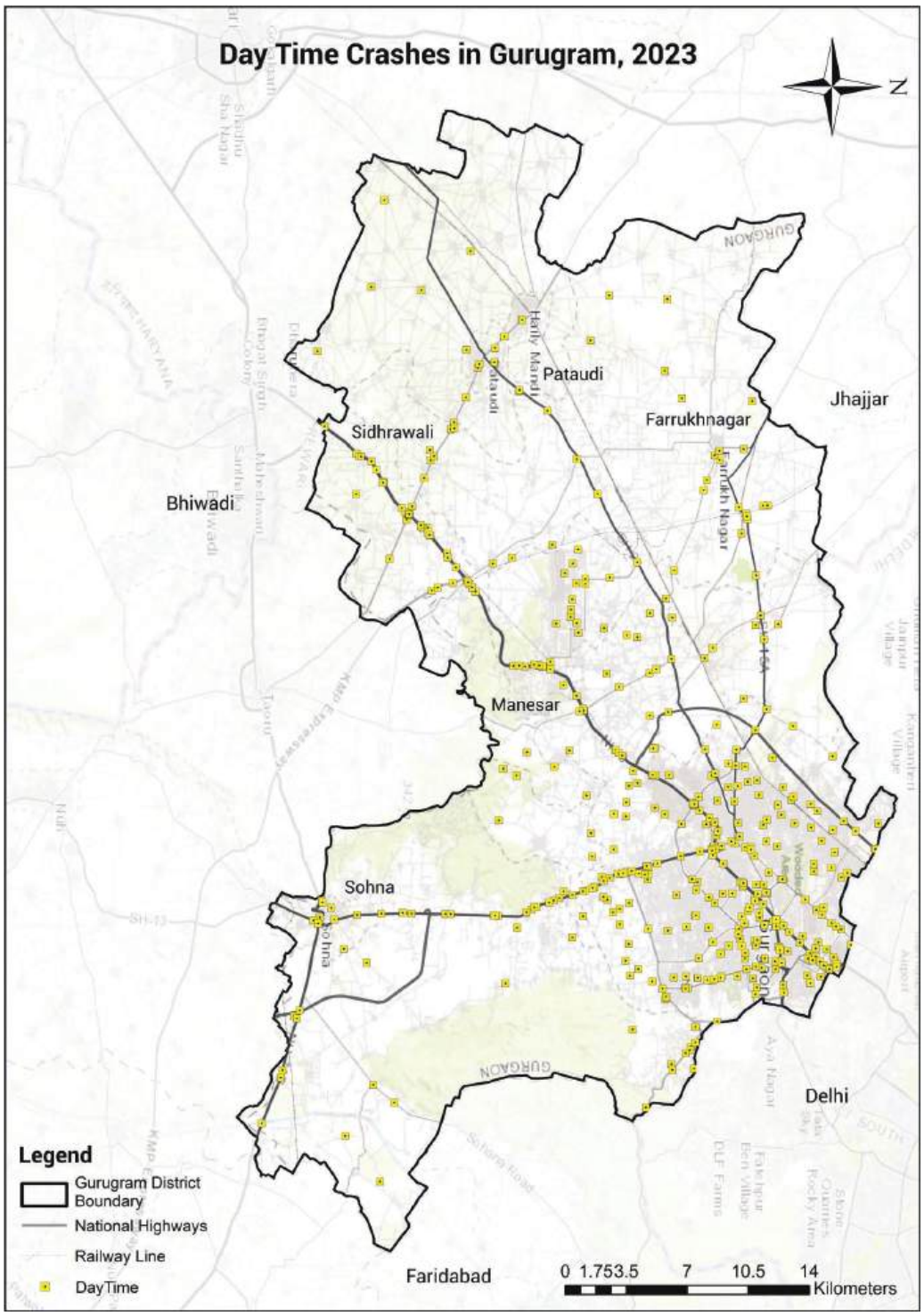
Temporal crash data provides insights into the patterns and trends of road traffic crashes over a specific period of time. Analysing temporal crash data can reveal valuable information about the following aspects:

1.Time of Day:
Identifying peak hours or time periods when crashes are more likely to occur. Understanding if certain times of the day are associated with higher crash rates.
2.Day of the Week:
Recognizing if there are particular days of the week with increased or decreased crash frequencies. Assessing if weekends or weekdays exhibit different patterns.
3.Month and Seasonal Variations:
Examining if there are seasonal influences on crash rates (e.g., more crashes during winter months). Understanding if specific months experience a higher incidence of crashes.
4.Yearly Trends:
Identifying long-term trends in road safety and whether the number of crashes is increasing, decreasing, or remaining stable over the years.

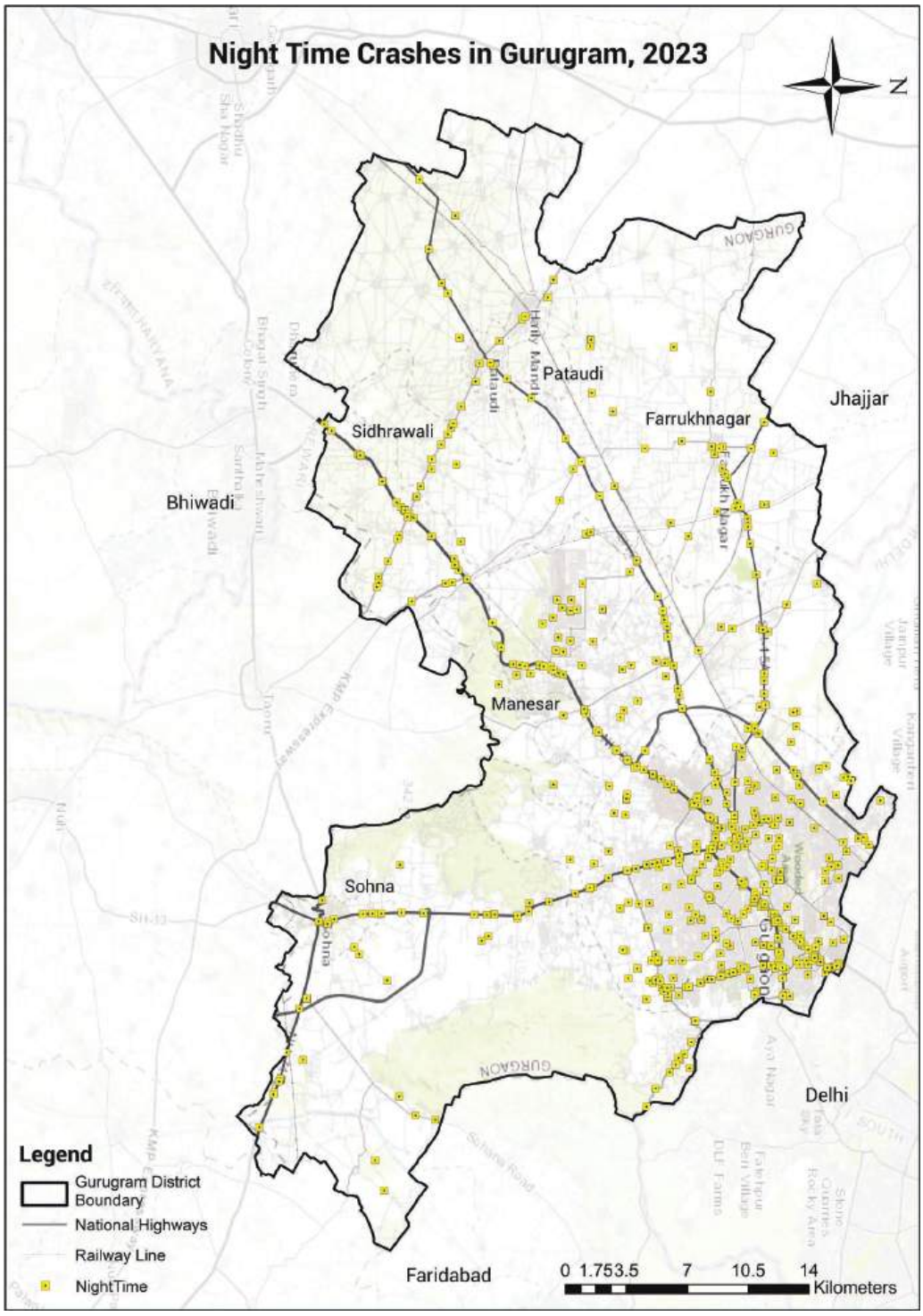
Assessing the effectiveness of safety measures during special occasions.By examining temporal crash data, policymakers, law enforcement, and road safety professionals can make informed decisions about implementing targeted interventions, improving infrastructure, and developing educational campaigns to reduce the frequency and severity of road traffic crashes.

Time of the crashes 2023

Time of the crash		Number of Crashes	Number of Deaths	Number of serious Injuries	Number of Minor Injuries	Persons involved
Day time	06 AM-06 PM	495	163	237	202	602
Night time	06 PM- 06 AM	695	275	303	276	853
Total		**1190**	**438**	**540**	**478**	**1455**



Map 17: Location of Day time crashes



Map 18: Location of Night Time crashes

During the daytime, defined from 06:00 AM to 06:00 PM, a total of 495 crashes were recorded, resulting in 163 fatalities. This accounts for 41% of the total crashes and 37% of the total deaths occurring during daytime hours. However, during the nighttime, from 06:00 PM to 06:00 AM, there were 695 crashes, constituting 58% of the total crashes observed during this period. Moreover, 62% of the total deaths occurred during nighttime hours.

Several areas such as the SPR cloverleaf on NH-48, Ghata village chowk, Golf course road, MG road, and Farruk nagar experience higher crash rates during nighttime. Implementing night visibility measures and incorporating reflective elements into road safety infrastructure could substantially reduce these crashes at these locations.

3.5.1 Hour-wise crashes in 2023

Table 22 : Hour wise crash analysis 2023

Time of the crash	Number of Crashes	Number of Deaths	Number of serious Injuries	Number of Minor Injuries	Persons involved
00-01 AM	226	91	105	84	280
01-02 AM	25	6	7	22	35
02-03 AM	17	11	2	7	20
03-04 AM	22	11	5	3	19
04-05 AM	27	11	7	17	35
05-06 AM	29	13	17	13	43
06-07 AM	25	9	11	5	25
07-08 AM	38	12	23	13	48
08-09 AM	41	17	15	16	48
09-10 AM	53	15	33	18	66
10-11 AM	42	11	21	18	50
11-12 PM	25	12	8	7	27

04-05 PM	50	15	24	18	57
05-06 PM	51	15	25	26	66
06-07 PM	56	18	32	21	71
07-08 PM	69	21	33	25	79
08-09 PM	61	20	25	22	67
09-10 PM	70	32	29	29	86
10-11 PM	50	22	27	23	72
11-12 AM	43	19	15	13	46
Total	**1190**	**438**	**541**	**478**	**1455**

The table above shows the hour wise classification of crashes, deaths, injuries and persons involved. During the day time the peak hour for crashes was recorded to be 05:00 PM to 06:00 PM, the mode share is listed below:

Table 23 : Mode share in Day time peak hour

Time (Day-time Peak) 05:00 – 06:00 PM	**Total crashes**	**Serious Injuries**	**Minor Injuries**	**Total deaths**
Car/Jeep/Van/Taxi	3	3	5	0
Pedestrian	17	11	6	3
Truck	1	0	0	0
Two Wheeler	24	13	12	7
Bicycle	1	0	0	1
Three Wheeler	4	1	3	3

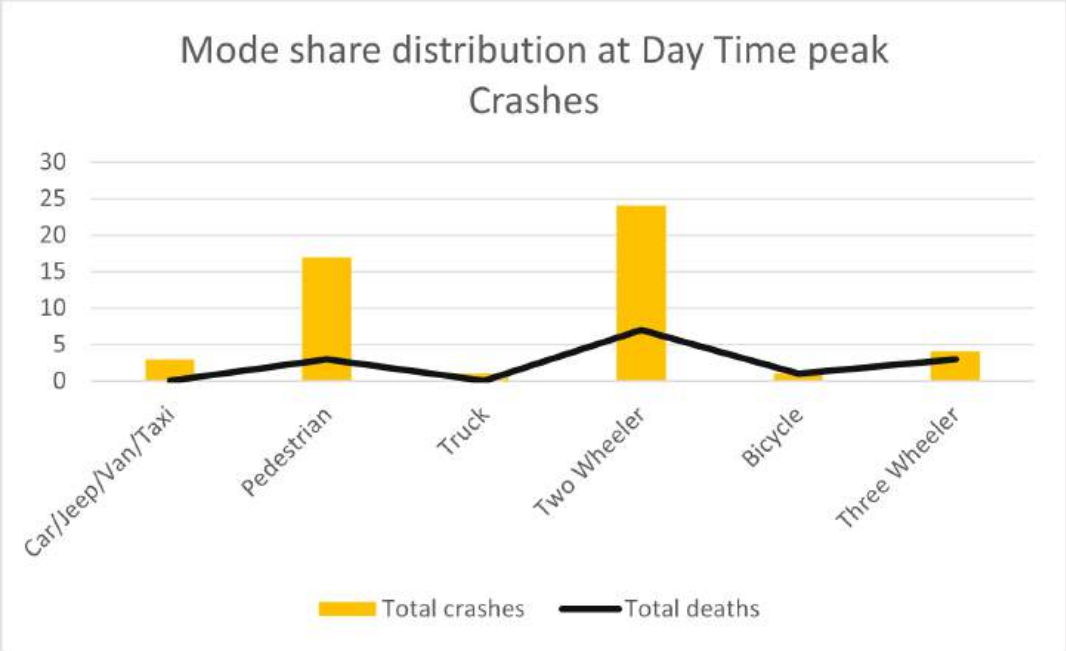


Figure 25: Mode share distribution at Day time peak hour

During the night time the highest number of crashes occurred during midnight and in between 09:00 PM-10:00 PM where 70 crashes and 32 deaths occurred annually.

Table 24 : Mode share distribution during night time peak hour

09:00 - 10:00 PM Peak	Total crashes	Sum of Total Serious	Sum of Total Minor	Total deaths
Pedestrian	22	10	4	12
Two Wheeler	26	14	21	9
Three Wheeler	3	0	0	3
Bicycle	1	0	0	1
Car/Jeep/Van/Taxi	14	4	4	5
Other	1	0	0	0
Multi Axle Vehicle	2	0	0	1
Light Commercial Vehicle	1	1	0	1

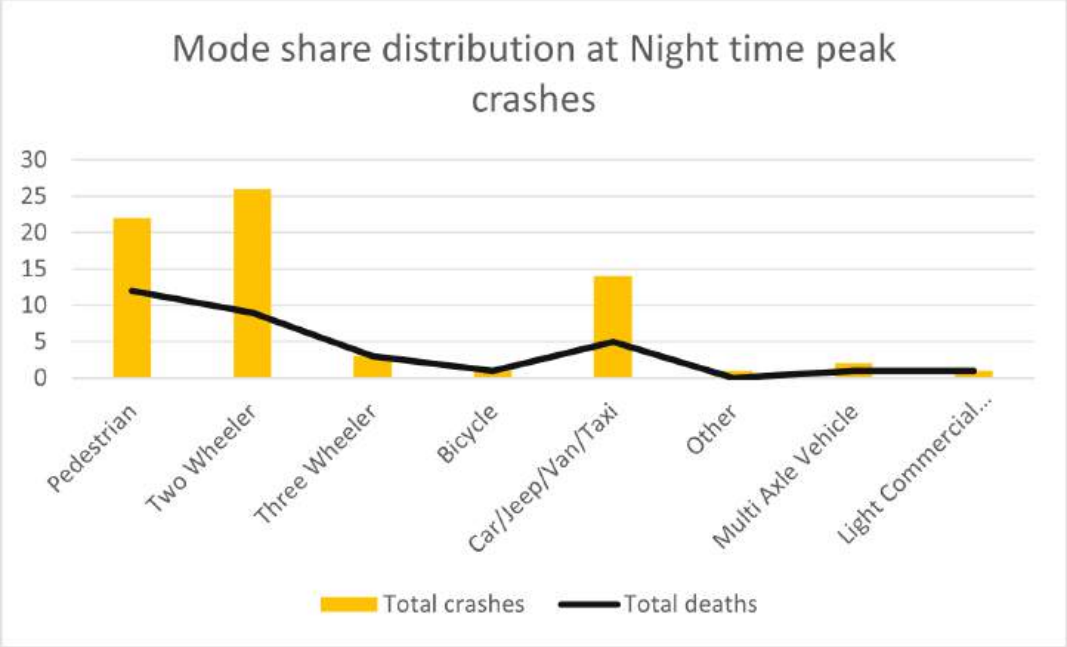


Figure 26: Mode share distribution during night time peak hour

Nighttime crashes are predominantly involving pedestrians and two-wheelers, resulting in a higher number of fatalities. Moreover, the overall death toll during nighttime peak hours is double that of daytime peak hours. This raises serious concerns regarding our approach to designing roads and intersections, particularly in addressing nighttime safety and visibility issues.

3.5.2 Days of crashes in 2023

Table 25: Crashes on the days of week

Row Labels	Total Crashes	Total Fatalities	Serious Injuries	Minor Injuries
Sunday	169	66	98	74
Monday	168	58	73	71
Tuesday	156	52	76	59
Wednesday	195	71	83	77
Thursday	152	59	68	58
Friday	180	69	77	78
Saturday	170	64	76	72
Grand Total	**1190**	**439**	**551**	**489**

The highest number of crashes were recorded on Wednesday with 16% crashes and deaths, followed by Saturday with 14.2% of the crashes. The lowest crashes were recorded on Thursday of the week with 12% of the crashes.

3.5.3 Month-Wise Crashes 2023

Table 26: Crashes on the months of the year 2023

Row Labels	Total Crashes	Total Fatalities	Serious Injuries	Minor Injuries
Jan	83	29	38	29
Feb	81	33	31	35
Mar	101	34	43	47
Apr	96	38	27	48
May	114	43	46	60
Jun	78	29	35	27
Jul	109	28	52	57
Aug	98	43	46	34
Sep	115	50	32	72
Oct	117	39	76	24
Nov	93	34	76	10
Dec	105	39	49	46
Grand Total	**1190**	**439**	**551**	**489**

The highest number of crashes were recorded in October 2023 with 117 crashes and 39 deaths in one month, which means that every day more than 1 human being was dying on roads of Gurugram.

