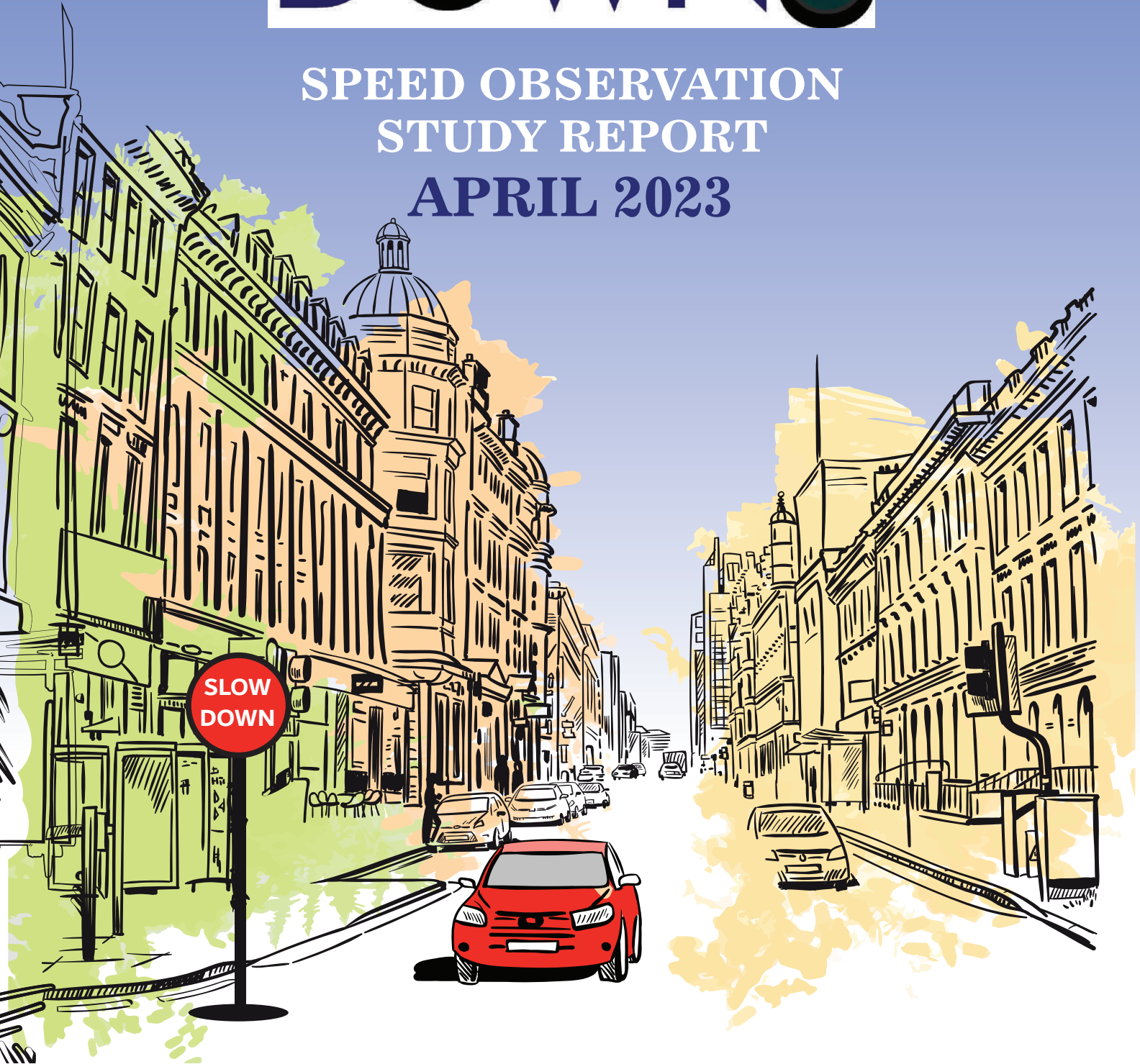


SLOW DOWN



SPEED OBSERVATION STUDY REPORT APRIL 2023



CONTENTS

ACKNOWLEDGEMENT.....	07
INTRODUCTION.....	08
METHODS.....	09
ANALYSIS.....	10
Table 1: Speed data observed at 85th percentile.....	11
Table 2: Percentage of vehicle speeding at Chedda Nagar, Chembur.....	12
Table 3: Percentage of vehicle speeding at Godrej Ghodagate, Vikhroli.....	13
RESULTS.....	14
Crash Data at Eastern Express Highway, Near Ramabai Nagar Bus Stop, Near Sainagar Nala, Retiwala, Ghatkopar East.....	15
Crash data at Chhedda Nagar & SCLR Bridge Chhedda Nagar, Bus Stop, Chembur East.....	18
Crash data at City Bakery, Gafarkhan Bridge, at Worli Naka, Worli.....	21
Crash Data at CST Bridge, near Kurla Bus Depot, Kurla West.....	24
Crash Data at Godrej Ghodagate Signal, Vikhroli (East).....	27
RECOMMENDATIONS.....	29
Recommended Interventions for Speed Management as per Speed Management Manual.....	32
WAY FORWARD.....	34

PREFACE



George Aikara
Chief Executive Officer,
United Way Mumbai

I am pleased to present to you the Speed Observation Report, prepared by United Way Mumbai in collaboration with IIT-Bombay, as part of the “Slow Down” project. The report captures critical observations about present road conditions and recommends speed-calming measures to facilitate better speed management at 20 identified blackspots in Mumbai.

The report assumes great significance in the context of road safety interventions in India, given that speed is one of the leading causes of fatal road traffic crashes. This report is evidence-based and provides a scientific assessment of the blackspots, which is a critical requirement for evidence-based enforcement.

United Way Mumbai, through the “Slow Down” project, has taken a comprehensive approach towards road safety interventions. Along with scientific assessments, we have also leveraged our expertise in community mobilisation to ensure a sense of ownership among local stakeholders towards road safety. This has resulted in the formation of Road Safety Advocacy Clubs across all the blackspots. These clubs comprise active and concerned citizens and local community volunteers who have been capacitated to work closely with the Mumbai Traffic Police for implementing the measures recommended in the report.

The scientific and participatory approach adopted by us while preparing this report will go a long way in guiding the path to developing the speed management policy at the state and national level. We are confident that the report and recommendations will be helpful for the Mumbai Traffic Police in their endeavour to stricter enforcement of speed control measures across Mumbai city.

I would like to express my sincere gratitude to the Global Road Safety Partnership, Mumbai Traffic Police, IIT- Bombay and the community stakeholders for their invaluable contribution to the Slow Down project.

I am confident that the scientific and participatory approach adopted by us while preparing this report will go a long way in guiding the path to developing the speed management policy at the state level and the national level.

George Aikara



Vivek L Bhimanwar IAS
Transport Commissioner,
Govt. of Maharashtra

Faster and safer vehicles are much more affordable today than ever before. This largely resonates with the technological advancements in the recent years across the World. Particularly in India, the technological adoption has been much quicker than any comparable developing country and this has resulted in unique benefits and its own challenges. One of the key challenges being the safety of all road users on our roads.

In India, and across the World, speeding has been a case of concern contributing to nearly 1/3rd of road traffic fatalities World-wide. This emphasises the need for installing adequate infrastructure capable of handling high speed, supported by extensive awareness campaigns to instil safe-driving road sense in the minds of budding drivers and technology assisted enforcement systems for effective enforcement. India, with over 1.3 billion people, 63 lakh kilometres of road and 32 crore vehicles registered, stands among the top in terms of population, road network and vehicle population. This necessitates a need for a profound ground-level understanding of the impact of interactions between people, vehicles, and infrastructure.

The work initiated by United Way Mumbai in this regard is appreciable and by bringing together inputs from all relevant stakeholder departments, this report shall be beneficial for the decision makers. I wish the team at United Way Mumbai all the very best and look forward to more field-based impact driven initiatives in the times to come.

Vivek L Bhimanwar



Pravin Padwal IPS,
Jt. Commissioner of Police, Traffic,
Mumbai

Road traffic crashes are an increasing public health concern globally and in India. Mumbai city too has been facing the issue of a sizeable number of road traffic crashes and crash fatalities. At Mumbai Traffic Police, we have been committed to working towards reducing road traffic crashes and making the road safer for all.

Speed has proven to be one of the major risk factors causing road traffic crashes. Recognising the severity of this issue, Mumbai Traffic Police has been garnering support from various key stakeholders in the city to work with a comprehensive approach to tackle this issue.

I am aware that United Way Mumbai has collaborated with the Mumbai Traffic Police on several road safety projects. Slow Down is an initiative by United Way Mumbai, where they have been working in consultation with the Mumbai Traffic Police to support stricter enforcement of speed control measures at select twenty blackspots across Mumbai.

This speed observation study report has been result of a scientific assessment of all twenty blackspots and consultation with the local enforcement officials and the neighbourhood citizens. The report thoroughly captures the critical observations about the present road conditions at these blackspots that lead to the speeding behaviour among motorists. The report has also recommended some very critical speed-calming measures that can facilitate better speed management.

Evidence-based reports and recommendations like these will come in handy for all government agencies to improve road safety at these blackspots, thereby eliminating the blackspots in the near future.

I also understand that United Way Mumbai has formed Road Safety Advocacy Clubs at each of these twenty blackspots whereby active neighbourhood citizens have been educated and empowered to address road safety issues in their neighbourhood. We at Mumbai Traffic Police appreciate this step and would look forward to the local citizens continued engagement.

I appreciate the efforts taken by the team from United Way Mumbai as part of the Slow Down project and I am confident that the Speed Observation Study Report will prove to be a useful tool for Mumbai Traffic Police in enforcing stricter speed management policies at the identified blackspots.

Pravin Padwal



Dr. Judy Fleiter
Global Manager, GRSP

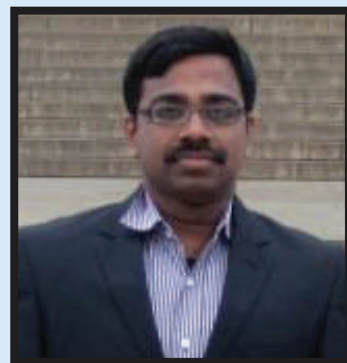
This report is the outcome of a Speed Survey study undertaken by United Way Mumbai as part of their advocacy efforts to improve road safety in India and in particular, to support the implementation of the Motor Vehicle Amendment Act 2019, especially as it relates to managing speed. The project was completed in close collaboration with the Indian Institute of Technology Bombay.

This report assesses the prevalence of speeding through observational techniques and pictorial representation of 20 blackspot locations that were jointly identified with the Mumbai Traffic Police. The observational data are complemented by secondary data obtained from the police (infringement and crash data) that was disaggregated by age group, gender, type of road user and time of occurrence.

A range of public policy recommendations for interventions to address speeding as a key multi-dimensional risk factor are presented in the report.

The Global Road Safety Partnership (GRSP) has administered the Road Safety Grants Program since 2012 to support road safety work in countries across Asia, Africa and Latin America. Work conducted by organizations that receive grant funding through the Road Safety Grants program helps to facilitate stronger laws and their implementation to protect all road users. We commend the efforts of United Way Mumbai in undertaking this work to support safer speeds to enhance the lives of all those who use the roads in Mumbai.

Dr. Judy Fleiter



Prof. P Vedagiri
Associate Dean,
Department of Civil Engineering, IIT-B

Road safety is an issue of concern for all countries globally, as approximately 1.3 million people die each year around the world as a result of road traffic crashes as per World Health Organization data. More than half of all road traffic deaths and injuries involve vulnerable road users, such as pedestrians, cyclists and motorcyclists and their passengers.

As per the 'Road Accidents in India 2020' published by MORTH, there were 3,66,138 unfortunate incidences of road accidents during 2020 which claimed 1,31,714 lives and caused injuries to 3,48,279 persons. In 2020, under the category of Traffic Rule Violations, over speeding is a major killer, accounting for 69.3 % of the persons killed followed by driving on the wrong side (5.6 %).

Speeding, one of the main risk factors leading to road crashes is the focal point of this study undertaken by the Transportation Systems Engineering Group of IIT Bombay in collaboration with United Way Mumbai (UWM). As the preliminary step, field observations were made at the identified twenty black spots spread across Mumbai to understand the site-specific issues. Base line speed surveys were then carried out in 2019 using radar guns at the black spots to capture the spot speed of different classes of vehicles by enumerators from IITB as well as from UWM.

The speed data captured during the surveys were analysed and average speed variability of different vehicle types were plotted. Traffic crash data analysis along with the speed data studies were used to give recommendations and suggest improvement measures to manage and reduce speed. These recommendations include speed management measures, traffic calming measures at intersections, pedestrian facilities, other safety related measures, etc. and they have been broadly divided into Engineering interventions, Behavioural risk factors vis-à-vis interventions and Traffic management and enforcement interventions. Wherever possible, the recommendations have also been classified as short term and long term based on the time required and the easiness in carrying them out. The report also discusses in detail the sitespecific recommendations based on the field observations. Once these measures are implemented, the end line surveys will be planned. After completion, assessment of pre and post enforcement or design impacts on traffic speed can be done.

We hope this document will be instructive and useful for the enforcers, policy makers, and society at large in making Mumbai roads safer for all road users.

Prof. P Vedagiri

ACKNOWLEDGEMENT

United Way Mumbai would like to sincerely acknowledge various stakeholders for their valuable contribution to this Speed Observation Report as mentioned below;

- Office of the Jt. Commissioner of Police (Traffic), Traffic Control Branch, Mumbai Police and all the officials of the Traffic Police Divisions across Mumbai city who have participated in this project activities and provided their valuable guidance and inputs
- Office of the Transport Commissioner, Motor Vehicle Department, Govt. of Maharashtra and all the transport officials who have participated in this project activities and provided their valuable guidance and inputs
- Indian Institute of Bombay (IIT-B), Department of Civil Engineering
- Members of all the twenty Road Safety Advocacy Clubs formed by United Way Mumbai around the select blackspots as part of the Slow Down project

This document has been produced with the help of a grant from The Global Road Safety Partnership a hosted project of the International Federation of Red Cross and Red Crescent Societies (IFRC). The contents of this document are the sole responsibility of the authors and can under no circumstances be regarded as reflecting the positions of the IFRC nor those of Bloomberg Philanthropies.



INTRODUCTION

India ranks first in the number of road crash deaths across the 199 countries reported in world statistics, 2018 followed by China and the US. India accounts for almost 11% of the crash related deaths in the world. According to the Ministry of Road Transport and Highways Report, 2019, Road crashes kill almost 1.51 lakh people annually in India.

Young adults in the age group of 18 - 45 years accounted for nearly 69.3 percent of road crash victims. The vulnerable road users accounted for 54% percent of the total road crash deaths.

Vehicular population has considerably increased in the last decade due to the rapid urbanization and economic development (rising income), along with which the road crashes have increased significantly. According to the statistics, more than 70 percent of road crashes are due to speeding. Over-speeding is a major cause of road crashes, accounting for 71% of crashes, 67.3% of deaths, and 72.4% of injuries.

Mumbai being an economic capital city and part of the most developed states of India. It observes most deaths and injuries resulting from road crashes. Mumbai Traffic Police reported 350 road crash deaths and 1740 injuries in the year 2020. Mumbai city has listed the top high-risk locations named as “Black Spots” across the city. United Way Mumbai along with Mumbai Traffic Police identified 20 black spot’s location of Mumbai city for detailed study in. This study has been done in collaboration with Indian Institute of Technology, Bombay (IIT-B).

United Way Mumbai is a part of the 130+ year old United Way movement engaged in nearly 1800 communities, spanning 41 countries across the world. Our mission is to improve lives by mobilizing the caring power of communities to advance the common good. Our flagship programs have been largely in the areas of civic awareness, health, safety, and greening. In addition to this, we have designed and facilitated large scale interventions in the areas of education, nutrition, and sanitation in urban and rural communities.

United Way Mumbai addressed various aspects related to the promotion of road safety through a community impact initiative “United for Road Safety” in Mumbai, India.

Under this initiative “Slow Down Project - a campaign to advocate the need to respect the speed limits on city roads”, was launched.

The project aims at enhancing road safety in Mumbai with a focus on safer public mobility, and speed management policies in Mumbai. This report is a summary of the detailed technical report.

The key objectives of this campaign are:

- **Objective 1:** Support MVA implementation in the state of Maharashtra especially related to speeding and strict enforcement of speed management in Mumbai
- **Objective 2:** Build awareness to curb speeding mass media activities, and support the state and city authorities to better plan and implement the Slow Down awareness campaigns.



METHODS

The key objectives of the Speed Observation Study are given below:

Objective 1: To study and identify the causal factors of speeding at the select blackspots

Objective 2: To recommend speed calming measures in order to support stricter enforcement speed limits at these blackspots

Objective 3: To provide to the Mumbai Traffic Police, the evidence of instances of over speeding and the need for speed calming interventions recommendations so that, they can plan and implement suitable enforcement measures

The main components of the speed observation study were to observe vehicle density, speeding patterns of the vehicles, nature of road crashes – severe/minor injuries or fatalities and evaluation of existing infrastructure to curb speeding and working on the strategies to implement the interventions.

This study included the identified black spot locations, including the behavior of different types of road users and other influencing factors to enable a full assessment of speed-related injury risks and identification of vulnerable road users.

Speed observation study surveys were conducted using radar guns at selected 20 locations for 2 days each (one-week day and one-week end day from 10.30 am to 11.00 pm). Measuring speed using radar uses reflected waves of very high frequency from the radar speed meter to the moving vehicle. The reflected wave is directly measurable and is proportional to the speed at which the vehicle is moving.

The methodology involved in the speed data collection was simple but scientific. During the data collection surveys, a spot was chosen at the black spot location such that a clear view of the oncoming traffic was available, but the enumerator was inconspicuous. If the enumerator holding the radar gun stands out, the drivers tend to slow down, and the free flow speed will not be obtained. During the survey, the enumerator points the radar gun so that the vehicle is either moving directly toward the radar gun or directly away from the gun. The enumerator will then press the trigger and the speed will be displayed on the screen. The speed gun also had a continuous mode which allows the enumerator to detect the speed of the vehicle without having to press the button for each vehicle in case of heavy flow of traffic.



ANALYSIS

The speed survey data was analyzed using the following statistical parameters:

- Average speed (Mean speed)
- Standard deviation
- Percentile speed (85th Percentile and 15th Percentile)

The definitions of the above parameters are discussed in the detailed report.

85th percentile speed was calculated using the speed data and the recommended speed limit ranges based on the same is listed below for all 20 locations.

Speed observation at 85th Percentile by Location

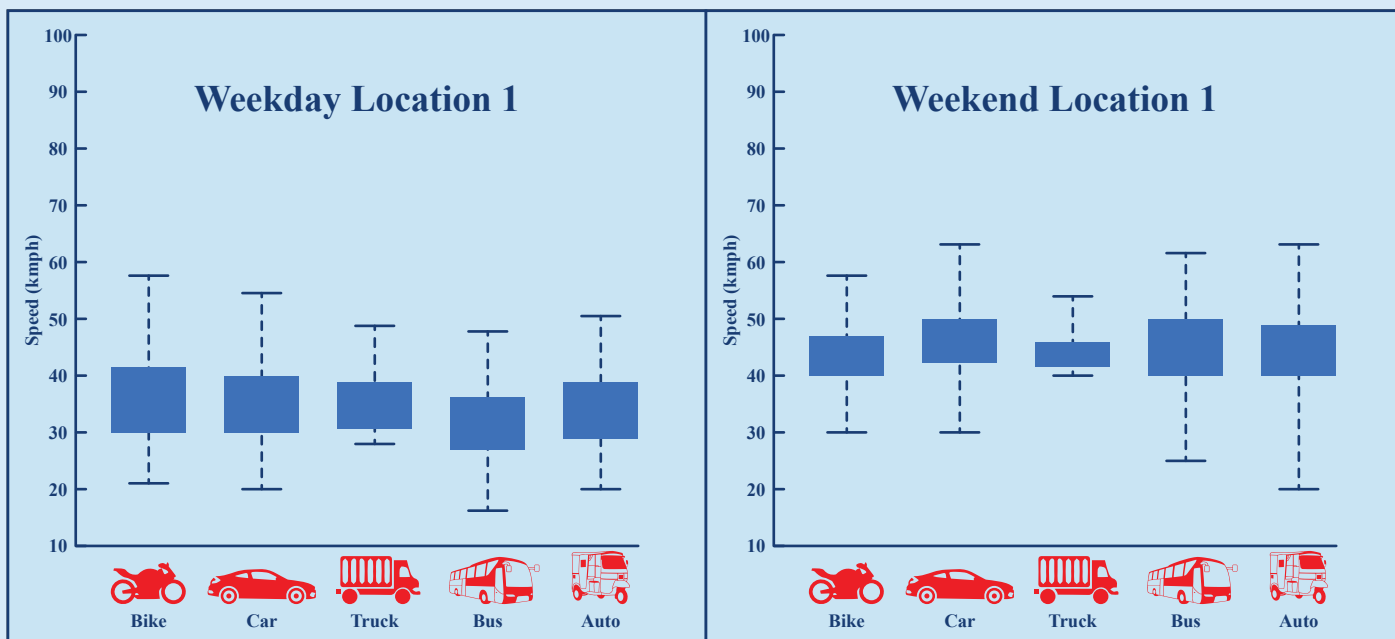
Sr.No.	Name of Location	85th Percentile Speed (kmph)	Speed Range (kmph)
Location 1	Eastern Express Highway, Near Ramabai Nagar Bus Stop, Near Sainagar Nala, Retiwala, Ghatkopar East	52.00	45-55
Location 2	Chheda Nagar & SCLR Bridge Chheda Nagar, Bus Stop, Chembur East	41.20	35-45
Location 3	Towards Sea Link, Mahim Causeway Junction, Near Bandra Chowky, U – Bridge, Western Express Highway, Bandra West	49.80	40-50
Location 4	Haji Ali Junction	57.16	45-55
Location 5	City Bakery, Gafarkhan Bridge, at Worli Naka, Worli	40.73	35-45
Location 6	In Front of Sane Guruji Udyan, Near Siddhivinayak Temple, Prabhadevi	37.06	30-40
Location 7	Opp. Sarswati Vidhya Mandir, Near Mahim Phatak, Senapati Bapat Road, Mahim	43.00	35-45
Location 8	Megdoot Bridge, Opp Islam Gymkhana, N.S.Road	53.63	45-55
Location 9	Baristar Nath Pai Road, Church Signal, Canara Bank, In Front Of ATM, Nearby Dock Yard Station, Mazgaon	31.00	25-35
Location 10	Y Junction, Sion Bandra Link Road, Dharavi	44.08	35-45
Location 11	CST Bridge, Near Kurla Bus Depot, Kurla West	39.54	30-40
Location 12	Shimpoli Naka Link Road, Shimpoli Gorai Road, Near Shimpoli Choki, Borivali West	37.03	30-40
Location 13	Near Sanjay Gandhi National Park Gate, Under Flyover, Borivali East	33.45	25-35
Location 14	Near Metro Mall, North Bound Magathane Depot Bridge Junction, Near Annex Mall, W.E.H, Borivali East	48.82	40-50
Location 15	Durga Nagar Junction, JVLR, Jogeshwari	29.80	25-35
Location 16	Opp. To Akbar Ali, Umarshi Bappa Chowk, Near Guru Prasad Bar, Sion Trombay Road, Chembur	39.00	30-40
Location 17	Amar Mahal Junction, Towards Thane, Starting of Amar Mahal Bridge	56.40	50-60
Location 18	Godrej Ghodagate Signal, Thane - Mumbai Way, Vikhroli East	63.52	55-65
Location 19	Near Airoli Toll Naka, Before Airoli Bridge, Thane-Mumbai Way, Airoli-Mulund Way	80.05	60-70
Location 20	Opp IIT Bombay Main Gate, IIT Bombay Signal, Powai	40.95	35-45

Table 1: Speed data observed at 85th percentile

The collected data produces into box plots and histograms using the above parameters. These are explained in the following samples.