3.6 Blackspots

Gurugram recorded 36 blackspots in 2024, having more than 10 fatalities or 5 crashes including fatalities and serious injuries from past three year. (2021-2022-2023). The list of 36 blackspots is mentioned below, in which 10 new blackspots are created due to more construction of roads, having some poor design or engineering this year.

Table 27: List of Blackspots 2024

Sr. No.	Location of Black Spot	Department	2023				2022				2021			
			C*	F	S	M	C	F	S	M	C	F	S	M
1	RAJIV CHOWK	NHAI / GMDA	**17**	8	6	6	**18**	4	12	2	**12**	6	5	3
2	KHERKI DAULA	NHAI	**1**	0	0	1	**13**	5	4	13	**14**	7	6	0
3	NARSINGH-PURCUT	NHAI	**6**	1	3	7	**6**	2	10	0	**13**	3	10	0
4	IMT MANESAR CHOWK	NHAI	**2**	1	0	2	**4**	2	1	1	**4**	0	2	1
5	BILASPUR CHOWK	NHAI	**12**	9	4	4	**13**	4	9	1	**12**	4	7	1
6	PANCHGAON CHOWK	NHAI	**13**	6	6	3	**20**	10	14	2	**10**	6	8	1
7	IFFCO CHOWK	NHAI / GMDA	**22**	5	8	12	**21**	10	14	9	**10**	4	6	0
8	SIDHRAWALI CUT	NHAI	**10**	5	4	2	**12**	10	5	1	**10**	4	3	2
9	NSG CAMPUS MANESAR	NHAI	**2**	2	0	2	**1**	0	0	1	**8**	4	6	0
10	KAPRIWAS	NHAI	**2**	1	1	0	**4**	0	3	3	**5**	5	2	0
11	SHANKAR CHOWK	NHAI / GMDA	**9**	4	5	2	**3**	1	4	0	**9**	4	4	2
12	AMBIENCE MALL	NHAI	**9**	3	3	4	**6**	1	4	0	**8**	2	3	0
13	SHUBHASH CHOWK	NHAI	**7**	3	2	1	**3**	2	1	0	**5**	2	3	1
14	ATLAS CHOWK	NHAI	**1**	0	1	0	**7**	2	3	6	**4**	2	1	2
15	VATIKA CHOWK	NHAI	**5**	1	4	5	**6**	5	0	0	**6**	1	5	1

16	Manesar bus stand	NHAI	**12**	3	5	7	**6**	3	2	6	**7**	4	1	3
17	SARHAUL TOLL	NHAI	**6**	3	0	2	**6**	2	6	0	**6**	2	2	0
18	Gamroz toll plaza	NHAI	**8**	3	1	7	**3**	1	2	0	**1**	1	3	0
19	HERO HONDA CHOWK	GMDA	**11**	4	3	5	**4**	3	0	0	**10**	3	4	0
20	RAMPURA chowk	GMDA	**9**	5	4	6	**13**	6	2	8	**12**	6	5	2
21	SIGNATURE CHOWK	GMDA	**10**	4	3	5	**9**	2	7	0	**8**	4	3	1
22	Khushboo chowk	GMDA	**3**	1	2	0	**3**	0	3	0	**4**	2	5	0
23	GENPACT CHOWK	GMDA	**6**	2	3	1	**6**	2	2	3	**5**	0	0	5
24	Sector 42/47 metro station	GMDA	**5**	1	2	1	**8**	1	6	6	**2**	0	2	0
25	Bakhtawar chowk	GMDA	**6**	0	5	1	**3**	2	1	1	**1**	0	1	0
26	CD Chowk	GMDA	**6**	0	6	3	**3**	2	2	0	**1**	0	1	0
27	32 milestone entry	GMDA	**15**	5	5	8	**4**	2	3	0	**1**	1	0	0
28	krishna chowk, Palam Vihar	GMDA	**5**	1	3	1	**3**	2	0	1	**9**	5	2	6
29	Mahavir chowk	GMDA	**4**	0	1	2	**5**	1	4	0	**3**	1	2	0
30	Sidheshwar chowk	GMDA	**6**	2	2	3	**5**	2	3	1	**3**	0	3	0
31	jharsa under-pass	GMDA	**3**	4	7	4	**11**	4	11	0	**0**	0	1	0
32	sector 4-7 chowk	GMDA	**4**	1	2	0	**3**	0	3	0	**3**	0	3	0
33	SANPKA(JA-MALPUR)	PWD (B&R)	**1**	1	0	0	**3**	2	0	1	**3**	3	2	0
34	PATAUDI MARKET AREA	PWD (B&R)	**3**	1	3	1	**4**	3	1	0	**3**	1	5	0
35	FAR-RUKHNAGAR CHOWK	PWD (B&R)	**6**	4	4	4	**9**	4	3	4	**2**	1	2	0
36	KMP TOLL NEAR PANCHGAON	HSIIDC	**6**	5	1	2	**5**	3	3	0	**5**	2	6	0
	Total		**255**	**99**	**109**	**114**	**255**	**105**	**148**	**70**	**209**	**87**	**120**	**31**

*C- Crashes, F-Fatalities, S-Serious Injuries, M-Minor Injuries

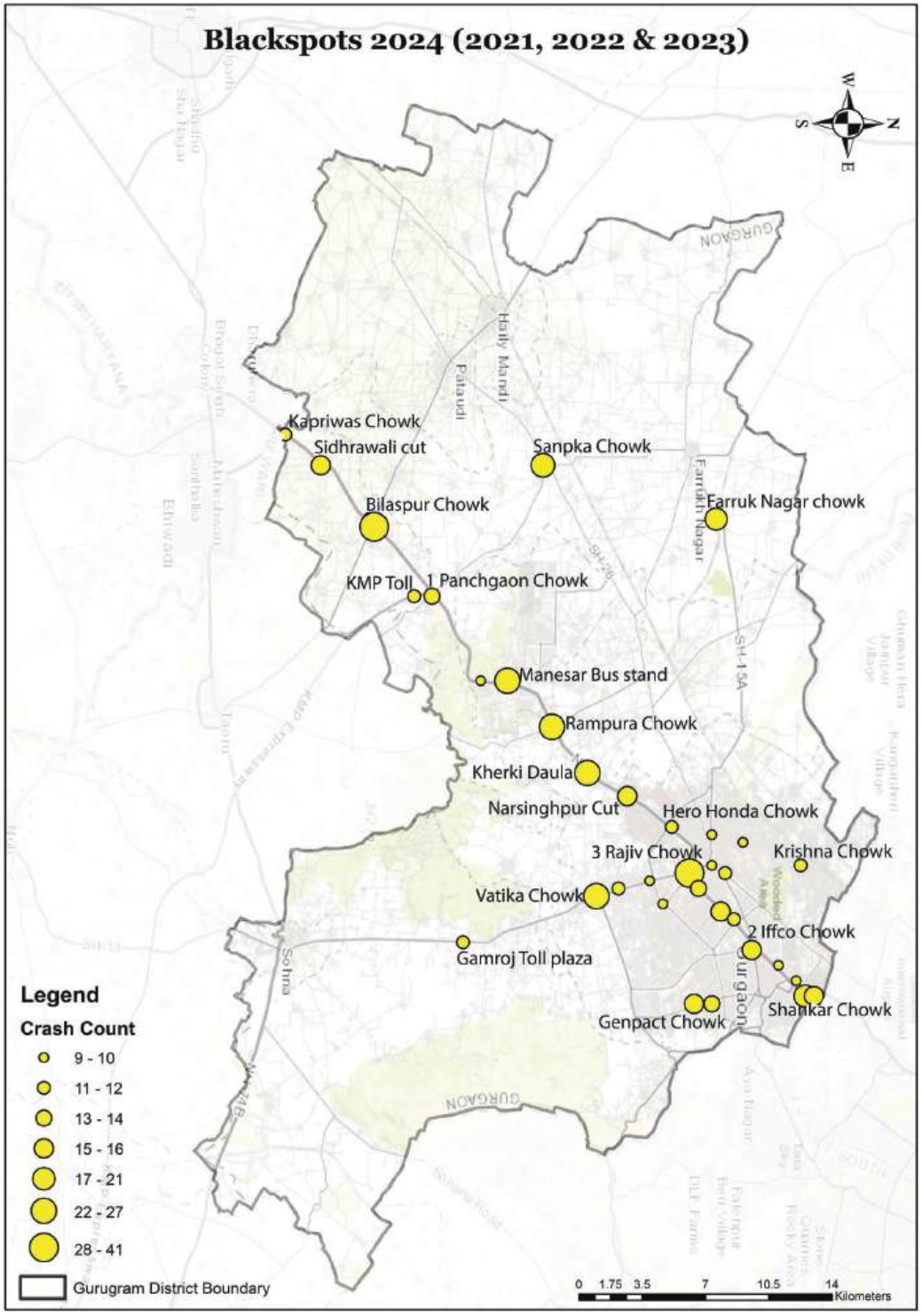
Table 28: Cumulative data of Blackspots for 3 years

Sr. No.	Location of Black Spot	Department	Blackspots 2024 (2021, 2022, 2023)			
			Total Crashes	Total Fatalities	Total Serious	Total Minor
1	RAJIV CHOWK	NHAI / GMDA	47	18	23	11
2	KHERKI DAULA	NHAI	28	12	10	14
3	NARSINGHPURCUT	NHAI	25	6	23	7
4	IMT MANESAR CHOWK	NHAI	10	3	3	4
5	BILASPUR CHOWK	NHAI	37	17	20	6
6	PANCHGAON CHOWK	NHAI	43	22	28	6
7	IFFCO CHOWK	NHAI / GMDA	46	17	24	21
8	SIDHRAWALI CUT	NHAI	31	18	12	5
9	NSG CAMPUS MANESAR	NHAI	11	6	6	3
10	KAPRIWAS	NHAI	11	6	6	3
11	SHANKAR CHOWK	NHAI / GMDA	21	9	13	4
12	AMBIENCE MALL	NHAI	23	6	10	4
13	SHUBHASH CHOWK	NHAI	15	7	6	2
14	ATLAS CHOWK	NHAI	12	4	5	8
15	VATIKA CHOWK	NHAI	17	7	9	6
16	Manesar bus stand	NHAI	25	10	8	16
17	SARHAUL TOLL	NHAI	18	7	8	2
18	Gamroz toll plaza	NHAI	12	5	6	7
19	HERO HONDA CHOWK	GMDA	25	10	7	5

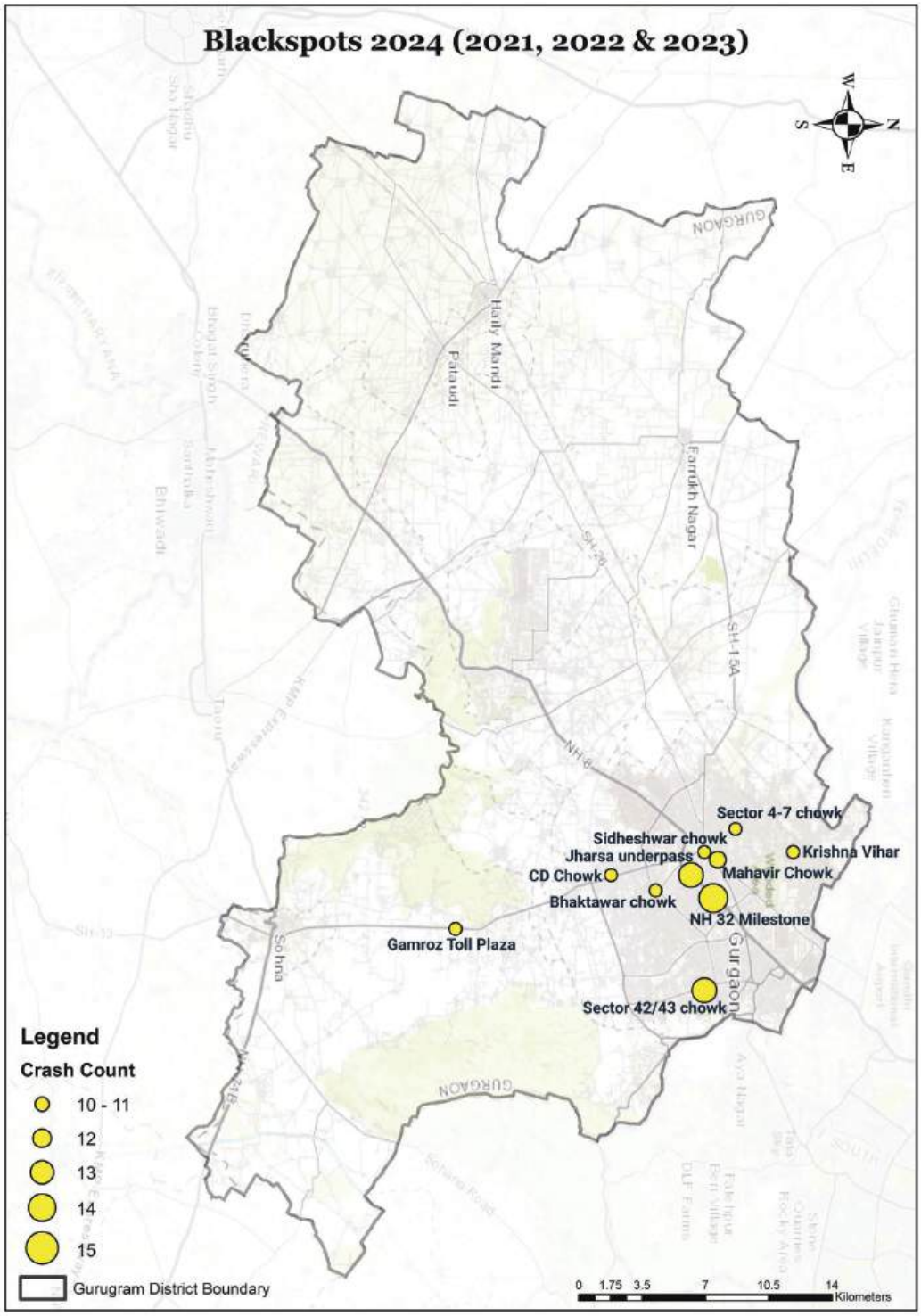
20	RAMPURA chowk	GMDA	35	17	11	16
21	SIGNATURE CHOWK	GMDA	27	10	13	6
22	Khushboo chowk	GMDA	10	3	10	0
23	GENPACT CHOWK	GMDA	17	4	5	9
24	Sector 42/47 metro station	GMDA	15	2	10	7
25	Bakhtawar chowk	GMDA	10	2	7	2
26	CD Chowk	GMDA	10	2	9	3
27	32 milestone entry	GMDA	20	8	8	8
28	krishna chowk, Palam Vihar	GMDA	17	8	5	8
29	Mahavir chowk	GMDA	12	2	7	2
30	Sidheshwar chowk	GMDA	14	4	8	4
31	Jharsa underpass	GMDA	14	8	19	4
32	sector 4-7 chowk	GMDA	10	1	8	0
33	SANPKA(JAMALPUR)	PWD (B&R)	7	6	2	1
34	PATAUDI MARKET AREA	PWD (B&R)	10	5	9	1
35	FARRUKHNAGAR CHOWK	PWD (B&R)	17	9	9	8
36	KMP TOLL NEAR PANCH-GAON	HSIIDC	16	10	10	2
	Total		**719**	**291**	**377**	**215**

The top 10 blackspots are: Rajiv Chowk, Iffco Chowk, Panchgaon Chowk, Bilaspur Chowk, Sidhrawali cut, Rampura Chowk, Kherki Daula toll plaza, signature chowk, Manesar bus stand, Narsingpur cut and Hero Honda chowk.

There are 50% blackspots on NHAI, 41% on GMDA roads, 8.8% on PWD roads and 2.9% on HSIIDC roads. Whereas, in 2022, 52% blackspots were on NHAI and 20% were on GMDA roads and 22% on pwd roads. There has been reduction of crashes and blackspots on PWD roads and slight reduction on NHAI, but the severity of crashes and deaths is rapidly increasing on GMDA roads.



Map 19: Blackspots map 2024



Map 20: New Blackspots of 2024

3.6.1 Severity of Blackspots

Presently, there is no defined accident analysis technique/methodology followed in India. "Accident Black Spots" or "Black Spots" are locations where the road accidents repeatedly take place or tend to cluster together. Black Spots may be Nodes (junctions /intersections) or Links (mid-block between adjacent Nodes) or Cells (areas)In order to quantify the criticality of an accident site, a system of assigning scores can be adopted based on the severity of accident. The score termed as Accident Severity Index (ASI). Accident Severity Index is a dimensionless value indicating the hazardousness of a spot on the road.

The following equation has been used:
ASI = (Nf x Wf) + (Ng x Wg) + (Nm x Wm)
Whereas,
Nf=No. of fatal accidents or fatality at the spot;
Wf= Weightage assigned to fatal accident or fatality=7;
Ng=No. of grievous accident or grievous injured persons;
Wg=Weightage assigned to grievous accident or grievous person=3
Ng=No. of minor accident or minor injured persons;
Wg=Weightage assigned to minor accident or minor person=1

Note:

i.The value of Wf = 7 and Wg = 3 was recently adopted for black spots deter mination while doing safety audit of NHAI PPP projects and given very satis factory results.

ii.In some countries, minor injury & non-injury are considered and weightage of 1 adopted.

Accident Severity Index will be determined for each location based on numbers of fatal/grievous/ minor accidents {ASI(n)} and numbers of fatality/grievous/minorly injured persons {ASI(p)}. The final ASI of each location will be determined.

ASI= 1/2 {ASI(n)+ASI(p)}

The Hazardous Spots on the road network are prioritized based on Accident Severity Index (ASI). The table below highlights the order of priority in blackspots for its remedial measures.

Table 29: Accident severity Index of Blackspots 24

Sr. No.	Location of Black Spot	Department	Severity Index
1	PANCHGAON CHOWK	NHAI	244
2	IFFCO CHOWK	NHAI / GMDA	238
3	RAJIV CHOWK	NHAI / GMDA	206
4	BILASPUR CHOWK	NHAI	185
5	SIDHRAWALI CUT	NHAI	174
6	RAMPURA chowk	GMDA	168
7	KHERKI DAULA	NHAI	128
8	NARSINGHPURCUT	NHAI	118
9	JHARSA UNDERPASS	GMDA	117
10	SIGNATURE CHOWK	GMDA	115
11	MANESAR BUS STAND	NHAI	110
12	SHANKAR CHOWK	NHAI / GMDA	106
13	KMP TOLL NEAR PANCHGAON	HSIIDC	102
14	FARRUKHNAGAR CHOWK	PWD (B&R)	98
15	HERO HONDA CHOWK	GMDA	96
16	32 MILESTONE ENTRY	GMDA	88
17	VATIKA CHOWK	NHAI	82
18	KRISHNA CHOWK, PALAM VIAHR	GMDA	79
19	AMBIENCE MALL	NHAI	76
20	SARHAUL TOLL	NHAI	75
21	SHUBHASH CHOWK	NHAI	69
22	NSG CAMPUS MANESAR	NHAI	63
23	KAPRIWAS	NHAI	63
24	PATAUDI MARKET AREA	PWD (B&R)	63
25	GAMROJ TOLL PLAZA	NHAI	60
26	SIDESHWAR CHOWK	GMDA	56
27	GENPACT CHOWK	GMDA	52
28	ATLAS CHOWK	NHAI	51
29	KHUSHBOO CHOWK	GMDA	51
30	SECTOR 42/47 METRO STATION	GMDA	51
31	SANPKA(JAMALPUR)	PWD (B&R)	49
32	CD Chowk	GMDA	44
33	BAKHTAWAR CHOWK	GMDA	37
34	MAHAVIR CHOWK	GMDA	37
35	IMT MANESAR CHOWK	NHAI	34
36	SECTOR 4-7 CHOWK	GMDA	31

The severity index helps in prioritizing the funding and energies to rectify the black-spot. The Panchgaon chowk is the most critical blackspot in the district and needs immediate reforms to avoid any future casualty. Iffco chowk and Rajiv Chowk is already taken up by GMDA and the rectification work is in process.

3.6.2 Cause of crashes for Blackspots 2024

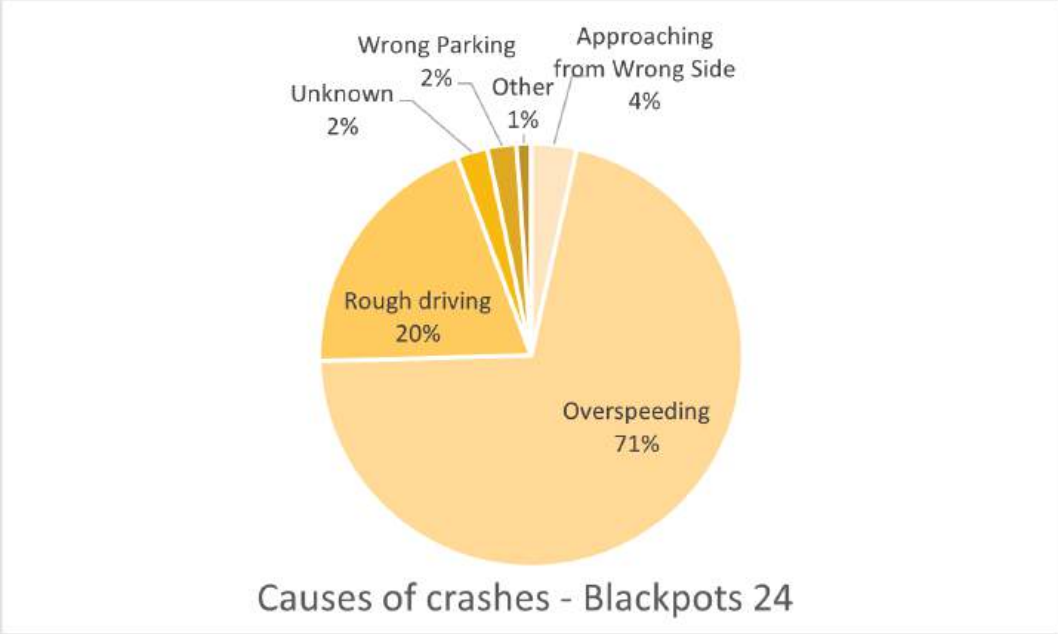


Figure 27: Causes of Crashes- Blackspots

71% of crashes occurring at blackspots are attributed to vehicle over-speeding, while 20% are attributed to rough driving. However, it's important to note that the causes listed in the FIRs primarily focus on driver errors and may not provide a comprehensive understanding of the accident scenario. Critical details regarding road infrastructure and other engineering aspects are often absent from the data. Therefore, conducting thorough crash investigations is crucial in accurately determining the root cause of road crashes. Merely attributing crashes to driver over-speeding without considering factors such as notified speed limits and the presence of speed controlling barriers may not effectively address road safety concerns and prevent future accidents.

3.6.3 Time of crash for blackspots 2024

Time of day	Crashes	Fatalities
Night Time (06:00 PM -06:00 AM)	402	186
Day Time (06:00 AM -06:00 PM)	231	87

It is evident from the data that there are more crashes during the night time of the day i.e. between 06:00 PM to 06:00 AM and the fatalities are 53 times higher during the night hours.The design of our roads and safety measures should focus on night time visibility and safety for drivers, pedestrians and cyclists. There should be appropriate hazard markers, dedicated walking and cycling zones, blinking cat eyes, signboards, and night illumination to avoid more deaths at these blackspots.

3.6.4 Type of Collisions, Blackspots 2024

The highest crashes are occurring because of Hit from back with 33% crashes and Head on Collisions with 17% of the crashes. Hit from back can be associated with over speeding of vehicles and lack of lay bays for cars or HVC on high-speed corridors. The hit pedestrian cases are crucial to address as the lack of footpaths and pedestrian crossings on our roads are responsible for 11% of these crashes.

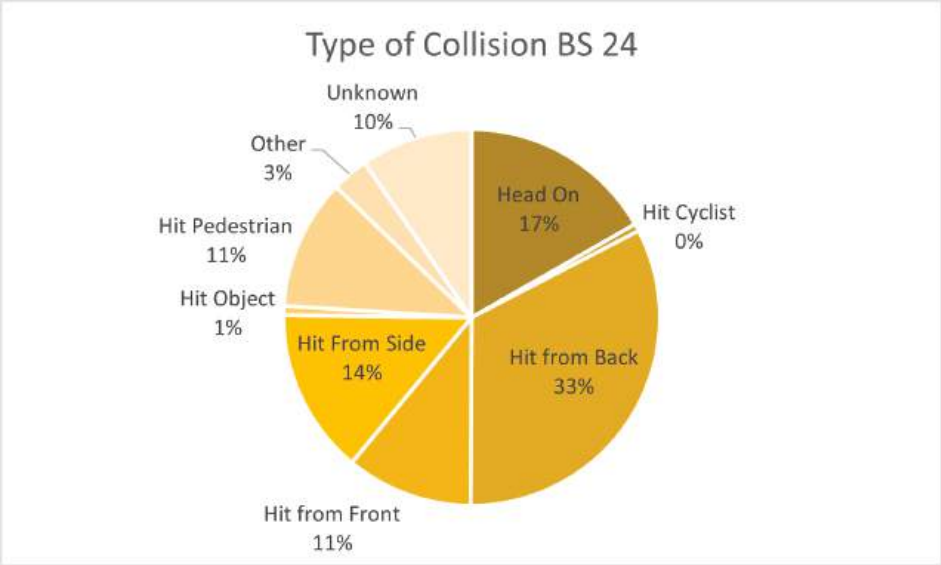


Figure 28: Type of Collision - Blackspots 24

04 POST CRASH MEASURES

In the aftermath of a road crash, prompt and effective measures are crucial to minimize injuries and save lives. Post-crash measures and emergency care services play a vital role in ensuring that victims receive timely medical attention and support. Here's an overview of the key components involved:

1.Emergency Health Care in Golden hour: It underscores the critical importance of timely and effective emergency medical care in improving survival rates and reducing the impact of traumatic injuries on crash victims.

2.Crash Investigation: Upon arrival at the crash site, emergency responders conduct a rapid assessment of the scene to ensure safety for themselves and others, while also evaluating the severity of injuries and the number of individuals involved. All the necessary information including the cause behind the crash are observed as this assessment and data collection helps prioritize care and resources.

3.Immediate interventions: It refer to actions taken promptly to address and mitigate risks, reduce the occurrence of road traffic accidents, and minimize the severity of injuries. It includes infrastructure improvement through tactical measures, speed managements, traffic enforcement, pedestrian safety measures, cycling safety measures, and public awareness.

4.Permanent interventions: Permanent interventions often involve infrastructure improvements such as road design modifications, installation of safety barriers, creation of pedestrian-friendly zones, and implementation of traffic calming measures.

Overall, post-crash measures and emergency care services play a crucial role in mitigating the impact of road crashes, saving lives, and supporting the recovery of those affected by these traumatic events. By prioritizing rapid response, effective medical intervention, and holistic support, communities can work towards reducing the incidence and severity of road traffic injuries.

4.1 Emergency health care systems

Policy level programs

There are few policy level changes that can be adapted from the ideas given below, some of these changes has already been adopted by several cities to make the emergency health care system strong in the city.

1.Golden Hour Trauma Care Plan: Plan for seamless networking amongst health facilities, rescue services, existing fleet of ambulances and to ensure the availability of one emergency care facility at every 50km along the national/state highways.

- **Equipping District Traffic Control Room**: The already existed the State Traffic Control Room can be setup with communication devices and network, so that Golden hour information can be received wirelessly and shall communicated to nearest Ambulance driver.
- **GPS Tracking Device enabled Emergency Vehicles**: Practice can reduce the response time in emergency care for the victims, presently Haryana emergency response time is 45-60 minutes from time of incidence.
- **Upgradation of existing hospitals and establishment of Trauma Care Centre**: In this system, each hospital has trained staff who are skilled and protocols for management are established. Hence, the hospitals get prepared for an incoming patient which not only helps give good care but also cut unnecessary delay
- **Development of Emergency Crash Care System**: To bypass and fasten the emergency response time in treating a patient for First Aid, local hospital can be identified as Emergency Crash Care Centre.

2.Good Samaritans model: India is an unfortunate victim of a large number of road crash fatalities. Three out of four people in the country are hesitant to help injured accident victims on roads due to fear of police harassment, detention at hospitals, and prolonged legal formalities. Even if someone wants to help, these factors stop them from doing so the Good Samaritan Law allows a person, without expectation of payment or reward and without any duty of care or special relationship, voluntarily come forward to administer immediate assistance or emergency care to a person injured in an accident, or crash, or emergency medical condition. Good Samaritan

from harassment on the actions being taken by them to save the life of the road accident victims. In 2012, a Public Interest Litigation (PIL) was filed in the Supreme Court of India, requesting the Hon'ble court to safeguard Good Samaritans who come forward to help the injured.

3.Tamil Nadu Accident and Emergency Care Initiative (TAEI): Tamil Nadu introduced the pilot Project in Salem city with the help of PPP mode. TAEI coordinated with government medical college hospitals, district headquarter hospitals and government hospitals working in various locations and about 80 centres were established across the state. Every centre had a designated Trauma Nodal officer and nursing staff all the time. In the trauma reporting module, data in six major categories such as Road Traffic Accidents, Fall Injuries, Assault cases, Surgeries, Head injuries and Mode of patient transfer. The main scope of TAEI reporting App is in capturing the data during peri- and post-accident timeframe to help increase the survival rate of the injured people. TAEI App helps in formulating policy framework to enhance the favourable outcomes of accidents. It provides a real-time database to analyse, get insight and thereby address the issues technologically.

Working on similar row, pilot projects can be introduced in Gurugram which creates awareness in people and save the life of crash victims as cases of crashes due to hit and run are high.

4.1.1 Ambulance Infrastructure- Gurugram

As per the WHO standards, there should be at least one ambulance per 100,000 population in the plains, although international standards recommend 1 ambulance per 50,000 people. The goal of an ambulance is to reach any place within 15-20 minutes after the distress call and transport the patient to a health facility within 20 minutes thereafter.

The data below highlights the number of ambulances in the district in past 10 years, and as per the WHO criteria there is sufficient number of ambulances in 2023

Table 30: Number of Ambulances in Gurugram 2013-2023

Referral Transport System Gurugram	
Session Year	**Total no. of ambulances**
2012-13	13
2013-14	17
2014-15	19
2015-16	18
2016-17	16
2017-18	17
2018-19	19
2019-20	20
2020-21	24
2021-22	36
2022-23	36
2023-24	34

4.1.2 Trauma Care Infrastructure- Gurugram

According to Road safety policy by the government of India:

"The Government will strive to aim that all persons involved in road accidents benefit from speedy and effective trauma care and health management. The essential functions of such a service would include the provision of rescue operation and administration of first aid at the site of an accident, the transport of the victim from accident site to an appropriate nearby trauma care hospital."

The trauma care network should be so envisaged that no trauma victim to be transported for more than 50 kilometres and a designated trauma care facility is available at every 100 Km. A Trauma Care Facility should have the resources and capabilities necessary to provide trauma services at a particular level to injured patients.

Trauma centre designation criteria set strict requirements for staffing, specialist availability, response times, training, quality improvement and community education.

- Level IV trauma care: This would be provided by appropriately equipped and manned mobile hospital / ambulances. These shall be provided by MoRTH / NHAI / NRHM / State Govts., etc as the case maybe.
- Level III TCF will provide initial evaluation and stabilization (surgically if appropriate) to the trauma patient. The district/ tehsil hospitals with a bed capacity of 100 to 200 beds have been selected for level III care.
- Level II TCF will provide definitive care for severe trauma victims. Emergency physicians, surgeons, Orthopaedic and Anaesthetists are in-house. The college hospitals or hospitals with bed strength of 300 to 500 are identified as Level II Trauma Centre.
- Level I TCF will provide the highest level of definitive and comprehensive care for patient with complex injuries. Level I Trauma Centres is only in medical college hospitals with more than 500 beds.

As per the norms for every 950 km, the requirement would be as follows:
- Level I Trauma centre: 1
- Level II Trauma centre: 3
- Level III Trauma centre: 4

The existing trauma care centres around the district have been listed below:

Table 31: Trauma care facility around Gurugram

Trauma Care Name	Level	Facilities	Distance from Gurugram
PGIMS Rohtak	Level 1	Multi-Specialty	79 km
Safdarjung Hospital	Level 1	Multi-Specialty	28 km

What needs to be understood is that a Trauma Centre is not an infrastructure concept but a systems concept in which the appropriate infrastructure, equipment & human resources work in tandem to provide the necessary trauma care services to a patient. At present there is just 1 government aided trauma centre in the district, which is far less to support the people of Gurugram.

4.2 Crash Investigation

Crash investigation is crucial for understanding the root causes of road traffic accidents and implementing effective measures to prevent future incidents. By analysing the circumstances leading to a crash, investigators can identify contributing factors such as road design flaws, cause of vehicle defects, and environmental conditions. This information enables policymakers, law enforcement agencies, and road safety professionals to develop targeted interventions and implement corrective actions to mitigate risks and improve road safety. Crash investigations typically involve gathering evidence from the crash site, examining vehicle damage, interviewing witnesses, and analysing available data, including vehicle telemetry and surveillance footage. Collaborative efforts between various stakeholders, including traffic police, transportation authorities, engineers, and medical professionals, are essential for conducting thorough and accurate crash investigations. At present, India lacks a standardized protocol or policy for conducting regular crash investigations and rely solely on FIR reports filed by the Traffic Police Department. However, this approach presents significant limitations, as it fails to provide comprehensive insights into

- the underlying causes of crashes
- photographs of the site at the time of crash
- speed limit assigned on the road, junction type
- availability of pedestrian infrastructure
- night visibility measures and road markings
- speed calming measures
- eight angle photographs of the first vehicle and second vehicle
- site examination including tyre marks, breaking conditions, infrastructure damage

thereby impeding timely mitigation efforts. To address this gap, there is an urgent need for reforms to establish a systematic framework for conducting regular crash investigations. By conducting thorough investigations into every instance of injury or death on the road, decision-makers and implementing authorities can gain valuable insights to inform proactive measures aimed at preventing future crashes and enhancing road safety initiatives.

Raahgiri Foundation has developed a Road crash audit checklist mentioned in Annexure B.

This checklist talks about Crash Data and Analysis: The audit begins by understanding the details of the crash — the people and vehicles involved, location, weather conditions, time of day, type of crash (head on, hit from the back, hit and run etc), and type of violation involved (over speeding, rash driving etc). This analysis helps identify contributing factors to the crash allowing for targeted interventions.

1.Road Environment and Infrastructure: The physical aspects of the road are scrutinised, including speed limits, junctions, road features like curves and bridges, and pedestrian infrastructure. This assessment examines the adequacy and effectiveness of these elements in ensuring safety for all road users.

2.Vehicle Details: Vehicles involved in crashes are documented, along with details like registration numbers and types.

3.Road Measures: The audit then evaluates the road surface condition, markings, signage, hazard markers, and night visibility measures. This assessment identifies potential improvements that can enhance road safety.

4.Photographs and Site Examination: Visual evidence plays a crucial role in the RSA. Photographs capture the crash site, vehicles involved, and surrounding elements, providing valuable context. The site examination itself meticulously analyses tire marks, braking conditions, and infrastructure damage, furthering the understanding of the crash dynamics.

5.Haddon Matrix and Recommendations: The Haddon Matrix, a framework that categorises crash factors into host, vehicle, and environment, helps identify where interventions can be most effective. Based on these insights, the RSA generates specific recommendations for:

- Immediate interventions: These are quick fixes like improving signage, clearing obstructions, or enhancing visibility.
- Permanent solutions: These involve more substantial changes, such as re designing intersections, installing guardrails, or improving lighting.

The benefits of Crash Data Analysis are undeniable. By identifying and addressing potential hazards before they cause harm, RSAs can significantly reduce the number and severity of crashes. They also promote:

- **Cost-effectiveness**: Addressing problems early is often cheaper than repairing damage and compensating victims after an accident.
- **Social impact**: Fewer crashes mean fewer injuries and fatalities, leading to a safer and healthier community.
- **Improved infrastructure**: These audits contribute to building roads that are not just efficient but also prioritise the safety of all users.