Sample Location: Chheda Nagar & SCLR Bridge Chheda Nagar, Bus Stop, Chembur East

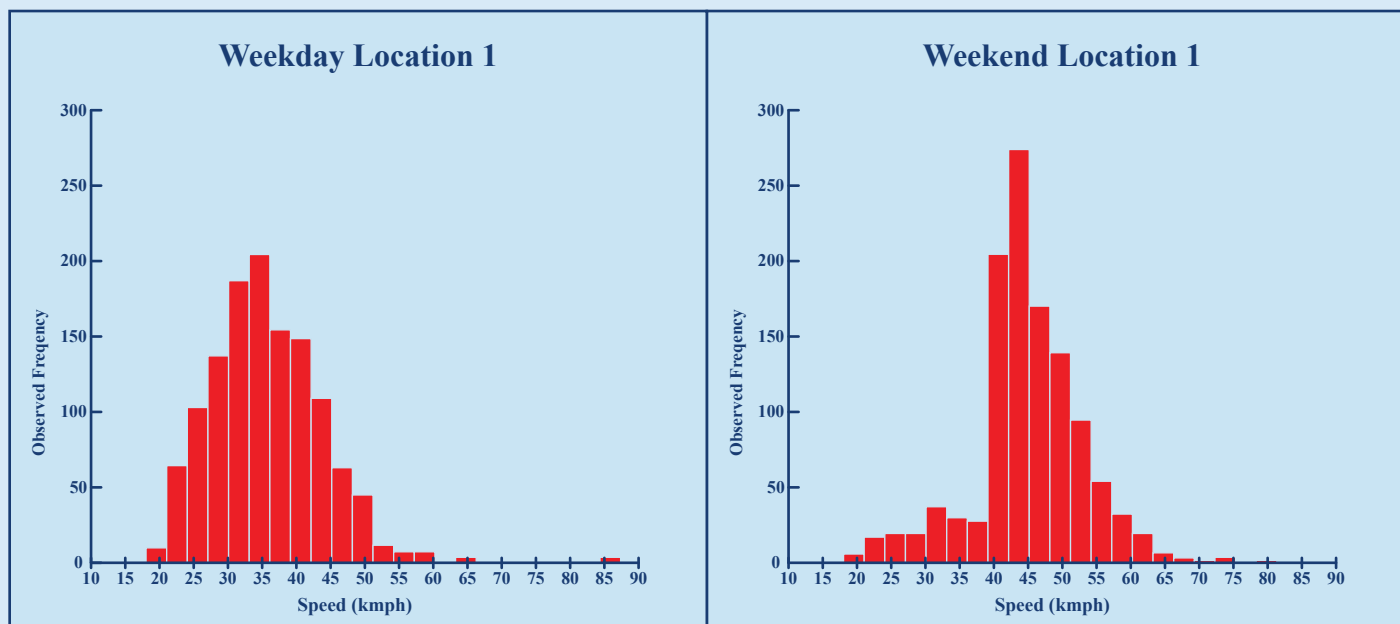
The box contains the middle 50% of the data sample – the bottom and top of the box are the 25th and 75th percentile. The remaining 50% of the sample is contained within the areas between the box and the whiskers. Speed distribution of the motorized two wheelers (bike) is normally distributed because the median line is located near the center of the box and the box is nearly centered between the whiskers.



Location: Eastern Express Highway, Near Ramabai Nagar Bus Stop, Near Sainagar Nala, Retiwala, Ghatkopar East



Speed Histogram



Location: Eastern Express Highway, Near Ramabai Nagar Bus Stop, Near Sainagar Nala, Retiwala, Ghatkopar East

It helps to visualize the distribution of the data. Box plots and speed histograms for all 20 locations have been analyzed on both weekdays and weekends.

Speed Violation Analysis

The present study considered 20 blackspots identified to understand the speed violation statistics. Speed limits of 7 black spots were posted at the locations. And remaining 13 black spots were missing posted speed limits. In some locations throughout Mumbai such as near IIT Main Gate, Powai, a reduced speed limit of 20 kmph was provided due to the construction of Metro in the area. The original speed limit of 50 kmph was considered for analysis, despite the reduced speed limit of 20 kmph due to Metro construction. For the 13 locations with missing posted speed limits 70-50 kmph speed limits were considered for the study.

Percentage of vehicles speeding during the time of day (Weekdays & Weekends):

Chheda Nagar, Chembur	10:30 to 12:00	14:00 to 15:30	16:30 to 18:00	19:00 to 20:30	21:30 to 23:00
Weekday	2.40	6.00	1.71	0.00	0.00
Weekend	24.33	10.20	10.64	6.19	19.70

Table 2: Percentage of vehicle speeding at Chhedda Nagar, Chembur

Godrej Ghodagate, Vikhroli	10:30 to 12:00	14:00 to 15:30	16:30 to 18:00	19:00 to 20:30	21:30 to 23:00
Weekday	24.00	43.40	17.00	15.25	18.86
Weekend	55.11	52.00	46.75	15.25	30.00

Table 3: Percentage of vehicle speeding at Godrej Ghodagate, Vikhroli

The above analysis shows what time of the day saw maximum speed violations. The speed violation increased significantly during weekends. One of the possible reasons might be the lower traffic volumes contributing to higher vehicular speeds.

The speed data were collected at the selected 20 locations to understand the speed trend and speed variability currently prevailing. Box plots and histograms have been developed to interpret the collected data in a pictorial representation, which can be easily understood.



RESULTS

Eastern Express Highway, Near Ramabai Nagar Bus Stop, Near Sainagar Nala, Retiwala, Ghatkopar East



Figure: 1 Google earth view of Eastern Express Highway, Near Ramabai Nagar Bus Stop, Near Sainagar Nala, Retiwala, Ghatkopar East

It is a midblock section with a 10-lane divided carriageway and 2 service lanes on either side. Considered speed limit is 70 kmph.

Observations made at the site:

Risky merging section: High-speed vehicles coming from the service lane merge into the high-speed vehicles in the main lane. The absence of a gradual merging section is a big issue.

Presence of a central island: Proper channelizing is absent at the location. Difficulty in seeing the central island and medians during nighttime due to the absence of reflectors.

Infrastructure: Existing rumble strips are not very effective in reducing the high speed of expressway users. No speed limit signs, and merging section ahead sign board. Existing road markings were observed to be faded and some temporary road markings were provided as a part of the Metro construction being carried out at the location.

Behavioral risk factors: Side friction is present because of parked trucks on the roadside.

Crash Data at Eastern Express Highway, Near Ramabai Nagar Bus Stop, Near Sainagar Nala, Retiwala, Ghatkopar East

Classification of crashes at Ghatkopar

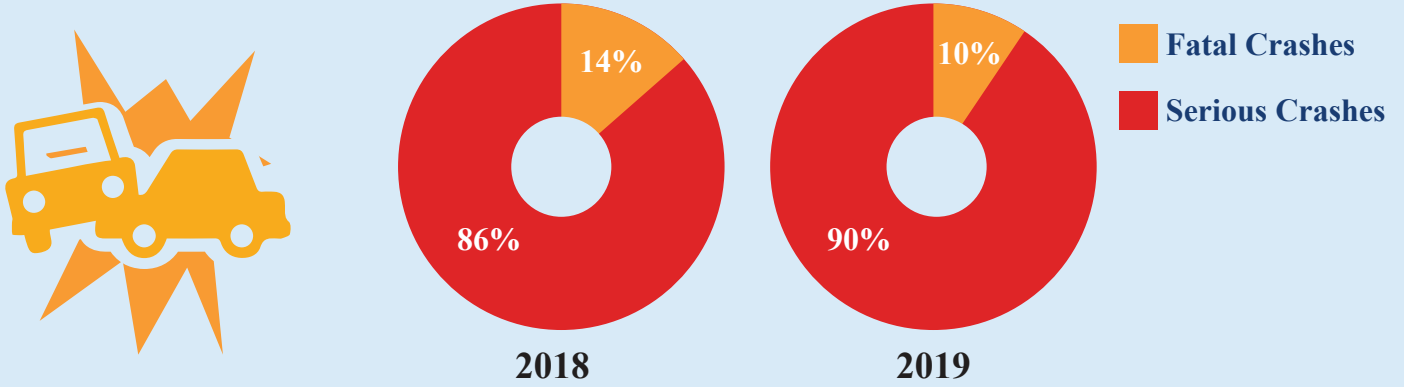


Figure 2: Distribution of fatal and serious crashes in the Ghatkopar area in 2018 and 2019

Distribution of crash timing at Ghatkopar

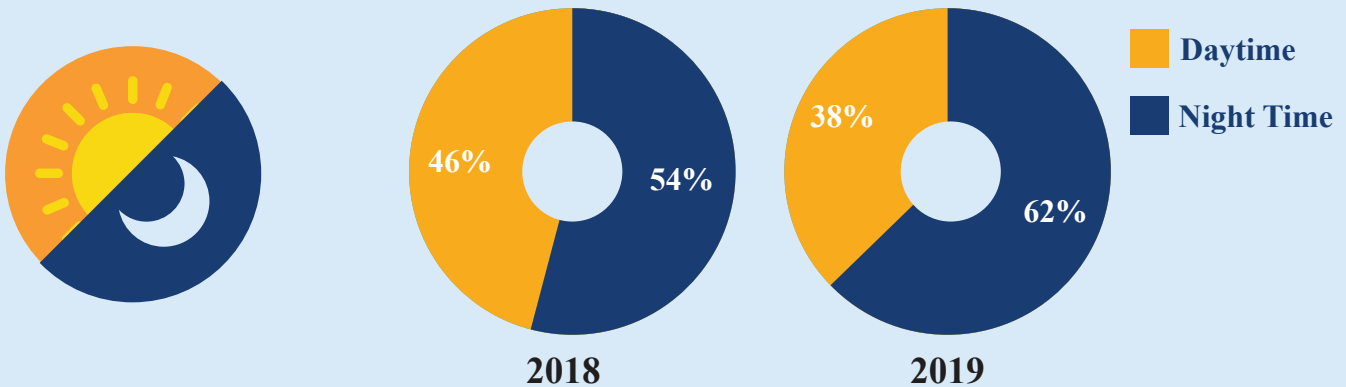


Figure 3: Distribution of daytime and night time crashes in the Ghatkopar area in 2018 and 2019

Distribution of age group of crash victims at Ghatkopar

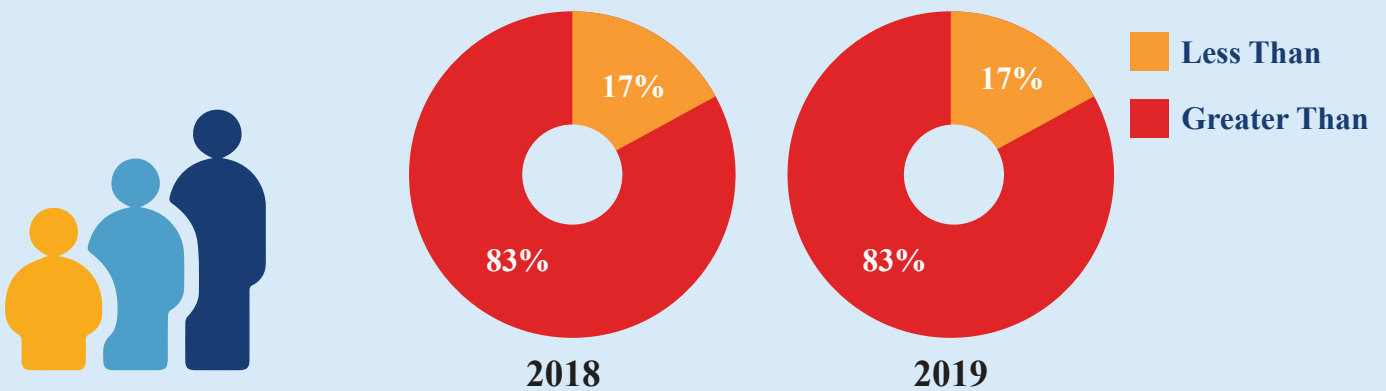


Figure 4: Distribution of age group of crash victims at the Ghatkopar area in 2018 and 2019