These audits are not just reactive measures in response to crashes; they are proactive tools that play a crucial role in creating safer roads. By systematically evaluating and addressing potential hazards, Crash Audits can prevent tragedies, save lives, and ensure smoother, safer journeys for everyone.

4.3 Immediate Interventions in Road safety

The purpose of immediate interventions is to avoid any upcoming road hazard due to similar reasons and remove the possibility of conflict with the minimum time and cost possible. If the safety hazard is installed at the earliest as a temporary measure but it will work to alert the road user and to guide the user this will prevent further mishap on the road.

To achieve the immediate interventions, the following principles are considered:

- To Implement the project quickly and cheaply.
- To address safety concerns and infrastructure gaps.
- To Engage with community members and spread awareness on road safety measures.
- To reallocate road spaces for all road users specially the vulnerable ones.
- To enhance Place-making for youth and society.
- To improve Equity and access to public spaces.
- To build public and political support.

The immediate interventions can be adopted through tactical measures which is an innovative approach in transforming our cities with minimum changes to the built environment but creating significant impact.
Tactical urbanism has been one of prominent design approaches taken by Raahgiri Foundation for creating safer streets, intersections and public spaces. With its rapid low-cost and scalable approach in making incremental changes to public areas, it can make cities more adaptive to citizens' changing requirements.

It helps in making our roads safer for even the most vulnerable users. Concepts of tactical urbanism has been used in many of design, one such has been Iffco Chowk, Gurugram, where with temporary changes by creating pedestrians crossing, islands, pick up and drop off zones a successful trial was done over the span of 4 weeks. As a result, it helped in making the intersection safer, inclusive and lively for all users. The same approach has been applied in other projects done by Raahgiri Foundation including Tapukara intersections and Khushboo Chowk.

There are several tools that can be utilized in the process:

Table 32: Tools for Tactical Urbanism

SURFACE MARKING	ROW DEMARCATIONS	SIGNAGE
Acrylic distemper paint	Traffic cones	Acrylic distemper paint
Floor coat emulsion paint	Delineators, Reflective tape	Thermoplastic paint
Water-based epoxy paint	Jersey barricades, Floor marking tape	Spray paint
Thermoplastic paint	Traffic buttons	Reflective boards
Spray paint	Pavement markers, Tyres	Easels
Aerosol line marking machine	Nylon ropes, Wooden pallets	Mill board/ MDF board

The process to implement a tactical trial is described underneath:

Table 33: Process of implementing the tactical measures

Stage 1	Project Planning	Purpose and Context	Generate ideas	Project details	Review with Commissioner	
Stage 2	Design	Consider site context	Develop concept	Review with government stakeholders	Permitting/ Approvals Process	
Stage 3	Conducting Traffic Trial	Prepare Trial Plan	Prepare cost estimation	Review with government stakeholders	Promotion and Awareness	Implement the trial project

Stage 4	Monitoring and Evaluation	Evaluate and adjust	Maintenance	Cleanup at the site	Submit pretrial and post-trial analysis
Stage 5	Implement permanent changes	Review of findings from post trial	Prepare plan and design for permanent solutions	Submit final DPR	

4.4 Permanent Interventions in road safety infrastructure

Permanent design solutions in road safety involve implementing infrastructure and engineering measures that address safety concerns on a long-term basis. Some examples include:

i. Road Design: Designing roads with appropriate lane widths, curvature, and alignment to reduce the risk of collisions and accommodate various modes of transportation.

ii. Designated parking place: There shall be provisions of cycle parking, two-wheeler and four-wheeler parking spaces to avoid any encroachment along the road or footpath as per the requirement of the site.

iii. Designated pick-up and drop off zones: The lay bays, pick-up spots should be designed as per the IRC standards with seamless connectivity to these locations.

iv. Traffic Calming Measures: Implementing features such as speed humps, roundabouts, and raised pedestrian crossings to slow down vehicle speeds and improve safety for all road users.

v. Pedestrian Facilities: Constructing sidewalks, crosswalks, pedestrian bridges, and refuge islands to enhance pedestrian safety and accessibility.

vi. Cycling Infrastructure: Building dedicated bike lanes, separated cycle tracks, and bike-friendly intersections to encourage cycling and reduce conflicts with motor vehicles.

vii.Intersection Improvements: Upgrading intersections with features like signalization, advanced warning signs, and clear markings to minimize the risk of crashes at junctions.

viii.Safety Barriers: Installing guardrails, crash cushions, and median barriers to prevent vehicles from veering off the road or colliding head-on.

ix.Street Lighting: Enhancing visibility and safety at night by installing adequate street lighting along roadways and intersections.

x.Traffic Management Systems: Implementing intelligent transportation systems (ITS) and traffic management technologies to monitor traffic flow, optimize signal timings, and detect hazards in real-time.

xi.Accessibility Upgrades: Ensuring accessibility for all road users, including those with disabilities, through features like curb ramps, tactile paving, and audible signals at crossings.

By incorporating these permanent design solutions into road infrastructure planning and development, communities can create safer environments for all road users and reduce the frequency and severity of traffic-related incidents over the long term.

05 MITIGATION MEASURES

The 6 Es

Based on the findings and analysis of Road Safety Audits, we can mitigate crashes, injuries, and fatalities using the 6 Es: Engineering, Enforcement, Education, Emergency response, Engagement strategies and Evaluation of data.

1.Engineering Smarter Roads: Engineering is the foundation of road safety. By creating roads that are safer by design, we can reduce the probability of crashes occurring in the first place and minimise fatalities and injuries after the fact. Tactical Urbanism allows for temporary changes like protected bike lanes or pedestrian crossings. These trials offer real-world data and community feedback before costly permanent infrastructure interventions.

2.Enforcing Traffic Safety: Consistent and visible enforcement of traffic laws plays a crucial role in deterring risky behaviour. Random Breathalyzer checks, speeding enforcement through cameras or patrols, and strict action against distracted drivin g can act as powerful deterrents. There is evidence on parking of four wheelers or vendor encroachment on footpaths causing the pedestrians to walk on vehicular carriageway, thereby risking the lives. However, enforcement must be fair and impartial, focusing on education and behaviour change alongside penalties. Community engagement with enforcement authorities' further fosters understanding and compliance.

3.Educating road users and stakeholders: Targeted training programs for professional drivers like truck and bus operators can instil a culture of safety. Training should emphasize responsible driving practices towards vulnerable road users like cyclists and pedestrians. Public awareness campaigns play a crucial role in changing the mindset of all road users. Raahgiri Days is one such program which gives space to pedestrians and cyclist to reclaim the streets and other road users to learn road safety practices. School programs focusing on road safety for children and young adults can lay a strong foundation for responsible future drivers.

4.Emergency Response: When crashes do occur, minimizing fatalities and injuries depends on a swift and efficient emergency response system. Strategically placing ambulances at major blackspots can dramatically reduce response times, saving

lives and minimizing long-term complications. Additionally, investing in first responder training and equipping them with modern medical equipment ensures the best possible care for crash victims.

5.Engagement Strategies: Effective post-crash measures rely on seamless collaboration and coordination among various stakeholders, including emergency responders, law enforcement agencies, medical professionals, transportation authorities, and community organizations. Regular training, drills, and communication protocols help ensure a cohesive response to road crashes.

6.Evaluation strategies: Conduct comprehensive evaluations of road safety interventions to determine their overall effectiveness and impact. This involves assessing key performance indicators, such as crash rates, injury severity, and fatalities, before and after the implementation of safety initiatives. Utilizing data analytics, and cost-benefit analysis can help quantify the benefits of road safety interventions and inform future decision-making.

By investing in the 6E's of road safety we can create a safer and more sustainable transportation system for all road users including the vulnerable ones.

5.1 Enforcement status

The responsibility of the enforcement department is to ensure that all the road users follow the traffic rules and regulations to ensure safety. This includes the following list of violations to be monitored:

Table 34: Traffic rules under enforcement department

Over speed while crossing Speed breaker
Drunken Driving / Consumption of Alcohol
Changing lane without care
Dangerous Overtaking
Driving against flow of traffic
Over Speed

Non-respect of Right of Way (ROW) rules
Carrying people in Load vehicle
Over speed while crossing Zebra crossing
Drugs abuse
Red Light jumping
Overloaded
Illegal Parking on Road
Using Phone while driving
Rash Driving
Travel without Seatbelt / Helmet
Juvenile driving
Driving body altered vehicle
Tripling on Two-wheeler
Violating the Mandatory signs
Improper use of headlight/ taillight
Improper use of horn
No indication of Vehicle parking along the road
Parking in No Parking area

The data collected from the RTA Gurugram highlighting the challans and revenue collections is shown below:

Table 35: Monthly Challan Revenue 2023

Challan Report Jan-2023 to Dec-2023		
Month/Year	**Total Challan**	**Total Amount**
Jan-23	330	15358500
Feb-23	198	10810000
Mar-23	207	12612000
Apr-23	216	13699500
May-23	200	11472300
Jun-23	216	12077500
Jul-23	213	12212400
Aug-23	228	12066500
Sep-23	238	10669100
Oct-23	193	10577500
Nov-23	404	10457000
Dec-23	237	10041000
Total	**2880**	**142053300**

The trend of high revenue collection in January followed by November 2023 suggests increased enforcement efforts, possibly due to festive seasons or targeted violations. However, it's crucial to recognize that high challan numbers indicate huge disregard for traffic rules, stemming from various factors including behavioural tendencies and infrastructure shortcomings. For instance, cases of wrong-side movement on service lanes of national highways, often caused by inadequate U-turn provisions, highlight design flaws that endanger lives. Similarly, the absence of designated pedestrian crossings on roads like Golf Course Road forces pedestrians

onto vehicular paths, jeopardizing safety. Furthermore, inadequate vending zones result in encroachment on footpaths, compelling pedestrians to walk on carriage-ways. While enforcement aims to curb violations, it's essential to assess whether our infrastructure truly caters to the needs of all road users, prompting a critical examination of our design practices

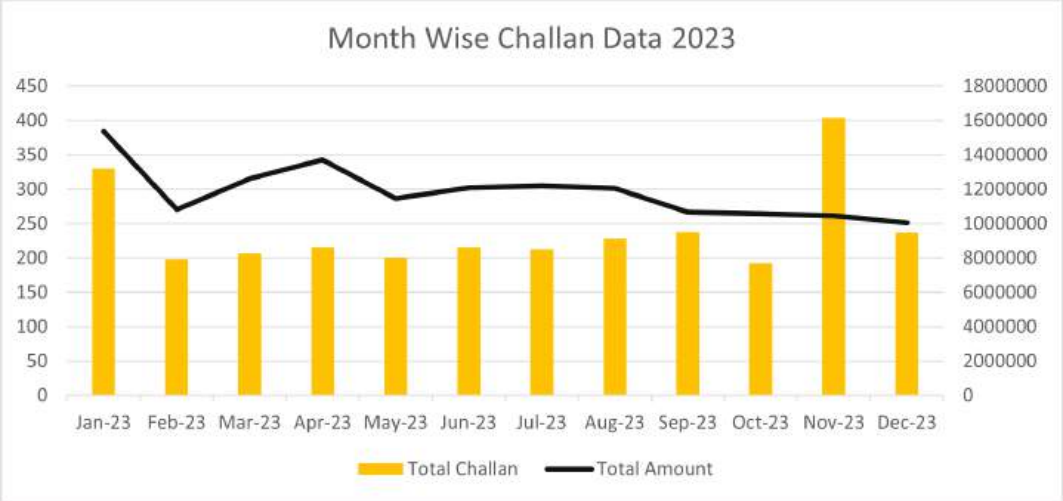


Figure 29: Monthly challan data

Over the past five years, there has been a notable trend in the number of challans issued and revenue collected. Specifically, both 2021 and 2022 witnessed a higher number of challans, resulting in increased revenue generation. However, in 2023, there was a significant decline in both the total revenue collected, amounting to less than 15 crores, and the total number of challan cases, which numbered nearly 3000, considerably lower than those issued in 2022 and 2021.

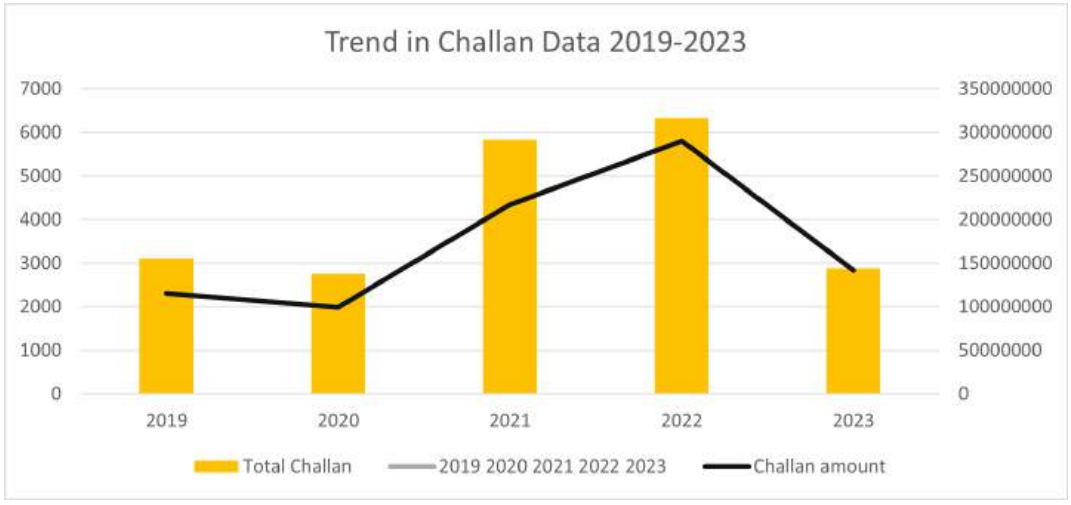


Figure 30: Trend in Challan reporting 2019 - 2023

5.2 Education and Awareness Campaigns

The education and awareness programs play a vital role in road safety for both road users and decision-making stakeholders. There is a need to work on regular capacity building programs on awareness of safety measures and designing of roads with the capacity to absorb the human error. Capacity building enables social organizations and their leaders to develop competencies and skills that can make them more effective and sustainable as well as an opportunity for different organisations to share their knowledge thus increasing the potential for them to enrich lives and solve society's most intractable problems, in this case, road safety. The few initiatives taken by Raahgiri Foundation has been listed below:

Surakshit School Vahan Policy- Education campaign

The program was organised by Regional Transport Authority of Gurugram in teaching the principles and transport authorities of school about the importance of making the commute of children to and from school to be safe. By working together with all stakeholders- the government, police, parents, schools and more to make school buses and environment safe around the school zone.

Awareness: Raahgiri days

Raahgiri Day is India's first sustained citizen initiative that makes streets exclusive to pedestrians and cyclists promoting road safety, healthy living, and connecting communities by reclaiming city streets and public spaces, to eventually reclaim urban lives. Raahgiri Days have been happening for the past 10 years in Delhi NCR. First started in Vya par Kendra in Gurugram, the Day became a movement that spread across the nation. Now, Raahgiri Days have been organised in over 90 cities in the country. Millions of citizens have attended a Raahgiri Day and seen the need for safe, accessible, sustainable streets in India.

Raahgiri Day works, among other things, to highlight the importance of tactical urbanism, the purpose of which is to highlight the improvement in the safety and comfort that road users experience by making street junctions more compact and reclaiming unused/overused spaces and putting them to better use. By allowing people to experientially reimagine their streets as being vehicle and congestion-free, it leads the citizenry to demand such changes – open, safe, and inclusive streets.

Capacity Building Workshop: Traffic Police

Training workshops and discussion panels are organized in partnership with expert groups and individuals to provide stakeholders with a comprehensive understanding of road safety. These initiatives aim to raise awareness about existing challenges and offer a platform for collaborative innovation and system redesign. For instance, a recent workshop convened traffic police from Haryana and Delhi, as well as planners, engineers, and architects, who engaged in group activities to brainstorm ideas for enhancing road safety in the city. Through such endeavours, authorities are sensitized to the importance of prioritizing safety measures on urban roads.

5.3 Regular Road Safety Audits

The Road Safety Audit (RSA) is a proactive tool designed to identify and address potential hazards on existing or planned roads. Unlike reactive measures taken after crashes occur, RSAs act as preventative shields, minimising the likelihood and severity of crashes. An RSA delves into the specifics of a road segment, analysing its design, layout, and surrounding environment. This analysis is guided by a comprehensive framework, often including the details outlined in **Annexure: C.**

The audit checklist is formulated in accordance with IRC: SP:88-2019, which covers various aspects including:

- Sight distance: Ensuring unobstructed visibility for road users along the way.
- Intersections: Designing intersections for safety and visibility, including functional traffic signals.
- Interchanges: Establishing safe distances at merging and diverging points.
- Cross sections: Providing appropriate right of way for vehicles, pedestrians, and cyclists.
- Roadside hazards: Placing crash barriers and addressing other potential hazards.
- Drainage: Ensuring proper drainage along the roads.
- Signs, Pavement Markings, and Delineation: Installing proper signage to inform, guide, control or delineate road users.

- Vulnerable road users: Addressing the needs of pedestrians, bicyclists, two-wheelers, three-wheelers, and animal-drawn carts, including seamless connectivity, safe crossings, placement of signages, and designated facilities of parking spaces and bus stops.
- Access to Property and Developments: Providing safe access points to properties and developments.
- Lighting and nighttime issues: Ensuring well-illuminated paths and facilities for nighttime visibility.
- General road safety clearance: Maintaining road safety in accordance with local weather conditions, free of gravels and potholes.

These attributes contribute to a comprehensive assessment of road safety conditions and should be conducted regularly.

5.4 Strategies and Programs

Various strategies and programs can be implemented to mitigate road crashes, one prominent example being the Vision Zero Program, a global movement aimed at eliminating traffic-related fatalities and serious injuries through a systematic approach to road safety. Originating as the national road policy in Sweden in 1997, Vision Zero has since been adopted by over 20 cities worldwide.

Central to this strategy is the Safe System, a comprehensive safety approach that shifts responsibility from road users to road designers, integrating core management and action areas to create a forgiving mobility system. As cities develop their road safety strategies, it's crucial to ensure that the Safe System's principles are applied holistically, considering both policy documents and practical implementation.