Distribution of male & female crash victims at Ghatkopar

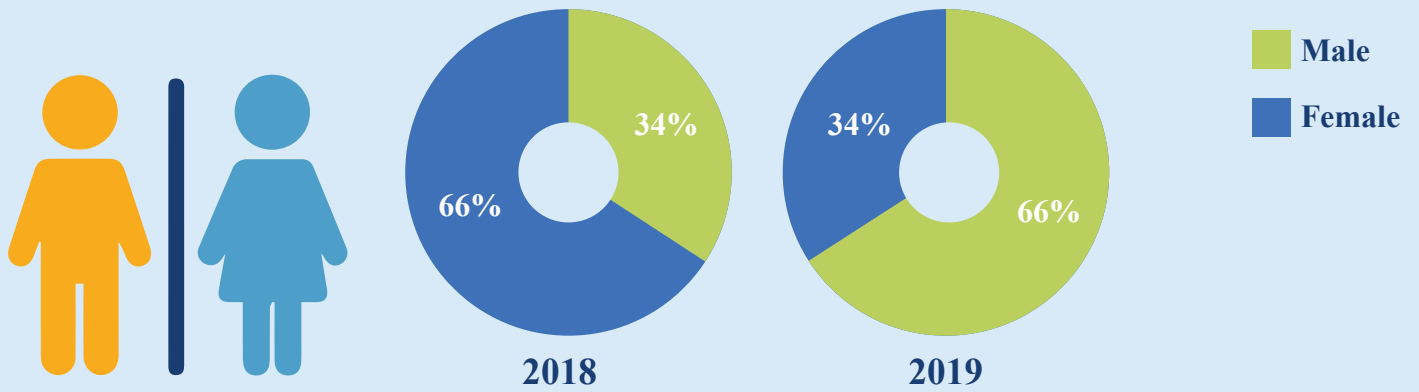


Figure 5: Distribution of male and female crash victims at the Ghatkopar area in 2018 and 2019

Classification of vehicle types involved in the crashes at Ghatkopar

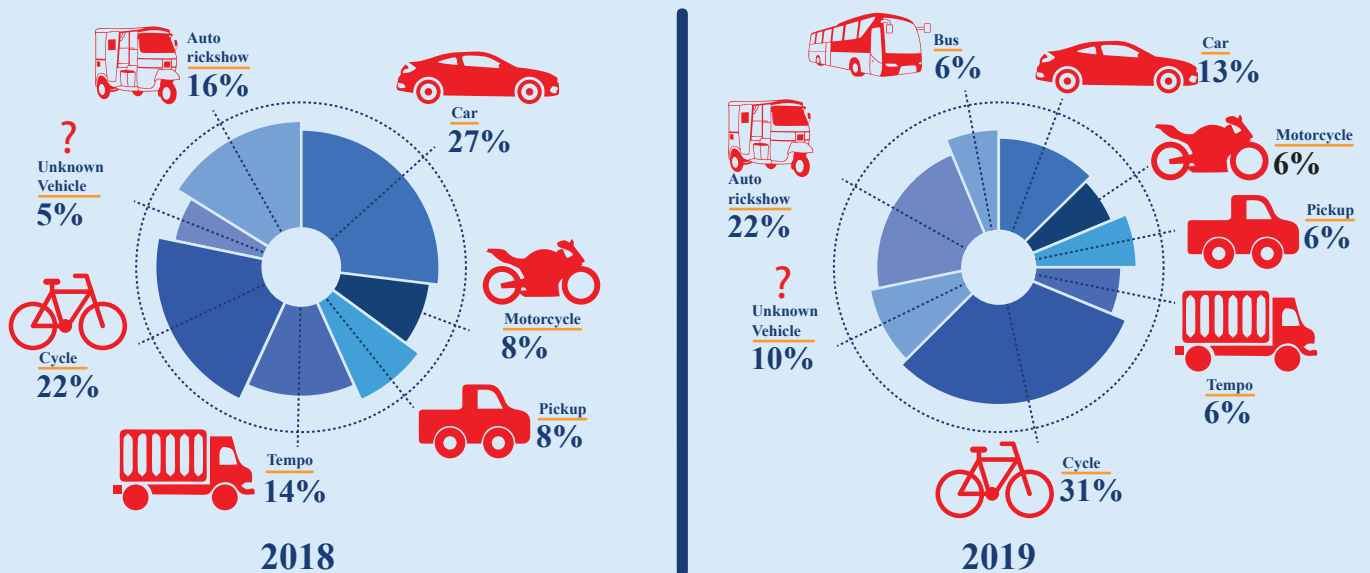


Figure 6: Distribution of vehicle types involved in crashes at the Ghatkopar area in 2018 and 2019





Figure 7: Google earth view of Chheda Nagar & SCLR Bridge Chheda Nagar, Bus Stop, Chembur East

It is a signalized T-intersection with no countdown timer. The carriageway at Chheda Nagar consists of 8 lanes (Ghatkopar - Mankhurd) divided road as shown in Figure 4. Eastern Express Highway is passing over the Chembur junction. Considered speed limit is 50 kmph.

Observations made at the site:

Risky merging section: Potential conflict points are at merging.

Infrastructure: Traffic signal system is implemented at the junction (Green time of 65 seconds, red time of 85 seconds) without countdown timing in the signal; during peak hours, the traffic was in fully jammed/congested condition starting from the flyover exit. Police were controlling the overall traffic at this junction. Rumble strips were absent on all the approach roads and vehicles were moving at very high speeds during the off-peak time (from the exit of the flyover). Lane markings such as Zebra crossings were faded and the left turning lane marking was absent. Poor visibility at night. Available road width was reduced due to the metro construction work going on both sides.

No speed limit signs, no merging sign board. Improper alignment of the carriageway.

Behavioral risk factors: Side friction is more because of the parked auto rickshaw on the left side of the road-side.

Crash data at Chheda Nagar & SCLR Bridge Chheda Nagar, Bus Stop, Chembur East

Classification of crashes at Chembur

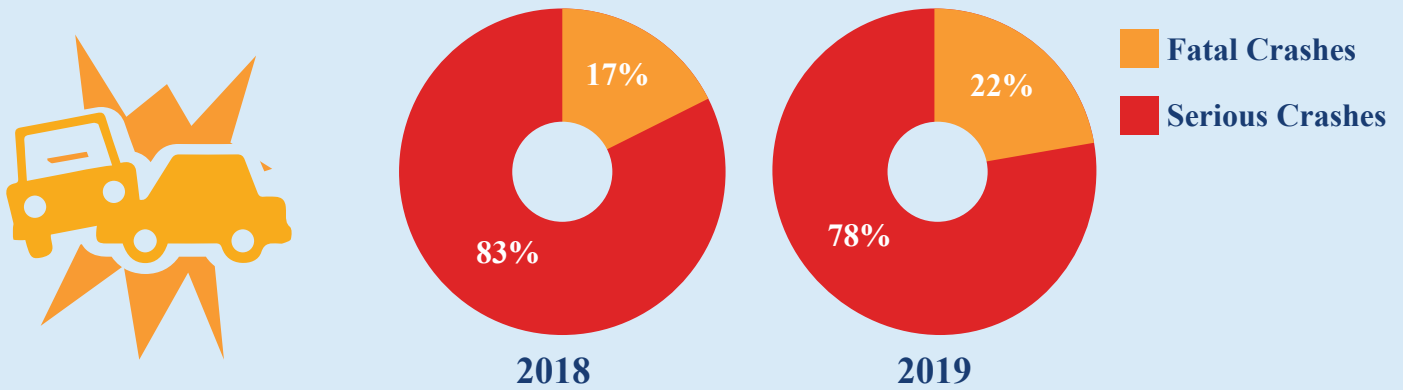


Figure 8: Distribution of fatal and serious crashes in the Chembur area in 2018 and 2019

Distribution of crash timing at Chembur

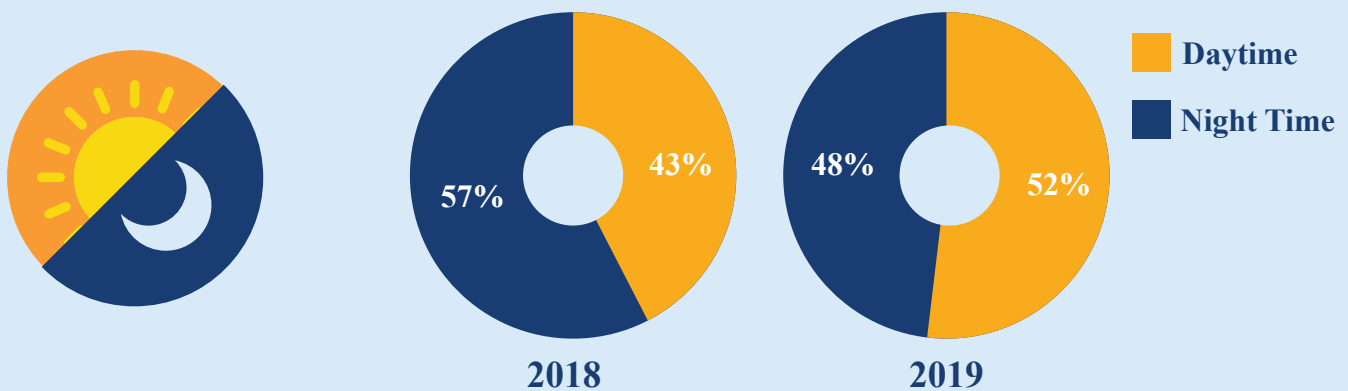


Figure 9: Distribution of daytime and night time crashes in the Chembur area in 2018 and 2019

Distribution of age group of crash victims at Chembur

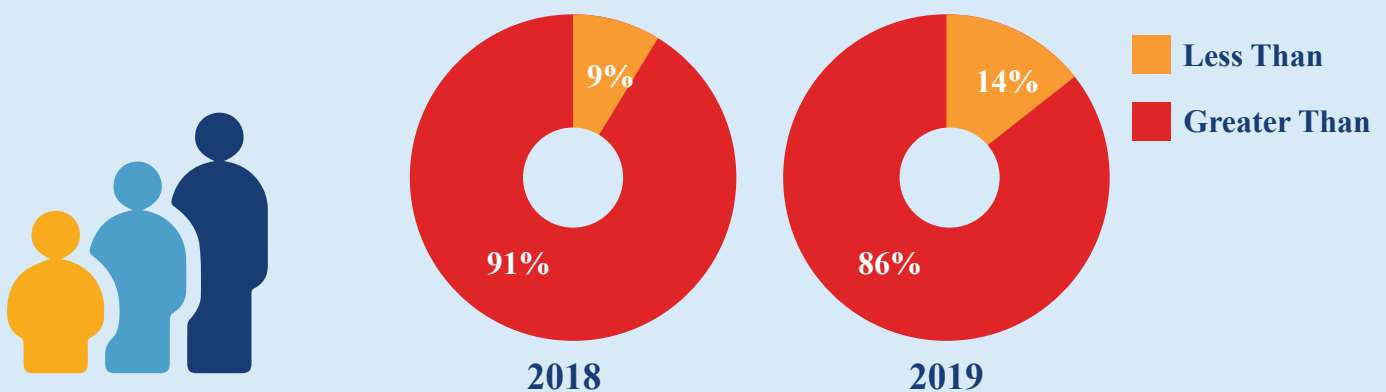


Figure 10: Distribution of age group of crash victims at the Chembur area in 2018 and 2019

Distribution of male & female crash victims at Chembur

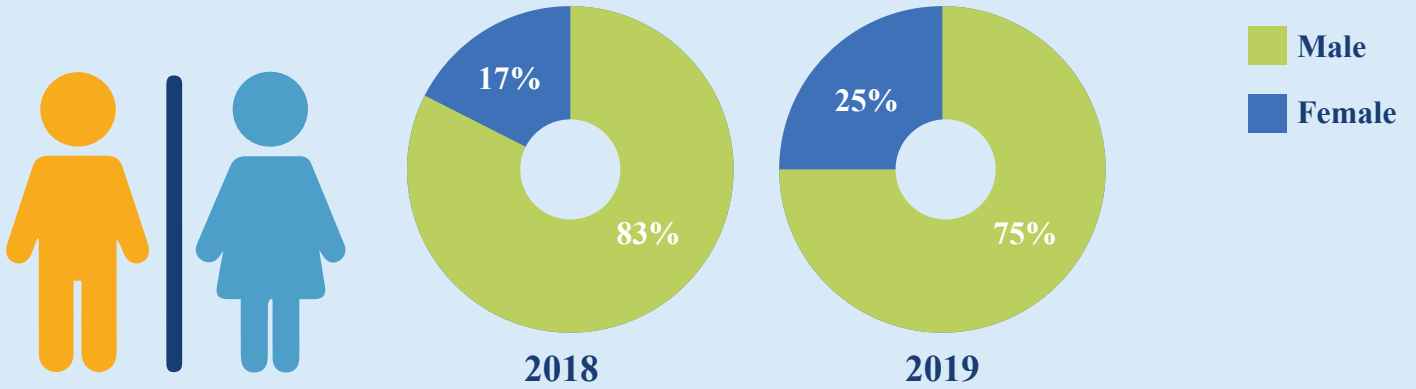


Figure 11: Distribution of male and female crash victims at the Chembur area in 2018 and 2019

Classification of vehicle types involved in the crashes at Chembur

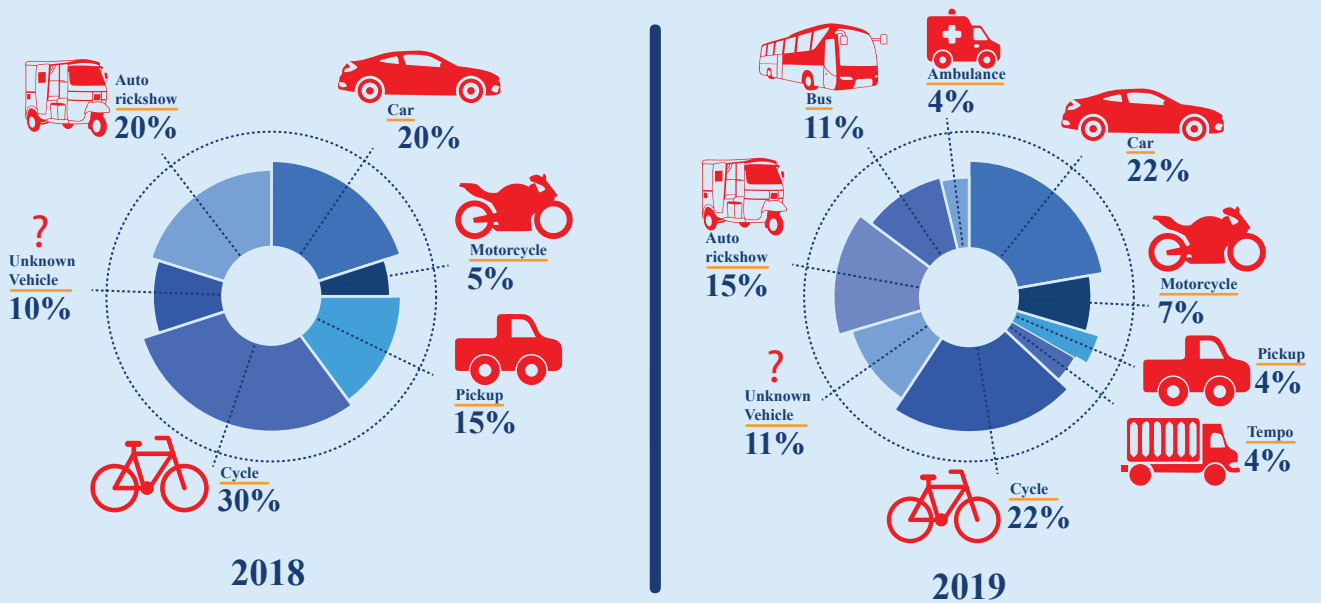


Figure 12: Distribution of vehicle types involved in crashes at the Chembur area in 2018 and 2019





Figure 13: Google earth view of City Bakery, Gafarkhan Bridge, at Worli Naka, Worli

This is a mid-block location with slight side friction. Although the section is between two signalized intersections, the speeds are not very high. Considered speed limit is 50 kmph.

Observations made at the site:

Infrastructure: Traffic signal to control the traffic provided with no countdown timer and green time of 70 seconds, red time of 100 seconds, amber time of 3 seconds for downstream signal (towards Mahalaxmi) and green time of 35 seconds, red time of 75 seconds, amber time of 3 seconds for upstream signal (towards Worli).

Pedestrian crossing signs and speed limit signs were missing.

Road markings are absent along the stretch and pedestrian crossing markings are absent at the median opening. Pedestrians were observed to randomly cross the road without waiting for the traffic to stop

Most of the road section has adequately wide footpaths.

Crash data at City Bakery, Gafarkhan Bridge, at Worli Naka, Worli

Classification of crashes at Worli

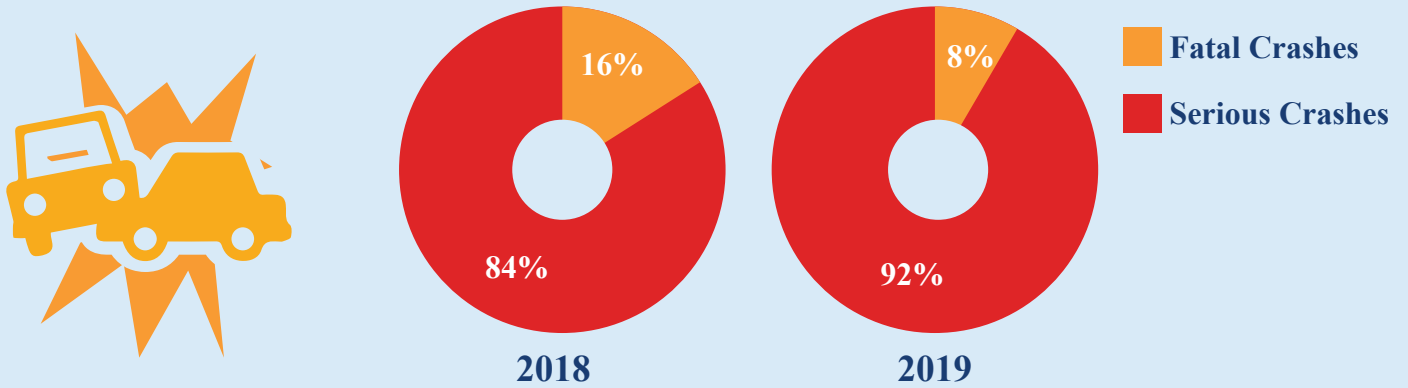


Figure 14: Distribution of fatal and serious crashes in the Worli area in 2018 and 2019

Distribution of crash timing at Worli

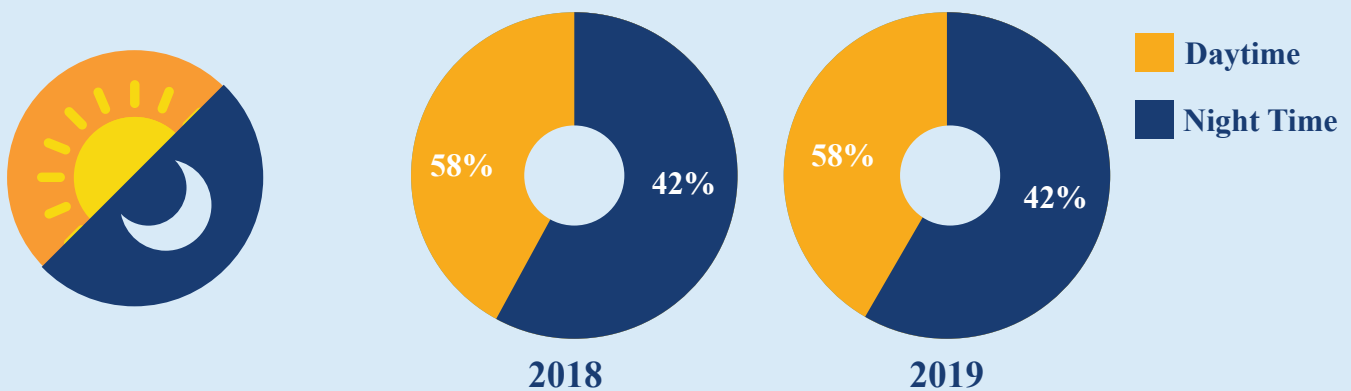


Figure 15: Distribution of daytime and night time crashes in the Worli area in 2018 and 2019

Distribution of age group of crash victims at Worli

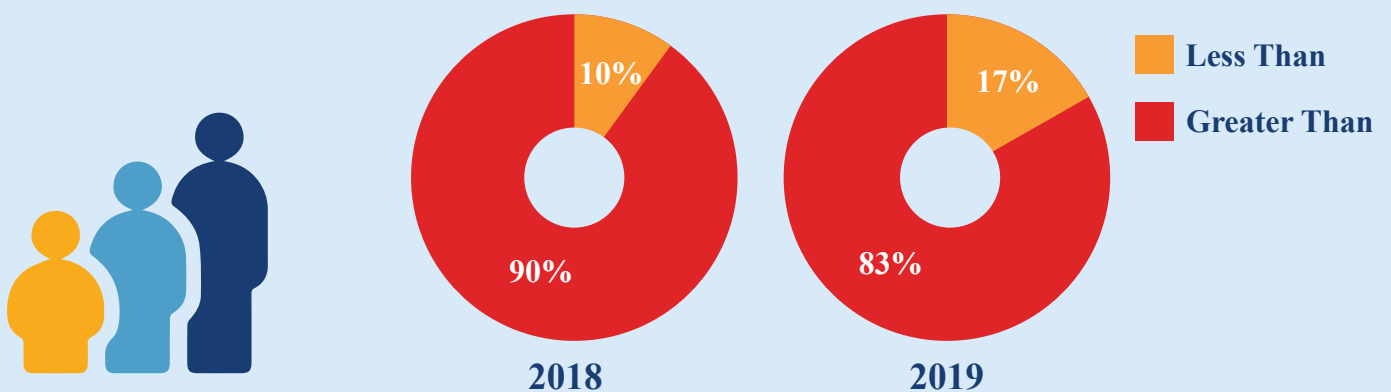


Figure 16: Distribution of age group of crash victims at the Worli area in 2018 and 2019

Distribution of male & female crash victims at Worli

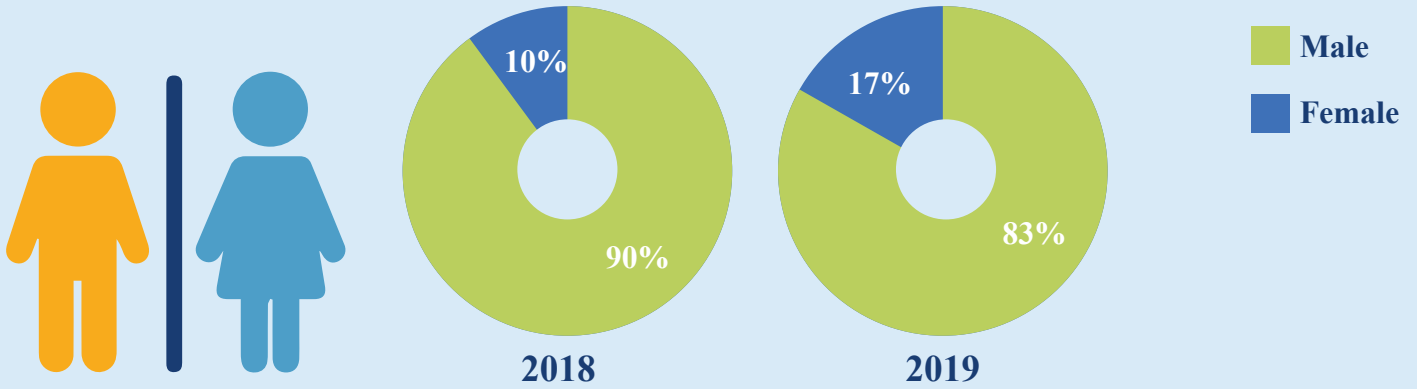


Figure 17: Distribution of male and female crash victims at the Worli area in 2018 and 2019