The Safe System approach involves all stakeholders in the transport system, from engineers and planners to lawmakers and police officers, sharing responsibility for designing roads that minimize the risk of serious or fatal outcomes from human error. Action areas within the Safe System contribute to building a mobility network that enhances safety, fosters healthier communities, and promotes sustainable transportation options. These areas include comprehensive speed management, safe street design, proactive land use planning, public transport improvements, enforcement, vehicle safety, emergency response, and education.

Figure 31: Safe system approach in Road safety

Many countries, such as Sweden, Norway, the Netherlands, Australia, New Zealand, New York, London, and Gurugram, have embraced Vision Zero principles. In India, the adoption of Haryana Vision Zero in 2017 preceded the implementation of Gurugram Vision Zero (GVZ). Commencing in April 2022, GVZ involves collaboration between the District Administration of Gurugram, Raahgiri Foundation, and Nagarro, employing private and government road safety experts. The initiative entails reviewing FIR incident reports of road crashes, identifying crash hotspots, analyzing collision types, and conducting surveys to determine crash causes. The one-year success of GVZ helped in reducing 12.7% of pedestrian deaths on roads in 2022. Recommendations are then made to relevant agencies for engineering changes and other measures to enhance road safety.

5.5 Technology and Road Safety

There is a need for an intelligent transport system and better tech solutions in a city like Gurugram which experience significant urbanisation and influx of people. One such method is through ITS (Integrated Transport System) which integrates advanced communication technologies into transportation infrastructure and vehicles to improve safety, efficiency, and sustainability. ITS encompasses a wide range

of applications designed to manage traffic flow, reduce congestion, enhance road safety, and provide timely information to commuters.

Some reference of cities using such technology is:

Singapore:

1. Electronic Road Pricing (ERP): A dynamic toll pricing system that reduces congestion by charging varying fees based on real-time traffic conditions.
2. Green Link Determining (GLIDE) System: Optimizes traffic signal timings across the city, improving traffic flow and reducing wait times at intersections.

Copenhagen:

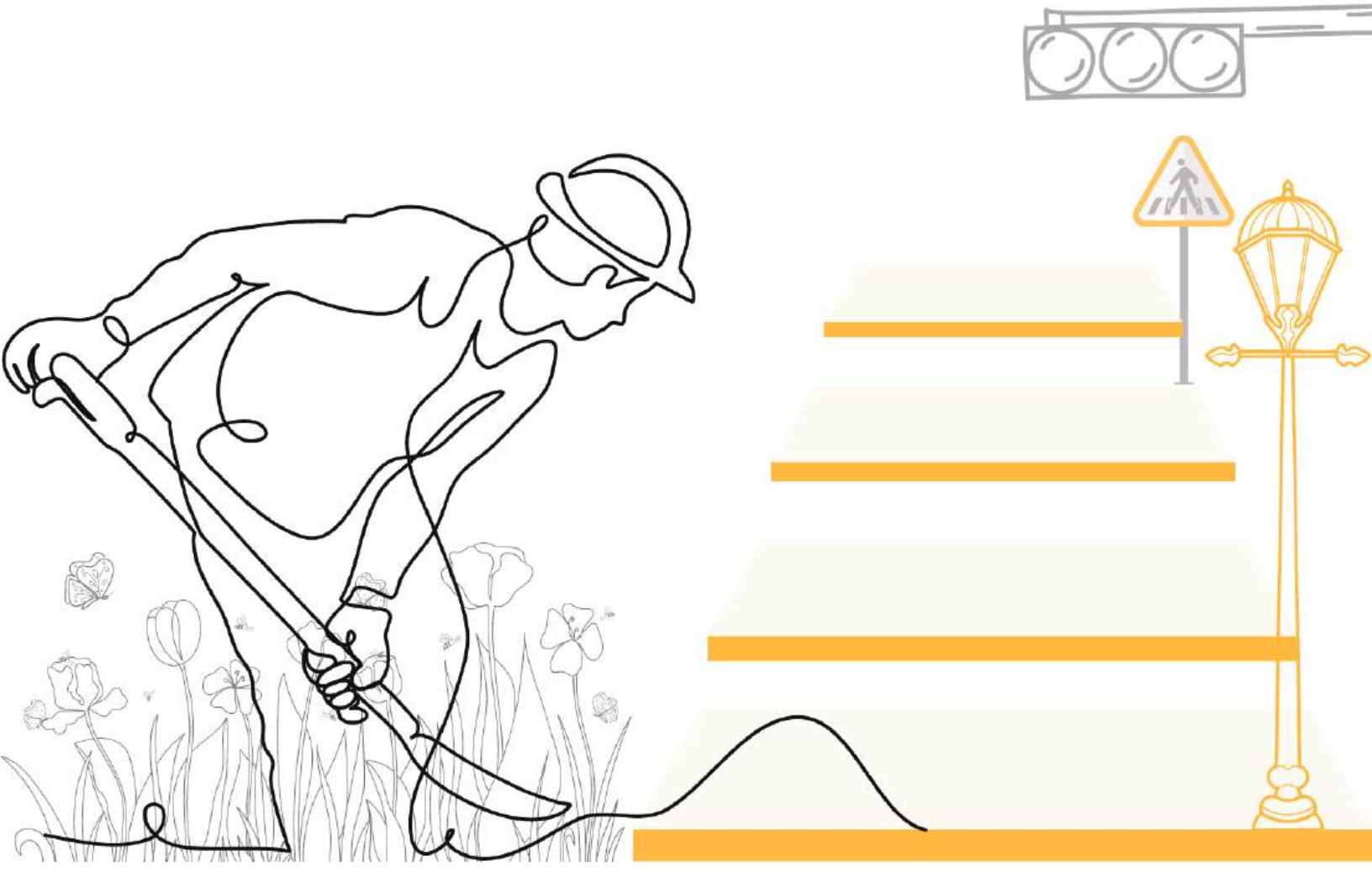
1. Bicycle Superhighways: Dedicated high-speed routes for cyclists, supported by intelligent traffic management to prioritize bike traffic at intersections.
2. Smart Parking System: Guides drivers to available parking spots using real-time data, reducing the time spent searching for parking and minimizing congestion.

There are technologies which can help in road safety like

1. Incident Detection and Management: Quickly identify and respond to accidents or breakdowns, minimizing delays and secondary accidents.
2. Speed Enforcement Systems: Implement automated speed cameras and radar to enforce speed limits and reduce speeding-related incidents.

Implementing an Intelligent Transport System in Gurugram can significantly enhance traffic management, improve road safety, and promote sustainable transportation. By learning from successful examples in other cities, Gurugram can adopt and adapt these technologies to address its unique challenges, ultimately creating a safer, more efficient, and environmentally friendly urban environment.

06 IMPACT OF GURUGRAM VISION ZERO



For the past two years, the Raahgiri Foundation has been collaborating with the district administration in Gurugram, focusing on an urgent and critical mission: saving the lives of citizens from road crashes. This partnership was prompted by a troubling rise in road accidents within the district, necessitating immediate and coordinated action.The alarming situation in the district led to the formation of a monthly road safety committee meeting held between different government organization stakeholders. These meetings serve as a vital platform for all parties involved to discuss and develop effective, actionable solutions to the pressing road safety issues facing the district. The goal is to implement targeted interventions and strategies that can significantly improve road safety.

One of the key methodologies employed is the intervention at identified blackspots and the process for addressing these blackspots involves several critical steps, as illustrated below:

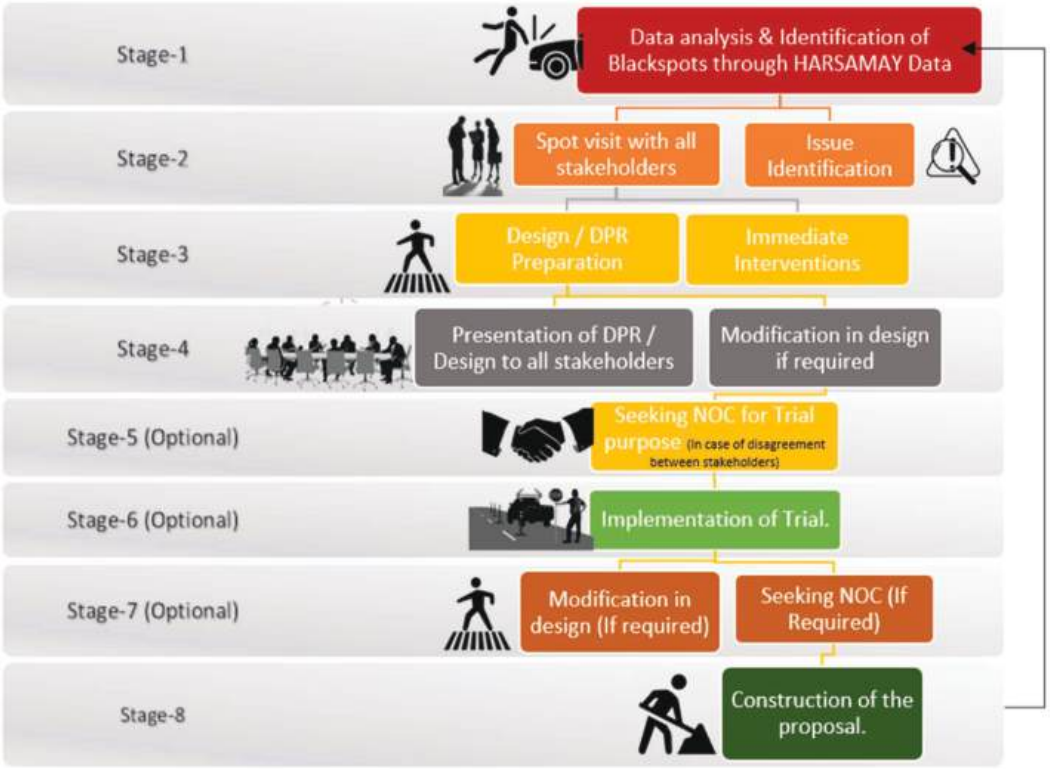


Figure 32: Methodology for blackspot rectification

Figure 33: Monthly District road safety committee meetings

These regular discussions have resulted in the redevelopment of few blackspots including:

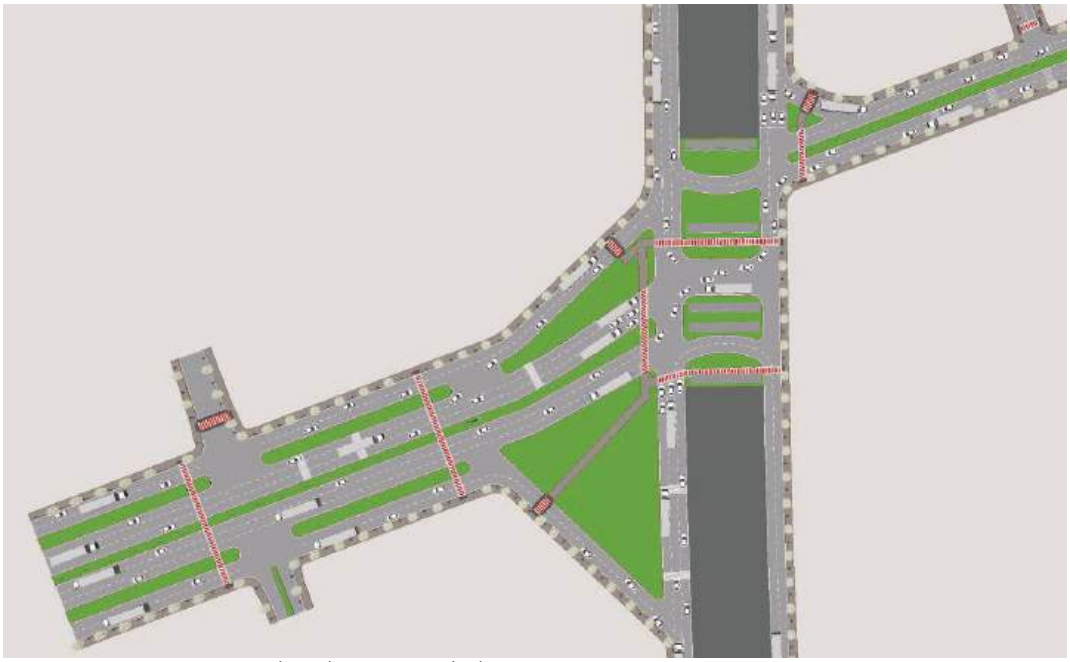
1.IMT Manesar chowk
2.Iffco Chowk
3.Hero Honda Chowk
4.Khushboo Chowk
5.Rajiv Chowk

During the meetings, various issues were raised, and collective proposals were formulated with the active involvement of all stakeholders. These stakeholders include road-owning agencies, enforcement departments, and think tanks. This collaborative approach ensures that the solutions are comprehensive and effectively address the specific safety concerns at each location.

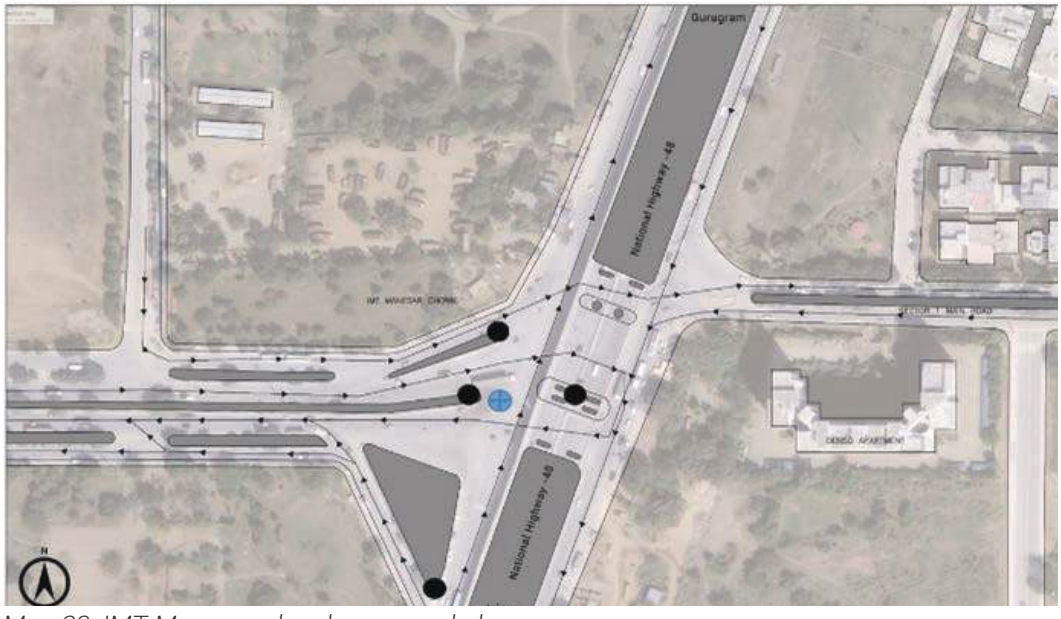
6.1 IMT Manesar Chowk

IMT Manesar is a staggered junction lacking essential speed-calming measures. The absence of safe pedestrian crossings and traffic signals has resulted in numerous accidents. The intersection had six conflict points, primarily caused by wide road openings and undesignated lanes. Black spot data reveals that there have been 26 fatalities at this location over the past five years.

With over 60,000 people passing through the intersection daily, it serves as one of the busiest entry points into Manesar. The redevelopment plan for this intersection aims to address these critical safety issues and improve overall traffic flow.



Map 21: IMT Manesar chowk proposed plan



Map 22: IMT Manesar chowk proposed plan

S.no	Issues	Proposals
1	No traffic Signal	Installed Traffic Signals at the junction, which helped in: 1. Traffic Flow Optimization 2. Improved Safety 3. Accident Reduction 4. Enhanced Road Discipline
2	No Pedestrian Crossing	Provided pedestrian crossings at the junction for: 1. Pedestrian safety 2. Accessibility 3. Provided Table top in slip lanes
3	No Speed calming measures	Provided Rumble strips at equal intervals before the junction to: 1. Alert the driver 2. Control the speed
4	No Hazard Marker	Provided Night Hazard signs and road studs as preventive measures.
5	No Signage	Installed signboards for better user information 1. Increased Awareness 2. Directional assistance

Figure 34: IMT Manesar chowk

Figure 35: IMT Manesar chowk

Figure 36: IMT Manesar chowk

6.2 Iffco Chowk

The IFFCO Chowk intersection is one of the critical blackspots in the Gurugram district, spanning a radius of 500 meters. This intersection faced numerous issues, including unmanaged traffic lanes, a lack of pedestrian crossings, and undefined pickup and drop-off points for autos, taxis, and buses. To address these problems, a trial was conducted from October 29, 2022, to November 30, 2022, with the assistance of RTA Gurugram, traffic police, GMDA, MCG, and the Raahgiri Foundation. During the trial program, the following changes were implemented:

-Portable traffic signals were installed at MG Road under the IFFCO Chowk flyover.
-Pedestrian crossings were painted at five locations.
-Pedestrian walkways and Island expansions were made to improve safety.
-Segregated pickup and drop-off locations for autos, taxis, and buses were designated.

These measures significantly improved pedestrian safety and traffic management. Based on the observations from the trial, the final plan is now under execution and is expected to be completed by October 2024. The intersection improvement plan will positively impact more than 240,000 vehicles and over 60,000 pedestrians daily, enhancing safety and efficiency for all road users.

S.no	Issues	Proposals
1	No traffic Signal	Traffic Signals with pedestrian lights at the junction will be installed, which will help in: 1. Safe Pedestrian crossing 2. Accident reduction
2	No Pedestrian Crossing	Proposed pedestrian crossings at the junction for: 1. Pedestrian safety 2. Accessibility

3	No Speed calming measures	Provided Rumble strips at equal intervals before the junction to: 1. Alert the driver 2. Control the speed
4	No Hazard Marker	Provided Night Hazard signs and road studs as preventive measures.
5	No Signage	Installed signboards for better user information 1. Increased Awareness 2. Directional assistance
6	No Lane markings	Thermoplastic paint on lanes 1. Improve guidance
7	No Road studs	Road studs will be installed 1. Enhanced Visibility 2. Accident Reduction
8	Inadequate Footpaths	The existing footpaths will be made accessible for the pedestrian capacity for safe accessibility
9	No designated pick up and drop off zones	There is requirement for designated pick up and drop off zones for autos and buses as Iffco chowk is multi modal hub of city.