Classification of vehicle types involved in the crashes at Worli

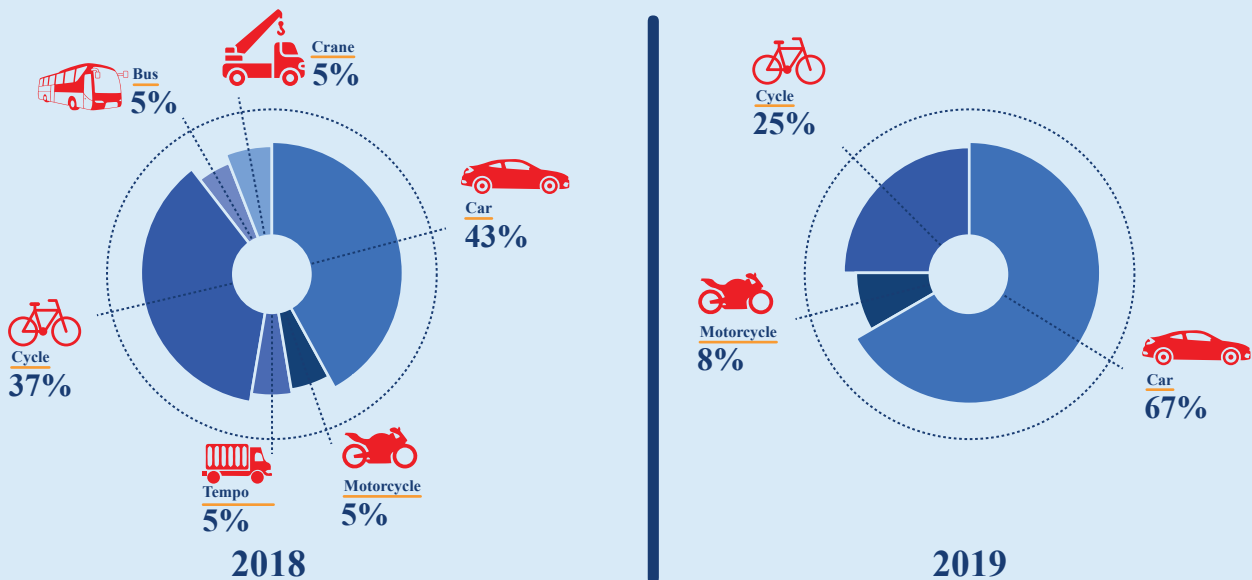


Figure 18: Distribution of vehicle types involved in crashes at the Worli area in 2018 and 2019





Figure 19: Google earth view of CST Bridge, near Kurla Bus Depot, Kurla West

It is a four-legged signalized intersection. Land use is mixed in nature. The intersection does not have a proper channelizing island and all the roads are 4 lanes (divided) with broken medians. The speed of the vehicles is very less because of the reduction in the width of lanes. A speed limit sign of 20 kmph was present at the location.

Observations made at the site:

Risky merging section: As the traffic is heavy in this section, speeds of the vehicles were observed to be low. The new BKC connector had opened in 2020 and it seems to have reduced the traffic congestion along these stretches.

Infrastructure: It is a four-legged signalized intersection with no countdown timer. Traffic signal is provided with a green time of 30 seconds for northern, green time of 25 seconds for eastern, green time of 40 seconds for southern and green time of 25 seconds for western. Traffic officials were also observed to be controlling the traffic.

Speed deterrents such as speed breakers, rumble strips absent at the location.

Pedestrian traffic was found to be very high at the location due to the presence of the residential area and it being a key market location.

Pedestrian crossing signs was absent at the location. Some sign boards are present but not properly placed.

Road markings such as left turn marking, pedestrian crossing markings, etc., were absent and some of them were faded. Available road width was reduced due to the metro construction work being carried out on both sides of the roads. Footpath or sidewalk was observed to be in poor condition. Improper alignment of the carriage way and pavement surface was in poor condition.

Behavioral risk factors: Side friction around the junction was caused due to the parked vehicles. Drivers were observed to be negligent of traffic rules and regulations.

Crash Data at CST Bridge, near Kurla Bus Depot, Kurla West

Classification of crashes at Kurla

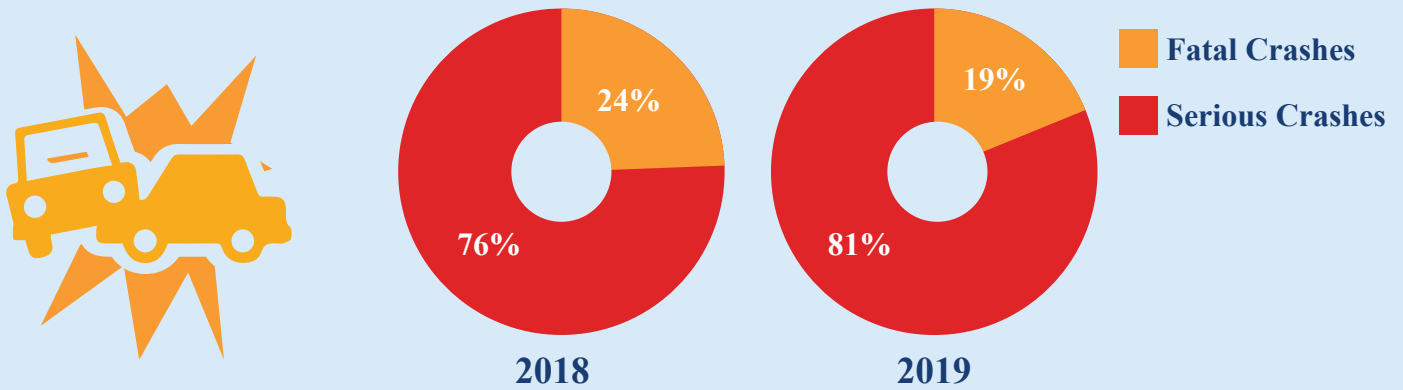


Figure 20: Distribution of fatal and serious crashes in the Kurla area in 2018 and 2019

Distribution of crash timing at Kurla

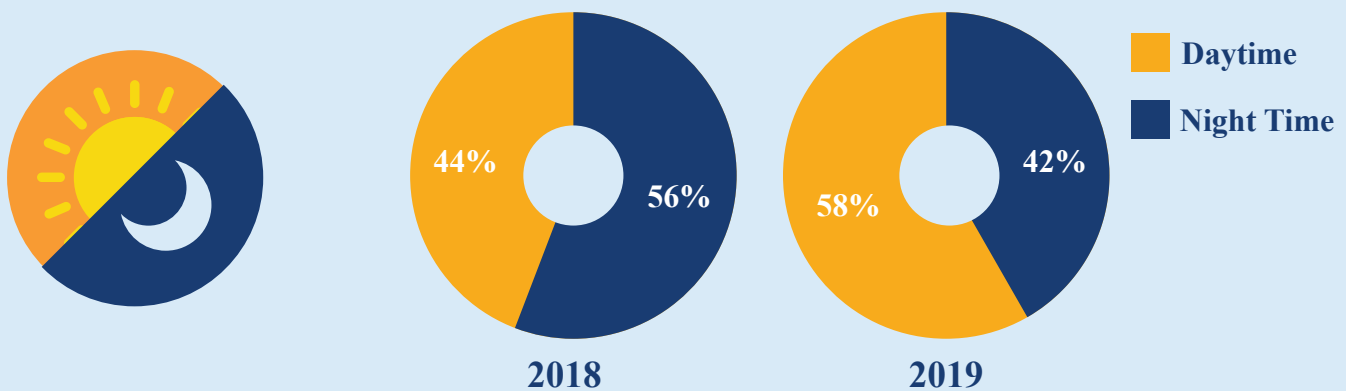


Figure 21: Distribution of daytime and night time crashes in the Kurla area in 2018 and 2019

Distribution of age group of crash victims at Kurla

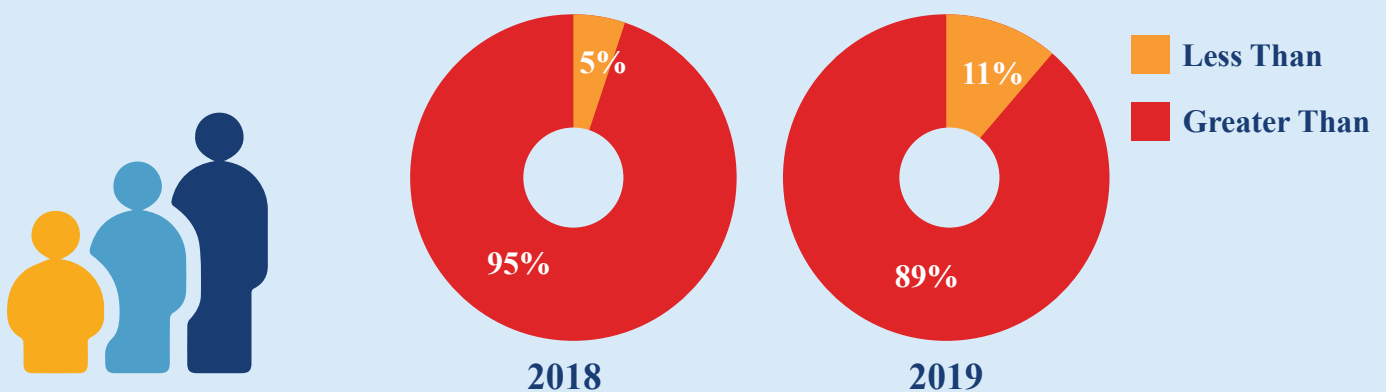


Figure 22: Distribution of age group of crash victims at the Kurla area in 2018 and 2019

Distribution of male & female crash victims at Kurla

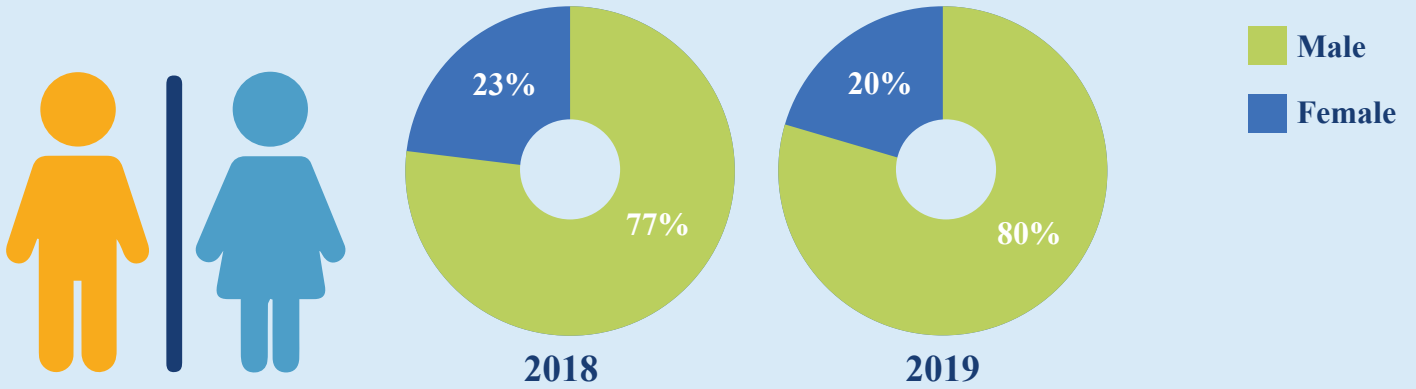


Figure 23: Distribution of male and female crash victims at the Kurla area in 2018 and 2019