Figure 37: Iffco chowk (During Trial)

Figure 38: Iffco chowk (After Implementation)

6.3 Hero Honda Chowk

The intersection at Hero Honda Chowk is grade-separated, featuring an underpass and an expressway in the Delhi-Jaipur direction. Beneath the flyover lies a staggered junction lacking essential speed-calming measures. There are significant safety concerns due to the absence of safe pedestrian crossings, dedicated cyclist paths, and proper lane balancing. Over the past five years, this intersection has witnessed 20 fatalities, with three occurring in both 2022 and 2023. Although the fatality rate has stabilized, the severity of these incidents necessitates urgent action.

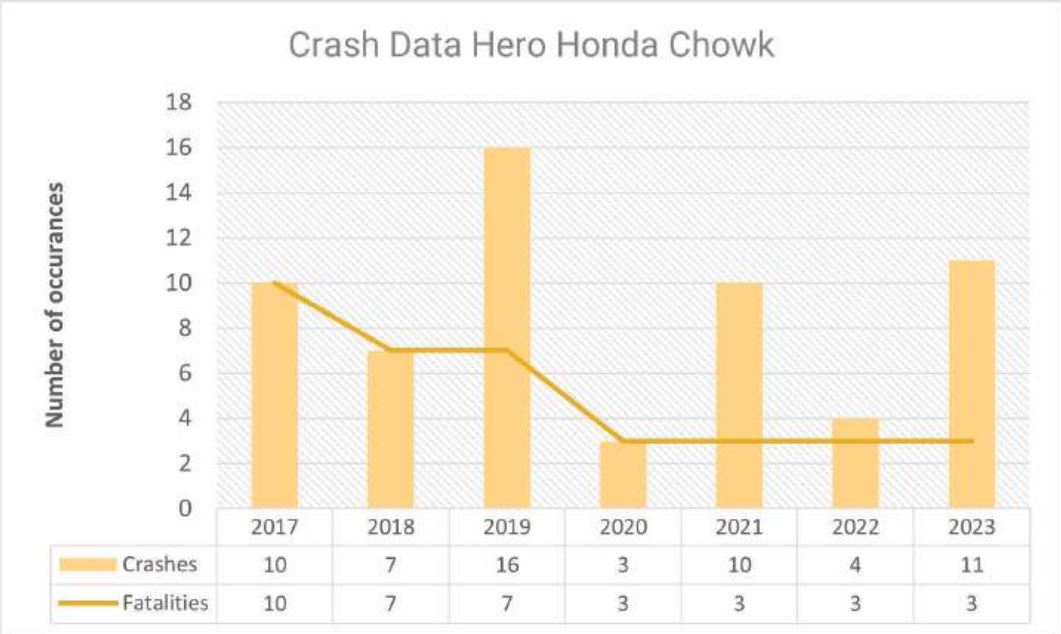
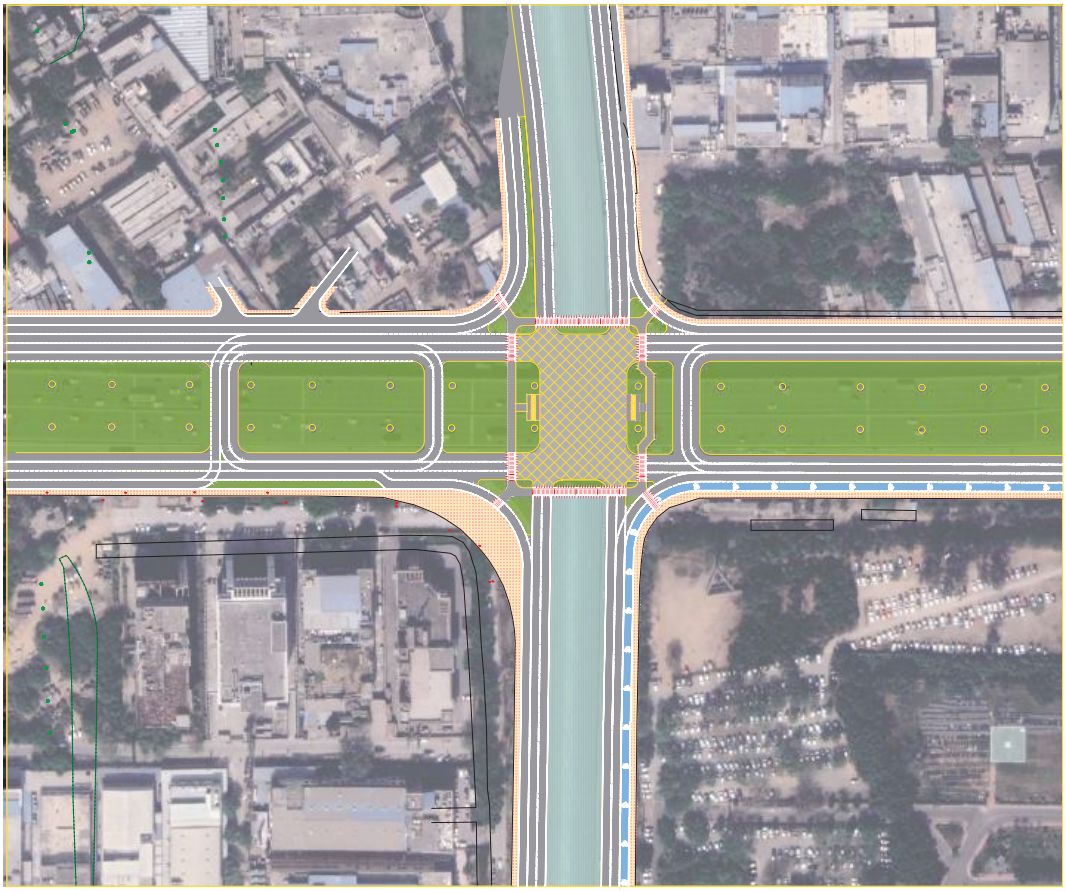


Figure 39: Crash Data- Hero Honda chowk

The major issues were due to poor geometric design, lack of pedestrian friendly infrastructure and ignorance of local land use. As there are many pedestrians, cyclists, motorcyclists and other vehicles which travel in wrong/ opposite direction of the ideal lane. This wrong-side driving is particularly prevalent from the Narsingpur industrial area to Khandsa village. The stretch between Hero Honda Chowk and the next intersection at Kherki Daula Toll Plaza spans 5 km, encompassing villages like Khandsa and Narsingpur, as well as industrial areas in sectors 34 and 35. Commuters in these sectors often resort to wrong-side driving to avoid an extra 10 km journey to reach the other side of the national highway.

Additionally, wrong-side driving is observed from the Hero MotoCorp plant to Rajiv Colony, especially during office hours. These movements lead to head-on collisions, resulting in severe injuries or fatal accidents at the intersection. While traffic signals regulate movement at the junction, their poor placement hinders visibility for users. Other issues include encroached lanes by hawkers, vendors, and auto/car drivers along the slip lanes of the intersection. The lack of dedicated spaces for all road users has led to illegal parking spots below the flyover and along the stretch, causing slow traffic movement and accidents.

The intersection improvement plan aims to address these critical issues and is expected to benefit over 120,000 vehicles and nearly 60,000 pedestrians daily, enhancing safety and traffic flow for all users.



Map 23: Hero Honda chowk proposed plan

Figure 40: Hero Honda chowk proposed view

Figure 41: Hero Honda chowk- Before and After Implementation

6.4 Khushboo Chowk

The welcoming intersection of Gurgaon through Faridabad city was declared a blackspot as per MoRTH criteria in 2022. A total of 13 crashes were recorded, in which there were 9 fatalities and 10 people suffered serious injuries. The fatalities were found to be two-wheelers, four-wheelers, cyclists, and pedestrians. Thus, none of the users were safe while crossing the intersection. The major issues behind these accidents were poor geometrical conditions, wider lanes leading to over-

rtaking and over-speeding, obstruction of pedestrian movement, and lack of speed calming measures.

The proposal for Khushboo chowk was designed to keep a focus on the safety of all users including motorists, cyclists, and pedestrians. The major interventions included a correction in geometry, lane balancing for streamlined movement of traffic, safe pedestrian crossing, speed calming measures, necessary signage for user information, and night safety elements. In addition, the aesthetics of the junction would also be improved by removing unwanted vegetation that might otherwise block the safe sight distance. The islands will be painted to promote safe pedestrian movement and warn vehicles to slow down.

Figure 42: Khushboo chowk aerial view after implementation

6.5 Rajiv Chowk

Rajiv Chowk presents a challenging non signalised four-arm intersection characterized by heavy traffic, excessive congestion and lack of pedestrian infrastructure. The intersection's inadequately balanced lanes and insufficient road safety measures contribute to a high incidence of accidents and fatalities. The lack of smooth traffic flow exacerbates the frequency of crashes, compounded by the absence of adequate pedestrian infrastructure, making it challenging for people to navigate from one side to the other.

According to the black spot data of 2022, there has been 18 crashes with 4 fatalities in which 2 fatalities are of pedestrians. The past 5-year data shows more than 60 crashes at Rajiv Chowk with 24 deaths occurred at only 1 intersection of the city. Henceforth there is a need to work on safety measures for the intersection.The traffic data shows that the total volume of vehicles entering at the junction from 08:00 AM to 08:00 PM is approx. 1, 84, 837 vehicles and the pedestrian volume during this time is 41,458 persons. This accounts for 22.4% of the total traffic has pedestrian movement at the junction.

Figure 43: Pedestrian volume count during morning peak hour at Rajiv chowk

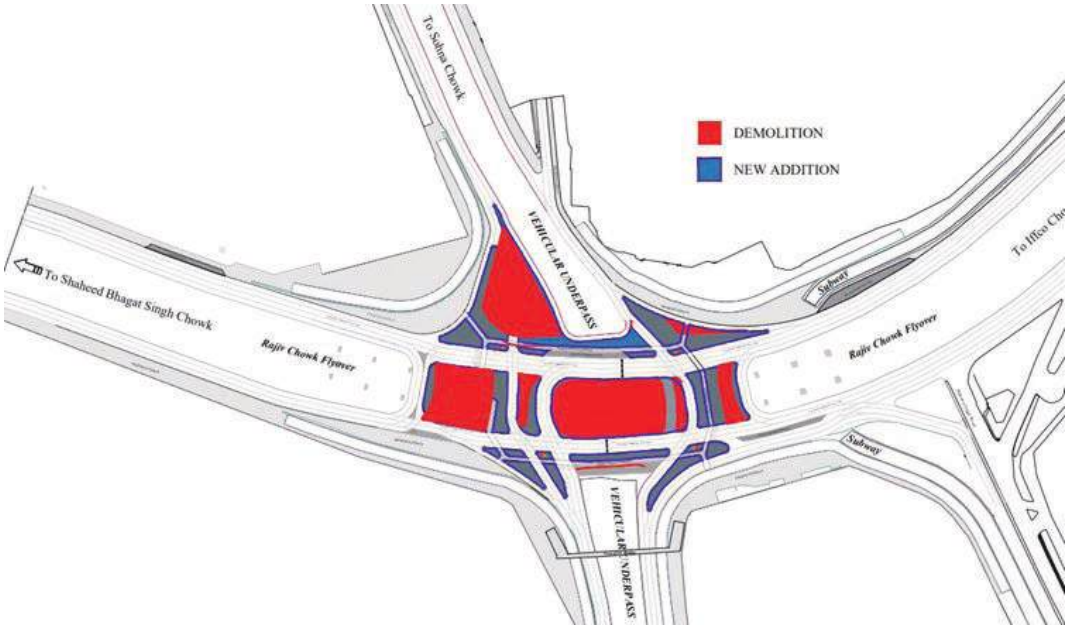
The intersection's deficient lighting poses a safety concern, particularly for women during evening hours. Waste management issues further compound the problem, with some traffic islands remaining underutilized. Key routes such as IFFCO Chowk to Sohna Road and Sohna to IFFCO Chowk, as well as Hero Honda to Sohna Road, experience heightened traffic during peak hours. However, the lack of appropriate road geometry and standards intensifies congestion along these routes.

Table 36: Total vehicle volume count towards Rajiv chowk junction during morning peak hour

S.no.	Directions	AM Peak	Weighted %	PM Peak	Weighted %
1	Sohna to Iffco	3765	23.57%	3980	27.69%
2	Iffco to Sohna	3406	21.32%	3882	27.01%
3	Hero Honda to Sohna	2010	12.58%	861	5.99%
4	Hero Honda to Iffco	1965	12.30%	621	4.32%
5	Ggn railways stn. to hero Honda chowk	996	6.24%	1257	8.75%
6	Hero Honda to Gurugram railway stn.	855	5.35%	733	5.10%
7	Iffco to Hero Honda Chowk	693	4.34%	810	5.64%
8	Hero Honda to Hero Honda	456	2.85%	519	3.61%
9	Ggn to Sohna	442	2.77%	318	2.21%
10	Sohna to Gurugram Railway stn.	379	2.37%	248	1.73%
11	Ggn railway station U turn.	365	2.28%	205	1.43%
12	Sohna to Sohna	165	1.03%	148	1.03%
13	Sohna to Hero Honda chowk	159	0.99%	347	2.41%
14	Iffco to Gurugram Railway stn.	142	0.89%	180	1.25%
15	Iffco to Iffco (U-turn)	136	0.85%	170	1.18%
16	Ggn railway station to Iffco	43	0.27%	95	0.66%
17	Total Volume towards junction	15974	100.00%	14371	100.00%

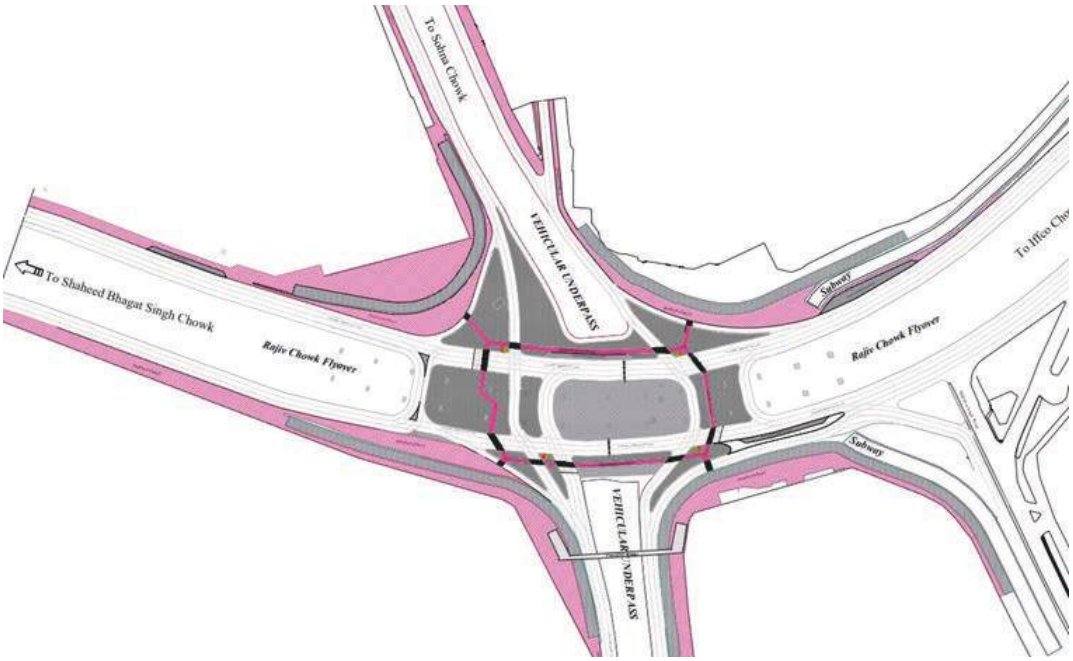
List of elements incorporated in proposal:

- Continuous Shared pathway
- Pedestrian crossings painted in thermoplastic
- Bollards
- Primary and Secondary Traffic Lights
- Street Lighting
- Traffic refuge islands
- Road safety signage and Wayfinding direction
- Road safety elements such as Road studs, Blinking cat eyes, Hazard markers, convex mirrors
- Stop Line and Lane Marking
- Landscaped Areas for passive recreation



Map 24: Rajiv chowk demolition plan

The highlighted pathway is dedicated for pedestrian movement across the junction. The pickup and drop off zones have also been highlighted below for each direction of movement. The continuous pedestrian crossing, and walkways will ensure safe and seamless movement of people without conflicting with other motorised road users.



Map 25: Rajiv chowk shared pathway plan

07 CONCLUSION & WAY FORWARD

The outcomes of the report highlight several key areas for improvement in road safety. Firstly, it's evident that vulnerable road users, including two-wheelers and pedestrians bear the brunt of road crashes with young people being particularly affected. The design of high-speed corridors poses significant risks to our cities' youth, leading to increased fatalities and injuries. Its high time that we redirect our energies in designing infrastructure for pedestrians and cyclists as it promotes sustainable transportation methods and fosters healthier urban lifestyles.

Additionally, efforts should be made to increase women ridership in the transportation network by providing safe and inclusive infrastructure. Addressing issues related to night-time visibility is crucial for reducing crashes and fatalities, necessitating targeted interventions in this regard. There is also a need to conduct regular safety audits to identify the infrastructure gaps before the crash occurs. Therefore, by establishing synergy among stakeholders, including road-owning agencies, traffic police departments, enforcement bodies, architects, planners, engineers, and other administrative entities, is paramount for creating safer cities and roads.

6.1 Way Forward

Road safety in Gurgaon requires a comprehensive and multifaceted strategy that addresses key areas such as black spots, road engineering, enforcement, and further enhancement of the existing Gurgaon Vision Zero initiative launched in 2017. By focusing on targeted interventions, technological innovations, and community engagement, Gurgaon can strive towards creating safer and more sustainable roads and can achieve the global goal of reducing 50% fatalities and serious injuries by 2030.

1. Black Spot Remediation:

Data-Driven Prioritization: Conduct a thorough analysis of accident data to identify and prioritize high-risk black spots.
Swift Implementation: Implement immediate safety measures, including traffic calming devices, improved signage, and well-designed pedestrian crossings.

Regular Audits: Conduct regular audits and updates based on evolving accident patterns to ensure ongoing effectiveness.

2. Road Engineering:

Sustainable Urban Planning: Integrate road safety into urban planning, focusing on improving public transport, especially city bs service, pedestrian-friendly infrastructure and dedicated cycling lanes to reduce conflicts between different modes of transportation.
Public Spaces Design: Create well-designed public spaces that encourage safer interactions between pedestrians, cyclists, and motorists.
Innovation in Infrastructure: Explore innovative road design concepts, such as roundabouts and raised pedestrian crossings, to enhance safety.

3. Enforcement Measures:

Technology-Driven Solutions: Implement advanced technologies like traffic cameras and automated monitoring systems to enhance enforcement capabilities.
Collaboration with Law Enforcement: Strengthen collaboration with law enforcement agencies for increased on-ground presence and efficient enforcement of traffic rules.
Penalty Points System: Introduce a penalty points system for drivers, discouraging repeat offenders and promoting responsible driving behavior.

4. Gurgaon Vision Zero Enhancement:

Continuous Monitoring and Evaluation: Establish a robust monitoring and evaluation framework to assess the effectiveness of existing initiatives under Gurgaon Vision Zero.
Adaptation Strategies: Remain agile in adapting strategies based on real-time data and feedback from ongoing safety measures.
Community Engagement: Foster community engagement through forums, awareness campaigns, and feedback mechanisms to create a sense of shared responsibility.

5. Integration of Emerging Technologies:

Smart Traffic Management Systems: Integrate smart traffic management systems that leverage real-time data to optimize traffic flow, detect anomalies, and improve overall road safety.
Mobile Applications for Reporting: Develop user-friendly mobile applications that allow citizens to report road safety concerns, encouraging active participation in identifying and addressing potential hazards.
Data Analytics for Predictive Modeling: Utilize data analytics for predictive modeling to identify potential future black spots and proactively implement safety measures.

6. Holistic Framework:

Inter-Agency Coordination: Foster collaboration among various government agencies, NGOs, and private stakeholders to ensure a unified and holistic approach to road safety.
Educational Programs: Implement educational programs in schools, workplaces, and communities to raise awareness about the importance of road safety and responsible behavior.
Inclusive Approach: Ensure inclusivity in road design to accommodate diverse user groups, including differently-abled individuals and senior citizens.

In conclusion, Gurgaon's journey toward improved road safety demands a comprehensive strategy that encompasses various aspects of black spot remediation, road engineering, enforcement, and continuous enhancement of existing initiatives. By adopting these measures and staying attuned to evolving challenges, Gurgaon can aspire to create a safer and more resilient transportation network for its residents.

ANNEXURE A

Table 37: Chapter 3 - Relation between Victim and Accused vehicle

Victims/ Accused vehicle		Total Crashes	Total Fatalities
1.	Animal (Victim)	1	1
	Car/Jeep/Van/Taxi	1	1
2.	Bicycle (Victim)	19	12
	Bus	1	1
	Car/Jeep/Van/Taxi	5	3
	Construction Machinery	1	1
	E-Rickshaw	1	0
	Multi Axle Vehicle	1	1
	Three Wheeler	2	1
	Truck	1	1
	Two Wheeler	5	2
	Unknown	2	2
3.	Bus (Victim)	8	1
	Bus	2	0
	Truck	1	0
	Unknown	4	1
	Light Commercial Vehicle	1	0
	Car/Jeep/Van/Taxi (Victim)	178	37
	Bus	7	0
	Car/Jeep/Van/Taxi	87	11
	Construction Machinery	2	0

	Light Commercial Vehicle	7	0
	Multi Axle Vehicle	28	9
	Pedestrian	1	0
	Three Wheeler	2	0
	Tractor/Trolley	4	2
	Truck	24	8
	Unknown	16	7
4.	Cycle Rickshaw (Victim)	1	0
	Car/Jeep/Van/Taxi	1	0
5.	E-rickshaw (Victim)	1	1
	Unknown	1	1
6.	Light Commercial Vehicle (Victim)	7	8
	Multi Axle Vehicle	3	3
	Bus	1	2
	Car/Jeep/Van/Taxi	1	1
	Light Commercial Vehicle	1	1
	Truck	1	1
7.	Multi Axle Vehicle (Victim)	7	4
	Car/Jeep/Van/Taxi	1	0
	Multi Axle Vehicle	5	3
	Truck	1	1
8.	Other (Victim)	7	1

	Car/Jeep/Van/Taxi	4	0
	Truck	1	0
	Unknown	2	1
9.	Pedestrian (Victim)	334	149
	Bus	13	5
	Car/Jeep/Van/Taxi	150	58
	Construction Machinery	4	2
	Light Commercial Vehicle	9	4
	Multi Axle Vehicle	16	10
	Three Wheeler	14	1
	Three Wheeler (Goods)	1	0
	Tractor/Trolley	5	4
	Truck	16	8
	Two Wheeler	38	4
	Unknown	68	53
10.	Three Wheeler (Victim)	54	23
	Bus	2	0
	Car/Jeep/Van/Taxi	25	9
	Fixed Object	1	1
	Multi Axle Vehicle	2	1
	Others	1	0
	Three Wheeler	10	3

	Tractor/Trolley	1	0
	Truck	2	1
	Two Wheeler	2	2
	Unknown	8	6
11.	Three Wheeler (Goods) (Victim)	4	3
	Car/Jeep/Van/Taxi	3	2
	Unknown	1	1
12.	Tractor/ Trolley (Victim)	1	1
	Unknown	1	1
13.	Truck (Victim)	12	7
	Construction machinery	1	0
	Truck	9	5
	Unknown	2	2
14.	Two Wheeler (Victim)	556	191
	Unknown	1	1
	Bus	14	7
	Car/Jeep/Van/Taxi	279	68
	Construction Machinery	6	4
	Fixed Object	1	1
	Light Commercial Vehicle	21	4
	Multi Axle Vehicle	57	23
	Others	1	0
	Pedestrian	1	1

	Three Wheeler	21	5
	Three Wheeler (Goods)	4	1
	Tractor/Trolley	7	5
	Truck	47	25
	Two Wheeler	38	8
	Unknown	58	38
	Grand Total	**1190**	**439**

Table 38: Chapter 3 - Cause of Crash 2023, Gurugram

S. No.	Row Labels	No of crashes	Serious injuries	Minor injuries	Total Fatalities
1.	Animal	1	0	0	1
	Over speeding	1	0	0	1
	Bicycle	19	9	1	12
	Over speeding	16	7	1	10
	Rough driving	3	2	0	2
2.	Bus	8	4	4	1
	Over speeding	6	4	3	0
	Rough driving	2	0	1	1
	Car/Jeep/Van/Taxi	178	76	86	37
	Approaching from Wrong Side	5	0	4	0
	Drink & drive	4	0	1	0
	Other	4	0	5	1

	Over speeding	132	59	59	32
	Rough driving	30	15	16	2
	Unknown	1	0	0	1
	Wrong parking	2	2	1	1
3.	Cycle Rickshaw	1	0	1	0
	Over speeding	1	0	1	0
4.	E-rickshaw	1	0	0	1
	Over speeding	1	0	0	1
	Light Commercial Vehicle	7	3	1	8
	Over speeding	7	3	1	8
	Multi Axle Vehicle	7	1	1	4
	Over speeding	5	1	1	2
	Rough driving	1	0	0	1
	Wrong parking	1	0	0	1
	Other	7	2	1	1
	Over speeding	6	2	1	1
	Rough driving	1	0	0	0
5.	Pedestrian	334	138	87	149
	From Wrong Side	1	1	0	0
	Drink & drive	1	1	0	0
	Other	1	3	1	0
	Over speeding	266	115	71	112

	Rash Driving	1	0	0	1
	Rough driving	53	17	14	27
	Unknown	9	1	0	8
	Wrong parking	2	0	1	1
6.	Three-Wheeler	54	25	36	23
	Drink & drive	1	0	1	0
	Fall From Auto Rickshaw	2	1	0	1
	Other	1	0	0	1
	Over speeding	40	21	28	15
	Rough driving	10	3	7	6
7.	Three-Wheeler (Goods)	4	1	1	3
	Over speeding	1	1	1	0
	Rough driving	3	0	0	3
	Tractor/ Trolley	1	0	0	1
	Over speeding	1	0	0	1
8.	Truck	12	4	2	7
	Over speeding	1	0	0	1
	Rough driving	6	3	1	3
	Wrong parking	5	1	1	3
9.	Two-Wheeler	556	288	268	191
	From Wrong Side	20	7	13	7
	Other	9	3	3	3
	Over speeding	451	256	207	137

Rash Driving	3	0	1	3
Rough driving	62	19	41	32
Unknown	4	0	0	5
Wrong parking	7	3	3	4
Grand Total	**1190**	**551**	**489**	**439**

ANNEXURE B

[Ref: MoRTH Road Accident Recording Form]
[Google form prepared by RF: https://forms.gle/mxEt8gH1eYitcoy26]

Crash Identification detail

1. FIR Number *

2. Police Station *

3. Date of incident *

4. Time of Incident *

5. Age and gender of Accused *

6. Age and gender of Victim

7. Weather at the time of incident: Sunny/Rainy/Foggy/Misty/other

8. Location: Road Number, and Road Name

9. GPS Coordinates (Lat: Long)

10. Crash severity: Fatal/Serious/Minor

11. Crash Type: Head on/ Hit from back/ Hit and run/ Hit from front/ hit from side/ hot object/ Hit pedestrian/ Manoeuvre overturned

12. Violation type: Over-speeding / approaching from wrong side/ drink and drive/ rash driving/ wrong parking/ unknown

Road Related Details

13. Speed limit of the road mentioned (Km/hr)

14. Accident Spot land use: Residential/ Mixed Use/ Commercial/ Industrial/ Institutional

15. Road Junction: T Junction/ Y Junction/ Four-armed Junction/ Staggered Junction/ Round about junction/ other

16. Road Features: Straight road/ curved road/ culvert/ bridge/pot holes/ steep gradient

17. Type of traffic control: Traffic signal/ Police control/ stop sign/ flashing blinker/ uncontrolled

18. Divided by Median: Yes/ No

19. Pedestrian Infrastructure: Footpath- Yes/ No, FOB or subway- Yes/ No, Zebra crossing- Yes/ No

Vehicle Details

20. Road users involved:

	First Vehicle	Second Vehicle	Third Vehicle (if any)
Pedestrian	☐	☐	☐
Cars/Jeep/Van	☐	☐	☐
Two Wheeler	☐	☐	☐
Three Wheeler	☐	☐	☐
Bus	☐	☐	☐
Truck/MAV/Canter/Construction Vehicle/Earth Mover	☐	☐	☐
Others	☐	☐	☐

21. Registration Number:
First vehicle----------Second Vehicle----------Third Vehicle (if any)

Road Safety Measures

22. Road Surface condition: Paved/ Unpaved/ potholes

23. Road marking: Yes/ No

24. Road Signage: Yes/ No

25. Hazard Markers: Yes/ No

26. Night Time Visibility Measures: Street Light/ Road studs/ Cat eyes

27. Speed Calming measures: Transverse Bar markings/ Table Top (if applicable)/ speed humps

28. Photographs of site

29. Satellite Location – Attach Google map view

30. Explanation of crash on map: Attach the image

31. Photographs: Attach eight angles for all vehicles involved

32. Road Safety recommendations

ANNEXURE C

Table 7.5 Checklist for Safety Audit of Existing Roads IRC 88:2019

1. Sight Distances

a) Are all sight distances adequate for the speed of traffic using this road?

b) Are safe overtaking opportunities provided?

c) Are U turn provisions conspicuous and "safe"

2. Intersections

a) Are all intersections clear and visible?

b) Are all traffic signals conspicuous, functioning properly and safely?

c) Are roundabouts visible and recognisable from all approaches?

3. Interchanges

a) Are sight lines open and free of obstruction at all merges and diverges?

b) Are the distances between decision-making points sufficient for safety at the operating speed?

c) Is the direction sign for each interchange clear and easily understood at the operating speed?

4. Cross Sections

a) Are lane widths, shoulder widths and bridge widths, "safe" for the traffic volume and mix?

b) Are medians and islands of adequate width for the safety of likely users?

c) Are the shoulders suitable for use by all vehicles and road users, including pedestrians, cyclists and animals?

d) Is appropriate super elevation and extra width of carriageway provided on curves?

5. Roadside Hazards

a) Are all larger (more than 100mm diameter) sign supports located outside the clear zone if they are not frangible?

b) Are all crash barriers correctly and safely installed?

c) Are any hazards within the agreed clear zone for this road?

d) Are crash barriers used only where necessary?

e) Are impact attenuators provided in gore area?

f) Are all the crash barriers correctly installed?

6. Drainage

a) Is the road well drained?

b) Are all drains outside the clear zone, covered, or behind suitable barrier?

7. Signs, Pavement Markings and Delineation

a) Do all signs and pavement markings satisfy the 6C's of good signage and pavement marking practice?

b) Is the speed zone "safe", and clearly signed?

c) Are pavement markings conspicuous and continuous?

d) Is there a need for more signs to warn, inform, guide, control or delineate?

e) Are road signs and road markings tested for retro-reflectivity and conforming to relevant IRC standards?

f) Is the road well delineated (warning signs, plastic guide posts, chevron alignment markers) installed as necessary and spaced in accordance with installation guidelines?

8. Vulnerable Road Users (pedestrians, bicyclists, two wheelers and three wheelers, and animal drawn carts)

a) Do all vulnerable road users have connectivity along the road, with suitable lateral clearance to motor traffic?

b) Are pedestrians (particularly the young, old and disabled) able to safely walk along the road?

c) Is the road free of "squeeze" points where vulnerable road users are exposed to nearby moving traffic?

d) Are pedestrians (particularly the young, old and disabled) able to safely cross the road?

e) Are dropped kerbs provided at all intersections and mid-block locations where pedestrians are to cross?

f) Is the number and placement of the pedestrian facilities adequate and safe for the situation and the pedestrian numbers?

g) Are all the formal crossings clearly marked and conspicuous on each approach?

h) Are the correct signs and pavement markings installed at each pedestrian facility?

i) Is each crossing facility well illuminated at night so that pedestrians can be seen by drivers/riders?

j) Do all mid-block traffic signals have pedestrian push buttons?

k) Are pedestrian paths provided through medians to permit pedestrians to cross "at road level" and to assist disabled pedestrians?

l) Has adequate provision been made for safe parking and stopping by three-wheelers/cycle rickshaws?

m) Does the road allow adequate visibility for an approaching driver to see a pedestrian waiting to cross the road?

n) Does the road allow adequate visibility funnel for an approaching driver to see a vehicle waiting to cross the carriageway from side road or storage space of median?

o) Are bus stops located where passengers will use them?

p) Are bus stops well delineated and lit?

9. Access to Property and Developments

a) Are all accesses to/from adjoining properties "safe"?

10. Lighting and Night Time Issues

a) Are the illumination levels of an appropriate standard, consistent with the needs of the location, pedestrian and other factors?

b) Are the lighting columns frangible? If not, are they located outside the clear zone?

c) Are all signs easy to see and read at night?

d) Are the critical locations (intersections, pedestrian facilities, bus bays, bus stops, truck lay bye, toll plaza, etc) conspicuous at night?

e) Is lighting provided on road sections passing through built up areas, service roads, above and below the grade separator, underpass, etc

f) Is the "through route" well signed, line marked and obvious to road users at night?

g) Is the road free of visual deceit for road users at night?

h) Is all lighting adequate and safe?

i) Are the lighting columns frangible? If not, are they outside the clear zone?

j) Are there any lighting poles in the median (less than 2m wide) unprotected by crash barriers?

11. General Road Safety Considerations

a) Is the road as safe as practical given the local weather conditions (sunrise, sunset, snow, fog, storms, and wind)?

b) Is the road surface free of gravel and sand, and with good skid resistance?

Yes = likely to be satisfactory for safety

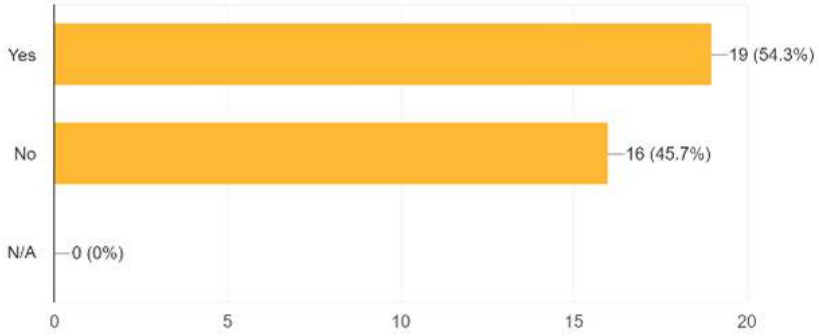
No = there are possible safety issues

NA = not applicable

ANNEXURE D: RESULTS

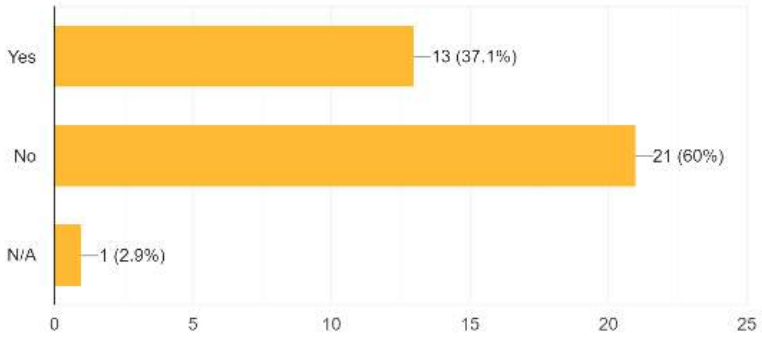
Are all sight distances adequate for the speed of traffic using this road?