Classification of vehicle types involved in the crashes at Kurla

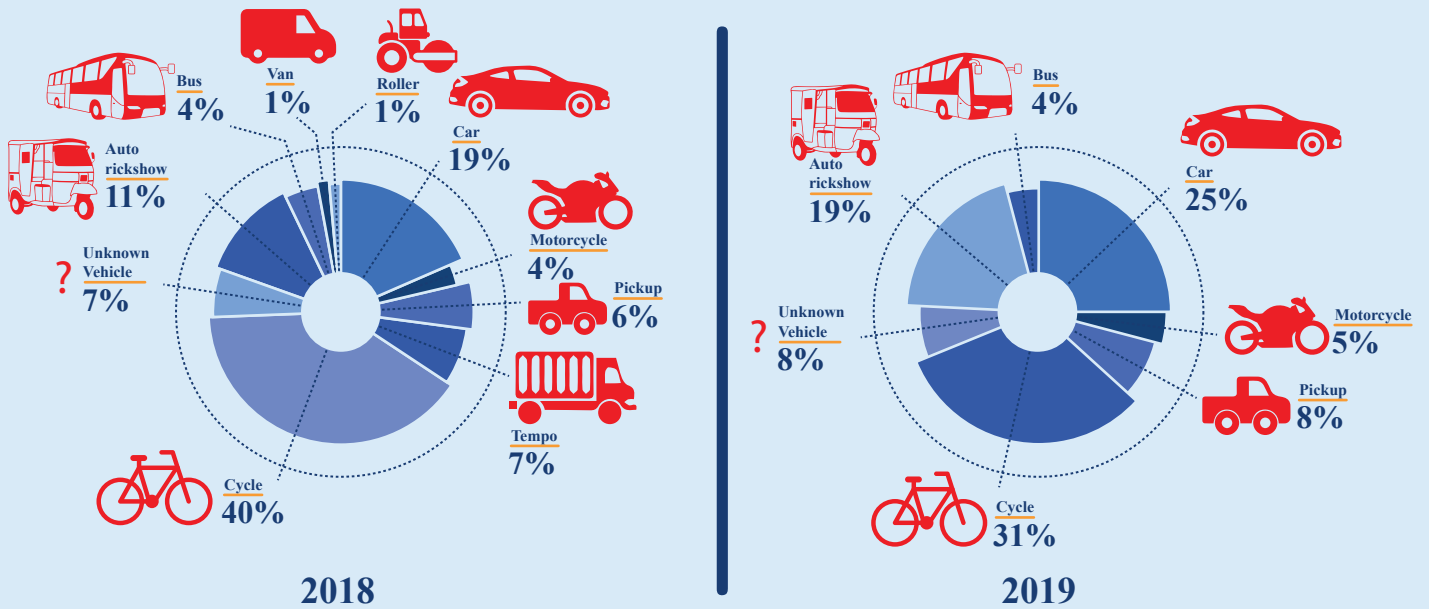


Figure 24: Distribution of vehicle types involved in crashes at the Kurla area in 2018 and 2019





Figure 25: Google earth view and photograph of Godrej Ghodagate Signal, Vikhroli (East)

Godrej Ghodagate Signal, Thane- Mumbai Way, Vikhroli (East). It is three-legged signalized junction with Eastern Express Highway passing through it. The carriageway at Godrej consists of 10 lanes divided. It also has a two-lane service road on either side of junction. Foot over bridge is also present for the smooth movement of pedestrians. Speed limit sign of 60 kmph was present at the location.

Observations made at the site:

Risky merging sections: Buses were sometimes found to stop in the second lane for passenger alighting rather than maneuvering close to the Godrej Soap bus stop posing serious conflict risks. Potential conflict can be caused due to rear end conflicts due to vehicles abruptly slowing down because of the signal.

Infrastructure: Traffic signal system has a countdown timer with a green time of 105 seconds, red time of 27seconds and an amber time of 5 seconds. Rumble strips are provided on the expressway. Lane markings are slightly faded. Road signs were observed to be absent. Inadequate road signs.

Behavioral risk factors: Speed limit sign of 60 kmph was observed at the location, but vehicles could be observed to be travelling at higher speeds on the Expressway. Pedestrians do not use foot over bridge.

Crash Data at Godrej Ghodagate Signal, Vikhroli (East)

Classification of crashes at Vikhroli

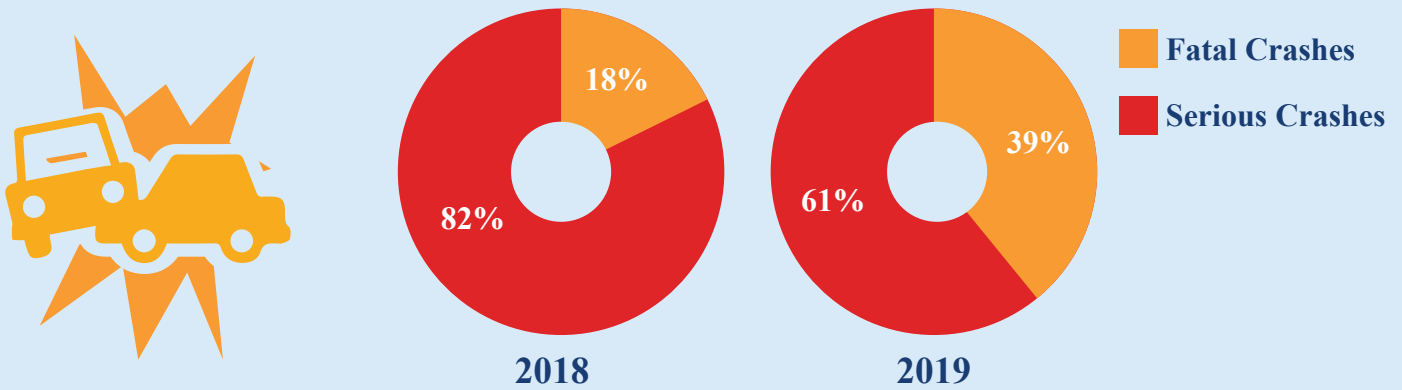


Figure 14: Distribution of fatal and serious crashes in the Vikhroli area in 2018 and 2019

Distribution of crash timing at Vikhroli

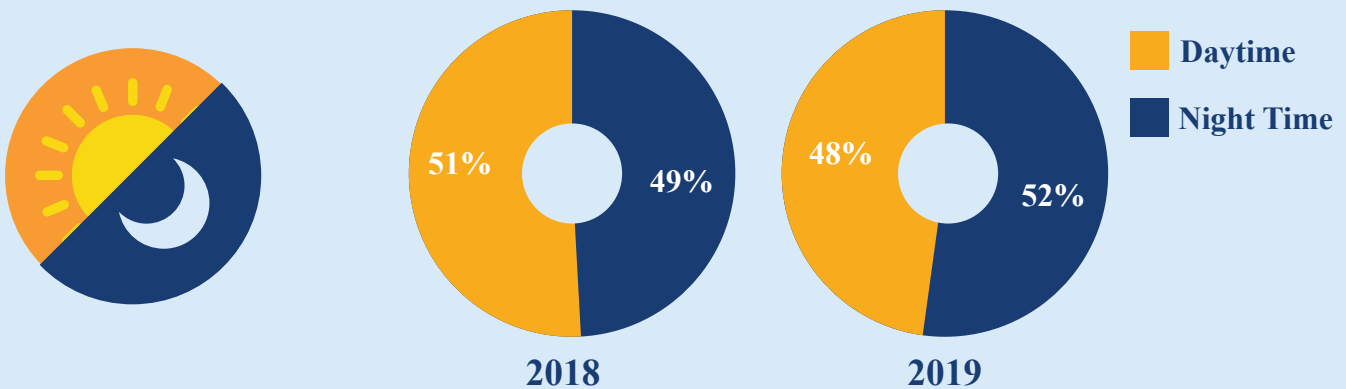


Figure 15: Distribution of daytime and night time crashes in the Vikhroli area in 2018 and 2019

Distribution of age group of crash victims at Vikhroli

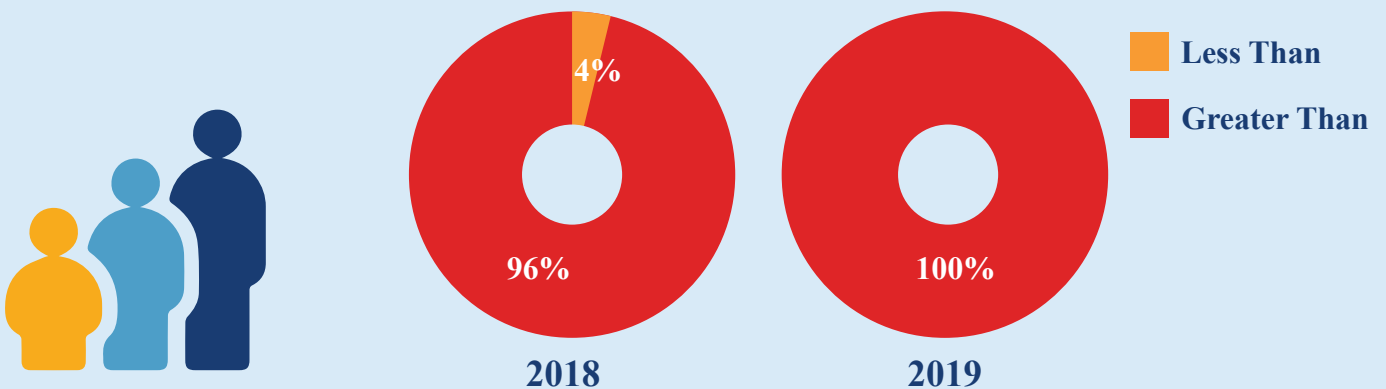


Figure 16: Distribution of age group of crash victims at the Vikhroli area in 2018 and 2019

Distribution of male & female crash victims at Vikhroli

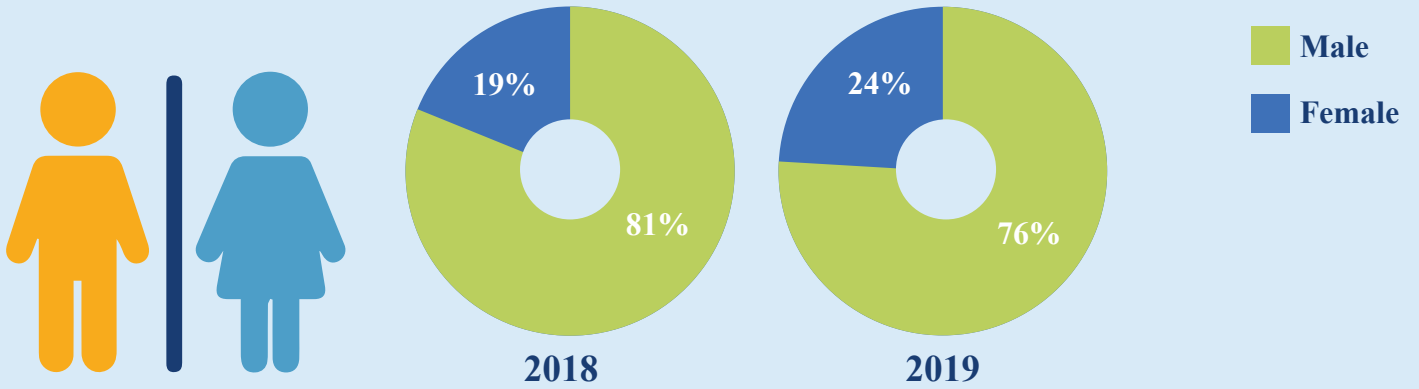


Figure 23: Distribution of male and female crash victims at the Vikhroli area in 2018 and 2019

Classification of vehicle types involved in the crashes at Vikhroli

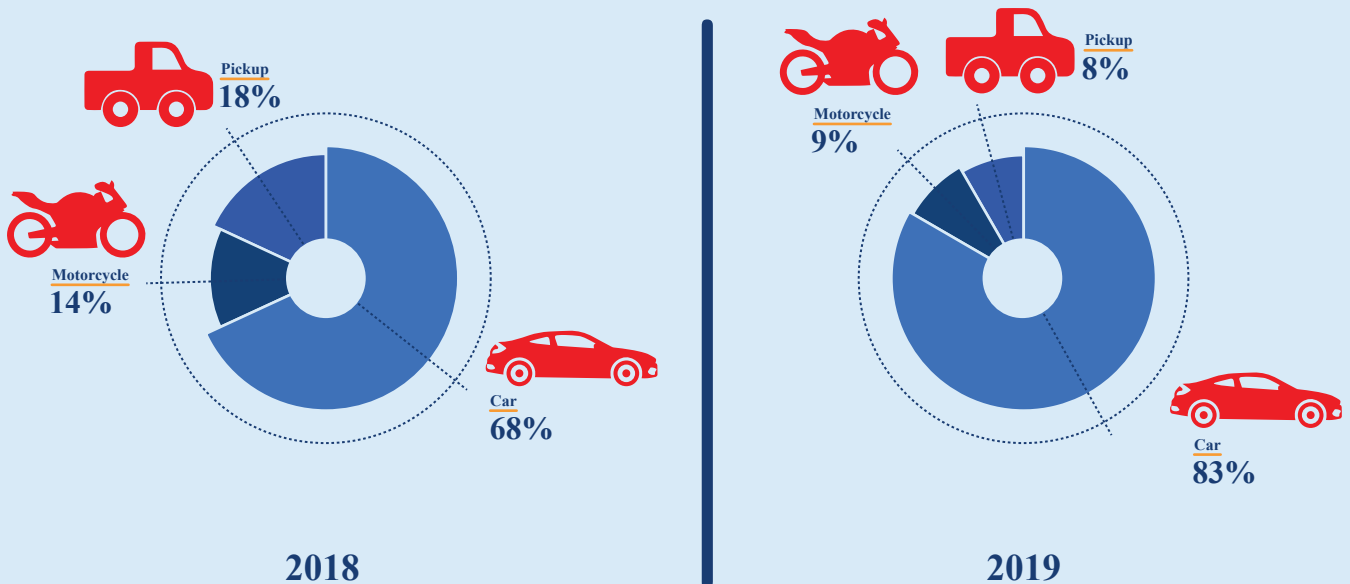


Figure 24: Distribution of vehicle types involved in crashes at the Vikhroli area in 2018 and 2019



RECOMMENDATIONS

The general recommendations have been broadly divided into 3 categories - Engineering interventions, Behavioral risk factors vis-à-vis interventions and Traffic management and enforcement interventions. These along with the recommendations which can be classified as short term and long term based on the time required and the easiness in carrying them out have been discussed in detail in this section. These recommendations for the issues observed are suitable for all the black spot locations and implementation of them as per the specifications shall help in reducing the pedestrian – vehicle conflict and ensure safety of the road users.