35 responses



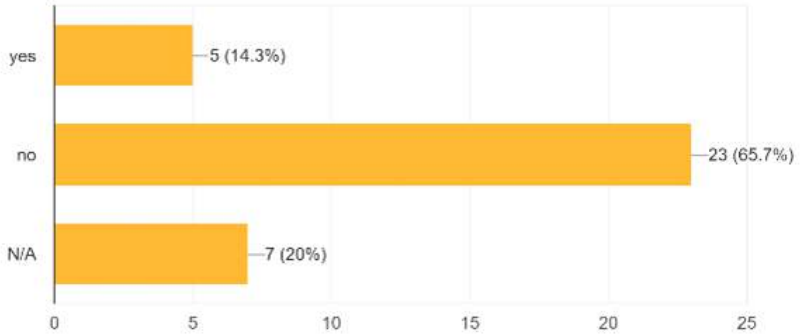
Are all intersections clear and visible

35 responses



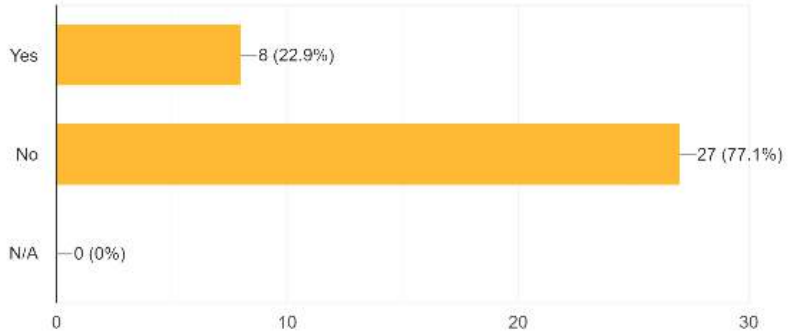
Are U turn provisions conspicuous and "safe"?

35 responses



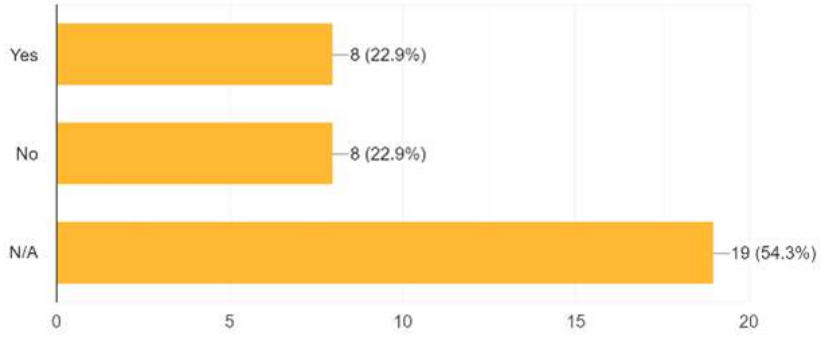
Are sight lines open and free of obstruction at all merges and diverges?

35 responses



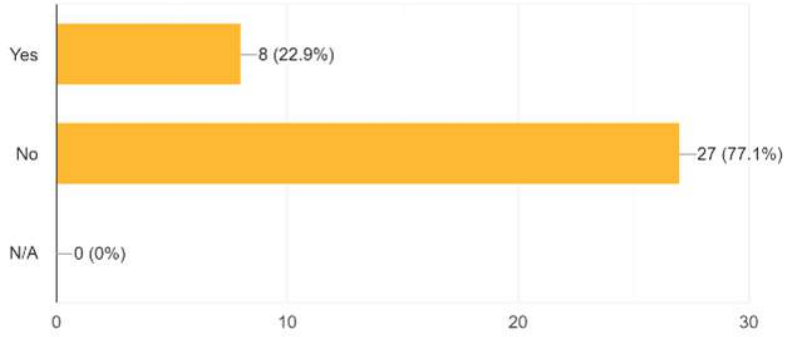
Are all traffic signals conspicuous, functioning properly and safely?

35 responses



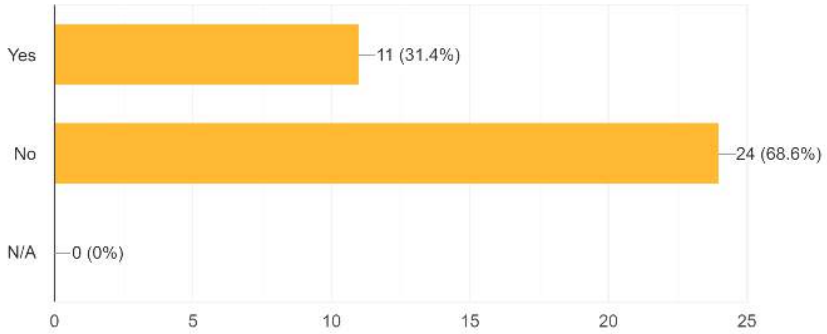
Is the direction sign for each interchange clear and easily understood at the operating speed?

35 responses



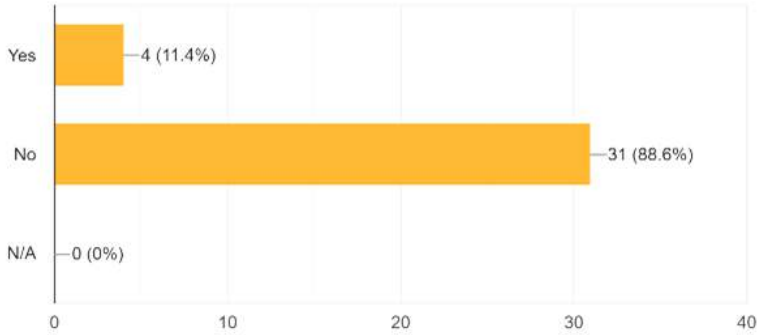
Are the distances between decision-making points sufficient for safety at the operating speed?

35 responses



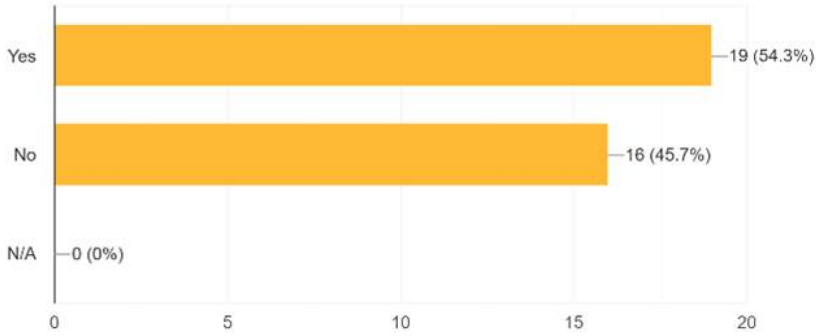
Are the shoulders suitable for use by all vehicles and road users, including pedestrians, cyclists and animals?

35 responses



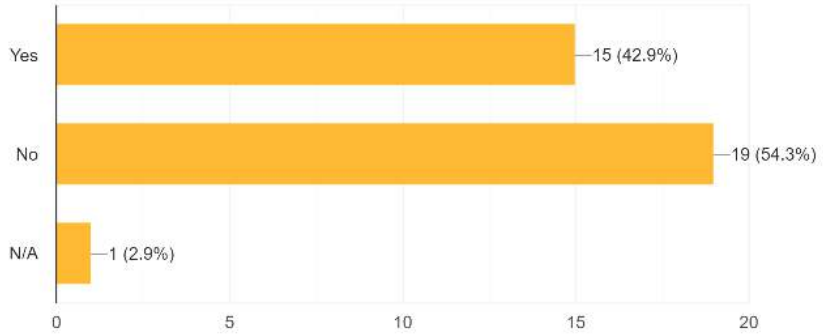
Are lane widths, shoulder widths and bridge widths, “safe” for the traffic volume and mix?

35 responses



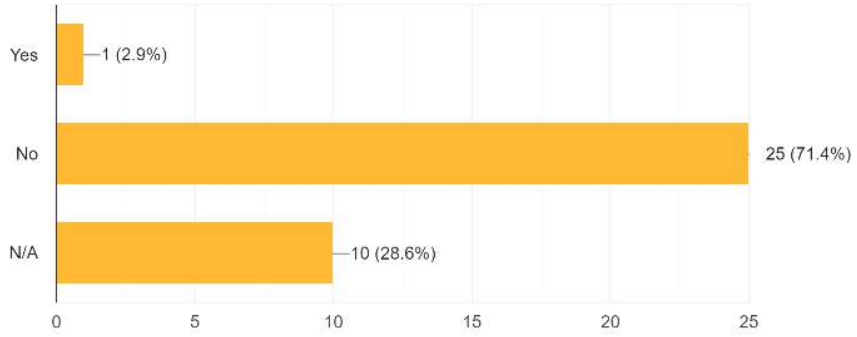
Is the road well drained?

35 responses



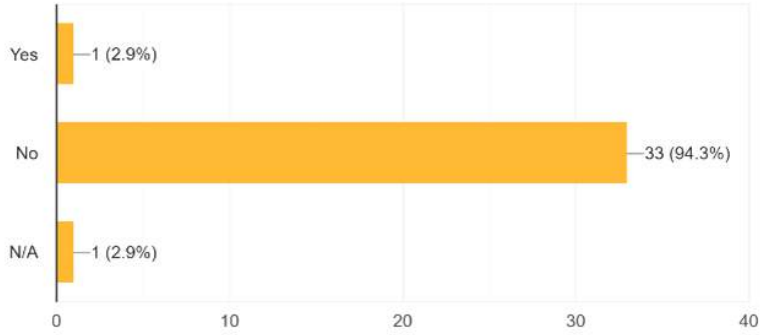
Are all crash barriers correctly and safely installed?

35 responses



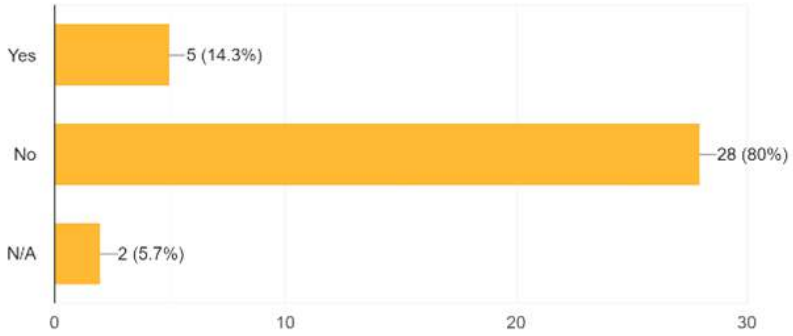
Are pavement markings conspicuous and continuous?

35 responses



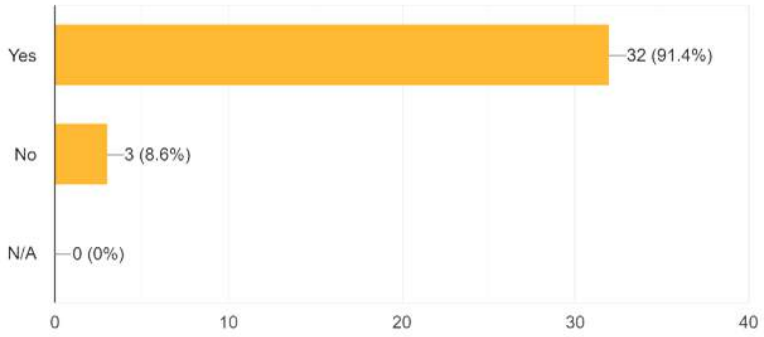
Do all vulnerable road users have connectivity along the road, with suitable lateral clearance to motor traffic?

35 responses



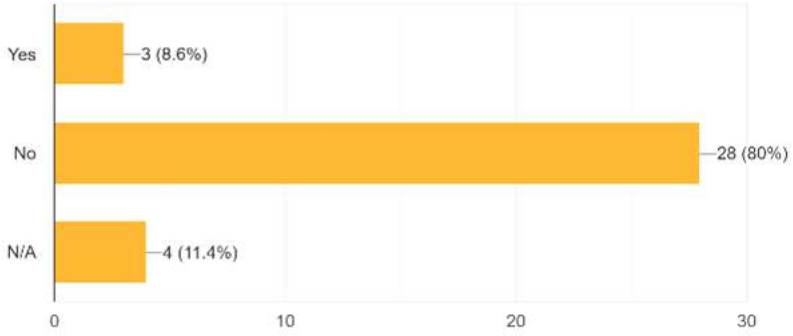
Is there a need for more signs to warn, inform, guide, control or delineate?

35 responses



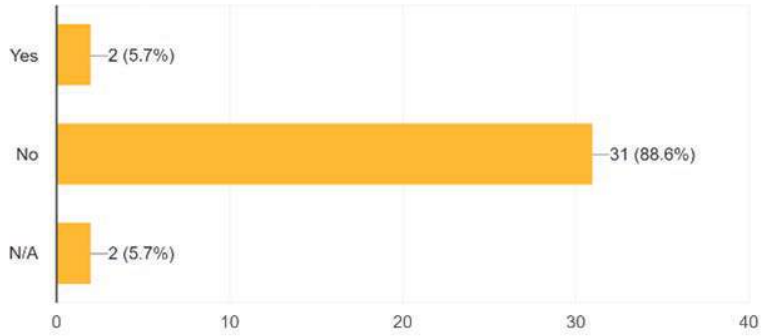
Are dropped kerbs provided at all intersections and mid-block locations where pedestrians are to cross?

35 responses



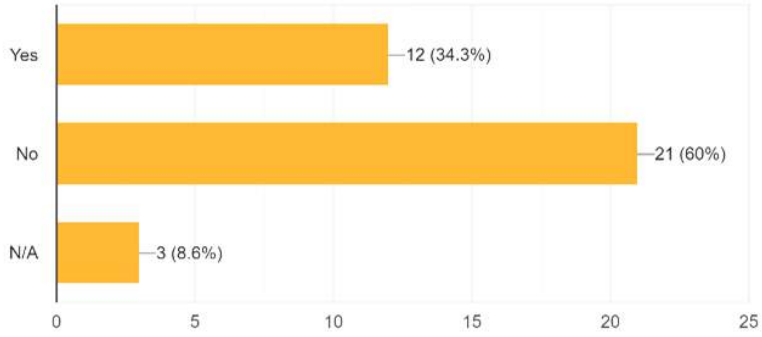
Are pedestrians (particularly the young, old and disabled) able to safely walk along the road?

35 responses



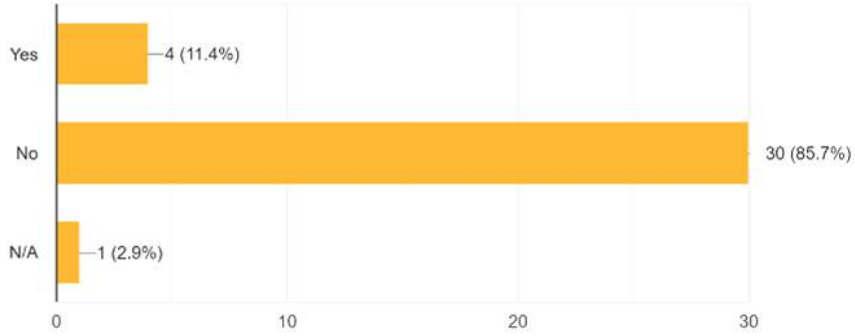
Are bus stops located where passengers will use them?

35 responses



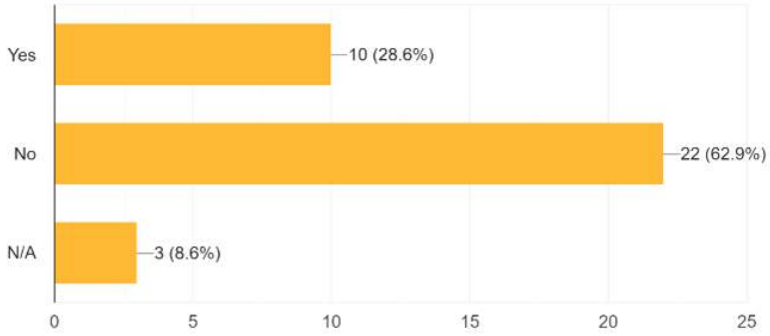
Has adequate provision been made for safe parking and stopping by three-wheelers/cycle rickshaws?

35 responses



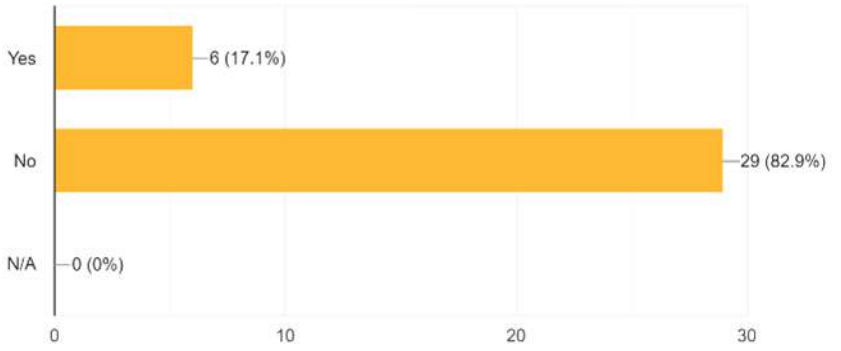
Are all signs easy to see and read at night?

35 responses



Are the illumination levels of an appropriate standard, consistent with the needs of the location, pedestrian and other factors?

35 responses



"Investing in robust road safety infrastructure is crucial for saving lives and reducing injuries. It's not just about building roads, but about creating safe, sustainable, and inclusive environments where all road users can travel without fear. Proper road design, effective signage, and well-maintained pedestrian pathways are fundamental components that can drastically decrease the number of road crashes and fatalities. Ensuring road safety is a shared responsibility that requires the commitment of governments, organizations, and communities worldwide." - Dr. Etienne Krug, Director of the Department of Social Determinants of Health at the World Health Organization.

"Road safety is a critical issue that demands immediate and sustained attention. By implementing well-researched and scientifically-backed design principles, we can create urban environments that protect all road users, especially the most vulnerable. Effective road safety infrastructure is essential not only for preventing accidents but also for promoting sustainable and inclusive urban mobility." -
Professor Geetam Tiwari, Transportation Research and Injury Prevention Programme (TRIPP), IIT Delhi.

"Every day, nearly 3,700 people are killed globally in road crashes involving cars, buses, motorcycles, bicycles, trucks, or pedestrians. Road safety is a shared responsibility; we all must act to reduce the devastating toll of traffic crashes." - Jean Todt, the UN Secretary-General's Special Envoy for Road Safety

"Road safety is not just a transportation issue; it is a public health challenge and an economic imperative. Safe roads save lives, reduce poverty, and drive sustainable development." - World Bank

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