Traffic management & enforcement interventions

Traffic wardens: Presence of traffic wardens at busy intersections and in front of schools during peak hours can help to control and regulate the traffic and safeguard pedestrians, the most vulnerable road users as per the crash analysis.

The traffic rules and regulations should be properly enforced by penalizing the violator by the traffic police or other respective personnel to curb the negligent attitude of the road users. Systems using red light cameras or the "photo radar" can be used to capture the lawbreakers. Any vehicle crossing the sensors on red light triggers the camera and a photo is produced showing the car, license plate, together with the date and time of the violation.

CCTV surveillance: Installing surveillance cameras at the intersections, near the school, would be helpful in discouraging the road users from violating traffic rules. Grade separated facilities such as foot over bridges, subways and skywalks are often unsafe and inaccessible and inconvenient to many users. They are also unsafe about sexual assaults and general crime, and often double as urinals. Hence the facility, if provided shall be well-lighted, ventilated and equipped with Surveillance cameras to ensure safety.

CCTV surveillance can be used to check the culprits of rash driving and fines should be imposed. Studies have shown that presence of sign boards warning drivers of an upcoming camera- based enforcement section has been found to increase speed compliance, modifying the over-speeding nature. This can be implemented effectively at the black spots. The foot over bridge should be periodically maintained, kept free of anti-social activities and installed with CCTV cameras and adequate warning signs so as to encourage the pedestrians to use it cross the road rather than crossing at grade.

Undisciplined parking: Private cars and two wheelers occupy most of the street space, it's widely known that private vehicles are voracious consumers of space as they require a parking spot at each leg of a journey- at home, at the market, and at the office. Streets are crowded with parked vehicles that block traffic and turn sidewalks into obstacle courses for pedestrians.

Medians should be repainted: The retro- reflective paint on the medians and islands should be redone to improve the visibility during nighttime. Reflectors with retro- reflective paint should be provided on the islands and medians to notify the road users of their presence especially in the nighttime.

Signboards

Road Signs: The road signs give information about the road conditions ahead, provide instructions to be followed at the major crossroads or junctions warn or guide drivers and ensure the smooth flow of traffic.

Placement of Sign: The road signs are the means of communication to the road users, especially drivers. The location and legibility of the road sign should be such as to provide adequate response time to road users to read and act at the operating speed. Therefore, the signs shall be so placed that the drivers can recognize them easily and in time the following are the essential road signs which should be installed especially near intersections, near schools, etc., for safe and efficient traffic operation.

- **Speed limit Sign in Urban Area:** The speed limit sign in cities shall be placed on each of the roads where the speed changes or on the exit arms of the junctions.
- **Speed Breaker:** This sign should be used to warn the drivers of the presence of the speed breaker and speed tables.
- **Rumble Strip:** The sign should be posted 50-60 m in advance of the rumble strips provided on the road to control and reduce the speed.
- **Merging Traffic Ahead:** This sign is posted in situations where the traffic from other roads merging and the drivers are required to slow down their vehicles for safe travel.
- **Zebra (pedestrian) Crossing:** This sign should be erected in advance on both approaches to uncontrolled pedestrian crossings.
- **School Ahead:** This sign should be erected where school buildings or grounds are adjacent to the road, and wherein the opinion of the controlling authority, passing traffic can create a hazard to children.
- **Chevron Signs:** at the curved alignment of a roadway, the chevron signs shall be used to inform the drivers about sharpness of the curve. Depending upon the sharpness of the curve, Single Chevron, Double Chevron sign and Triple Chevron Signs can be installed.
- **Road Markings:** Road markings such as center line, edge line and traffic lanes should be provided to help in segregating the traffic as per the specifications of IRC 35-2015 with respect to design graphics, dimensions, font size, color and material. The faded or missing road markings should be maintained periodically to serve their purpose. Markings indicating parking, prohibition of parking, bus stops, and intermediate para transit stands such as taxi and auto rickshaw stands should be clearly applied.

Informatory sign boards:

All other mandatory signs, cautionary signs, and informatory signs ought to be installed in the right way to alert the drivers and encourage them to slow down as per the guidelines and specifications laid down.

Mandatory and regulatory signs such as overtaking prohibited, STOP signs, speed limit signs, etc., need to be complied with and any violation of the rules and regulations conveyed by these signs is a legal offense. Awareness of the significance of these signs motivates the driver to exercise caution while traversing through those locations.

Cautionary or warning signs such as Narrow Bridge, Gap in Median, School Ahead, etc., indicate a need for special caution by road users and may require a reduction in speed or some other maneuver. The aim of such signs is to capture the attention of the driver, who in turn will process the information and then drive appropri-

ately to prevent conflicts or crashes.

Informatory signs like direction information, fuel station, parking, etc., are used to give such information to road users which will help them along the route in the simplest and direct manner. This will help the driver to take an informed decision while heading for a destination, thus aiding them to drive responsibly.

Medians should be repainted with retro-reflective paint to improve the visibility at night at certain locations wherever poor visibility at night was observed.

Need to smoothen the uneven road surface approach to flyover and to be marked properly at ascending and descending spots of flyovers.

Pedestrian Facilities

According to the crash data analysis, pedestrians are the most vulnerable road users at the black spots. The existing facilities are not much effective in protecting the pedestrians and hence additional facilities should be provided for the same. Pedestrian crossing will be constructed as raised crosswalks, or painted zebra crossings. A half subway or foot-over bridges can be considered (Figure 108). This would help the pedestrian cross the road safely without having to interact with the vehicles on roads with heavy traffic.

The pedestrian crossings can be uncontrolled type where the pedestrian crosswalk is marked by studs or paints but not controlled by any system of signals. Controlled pedestrian crosswalks are those where the passage of pedestrians and vehicles conflicting with each other is regulated by traffic signals. Depending upon the conditions, the signals can be actuated either by means of pedestrian detectors or by pedestrian push buttons. Pedestrian crossings such as pelican crossing, puffin crossing, toucan crossing, etc., can be implemented to serve a similar purpose.

Width of the footpath: footpath with a minimum width of 1.8 m which can go up to 2.5 m should be provided wherever possible.

Ramps: Ramps allow for the smooth movement of differently abled users at the meeting point of footpaths and roads.

Bollards: As per standards, bollards should be painted in a contrasting color or in colored stripes with the distance between guiding posts around 1.20 m

Safety guards: Safety guards or railings should be installed around hazardous areas, stairs, ramps, accessible roofs, mezzanines, galleries, balconies, and raised platforms more than 0.40 m high.

Drainage Cover: Drainage Cover or gratings can be hazardous to wheelchair users, cane and crutch users, parents with prams, and women with high heels, if they are not properly installed

Guidelines: The path of travel should be easy to detect by a visually impaired pedestrians using a long white cane. Natural guidelines and guide strips using tactile tiles are used to help identify travel routes.

Recommended Interventions for Speed Management as per Speed Management Manual

Speed Limit

1. Speed limits should be assigned for different types and function of the road. Speed limit should limit to 80 km/h along with fully access controlled facilities. Two-way traffic roads should have 70 km/h speed limit. Speed should be reduced to 50 km/h based on the nature of terrain. Commercial area road should have speed limit of 30 km/h.
2. Road Infrastructure assessment is necessary to determine the safe speed limit.
3. Multi-stakeholder like Road development authority and Traffic Police should jointly decide safe speed limits.

Speed Limit Signage

1. IRC 67-2012 “Code of Practice for Road Signs” has detailed every aspect related to design, size, location and lateral placement of road signs. the signs should be designed and placed strictly as per IRC 67 guidelines by the road development authority in consultation with local traffic police.
2. Guidelines for speed limit signs are:
 - a. One speed limit sign posted every 5 km on road.
 - b. All major intersection should have speed limit sign at entry and exit point.
 - c. Roads with multiple speed limits should have speed limit sign at every interval.

Speed Management Measures

1. Speed Management Manual should be developed and implemented for effective enforcement jointly by Road development authorities and Traffic Police.
2. Special focus on speed restrictive areas like commercial areas as per the Manual.
3. Infrastructure development should focus on “self-explaining road” to keep the road users informed about the type of the road they are plying on.

Audit of Existing Measures and Accident Investigation

1. Timely audit of posted speed limit across state and making necessary recommendations to the District Road Safety Committee can maintain consistent speed limit.
2. An accident investigation should have representatives from Police, Road development authority and Vehicle department.
3. A standard protocol for all type of roads should be developed for random vehicle audits by Transport department

Speed Monitoring and Use of Technology

1. Behavioral Risk Factor assessment is necessary to understand the impact of implementation of safety measures on road crashes.
2. The enforcement agencies should standardize and centralize their vehicle and speed monitoring system



among each other for policy making, research and development.

3. Technology-driven speed management should be available across all states for speed analysis.
4. Speed governor should be installed on school vehicles and public buses to ensure that these vehicles do not exceed safe speeds under any circumstances.

Enforcement

1. Speed enforcement should have “anytime, anywhere” approach to deter speeding. Enforcement should work towards the following:
 - a. Increased visibility
 - b. Repeated campaigns
 - c. Strict, fair and consistent enforcement
 - d. Zero tolerance to speeding
 - e. Well publicized enforcement
 - f. Training and safety precautions
 - g. Proper selection of sites
2. Enforcement should adopt non-monetary method along with fines considering diversity of socio-economic status of citizens.

Training and capacity building

1. Periodically Police Trainings lead to oriented traffic management. Development of course materials should be customized to suit the responsibilities of the Police staff.
2. Drivers should receive training to ensure their safety on dangers high-speed roads.
3. Road development authorities also need periodical trainings to ensure safe infrastructure development for road safety.
4. All stakeholders involving in accident investigation needs capacity building to understand each aspect of investigation in case of road accident.

Education and Awareness

1. All road users should be periodically made aware of the safe driving and maintaining safe speeds on road via print and television media.
2. Safe speed and safe driving education campaigns should be organized by District Road Safety Committee.
3. Speed Management Manual are likely to be relevant to different stakeholders; however, every state holder should go through the entire manual to develop an overall understanding regarding how their role fits into the overall program.

Pilot implementation of Speed Management

A few pilot stretches across different road categories (e.g., NH, SH, MDR, ODR, etc.) should be selected for implementation of all recommendations as per the Speed Management Manual and the impacts should be evaluated regarding the effectiveness of the recommendations.

WAY FORWARD

The Speed Observation Study report is aimed at supporting the Mumbai Traffic Police in developing evidence based strategy for provisioning various speed management interventions at the blackspots as well as in developing an action for stricter enforcement of speed limits in the city. We at United Way Mumbai are confident that, the methodology and approach adopted during this study paves way for replicating the similar strategies to systematically analyzing all the other blackspots not only within Mumbai city, but also across the state of Maharashtra.

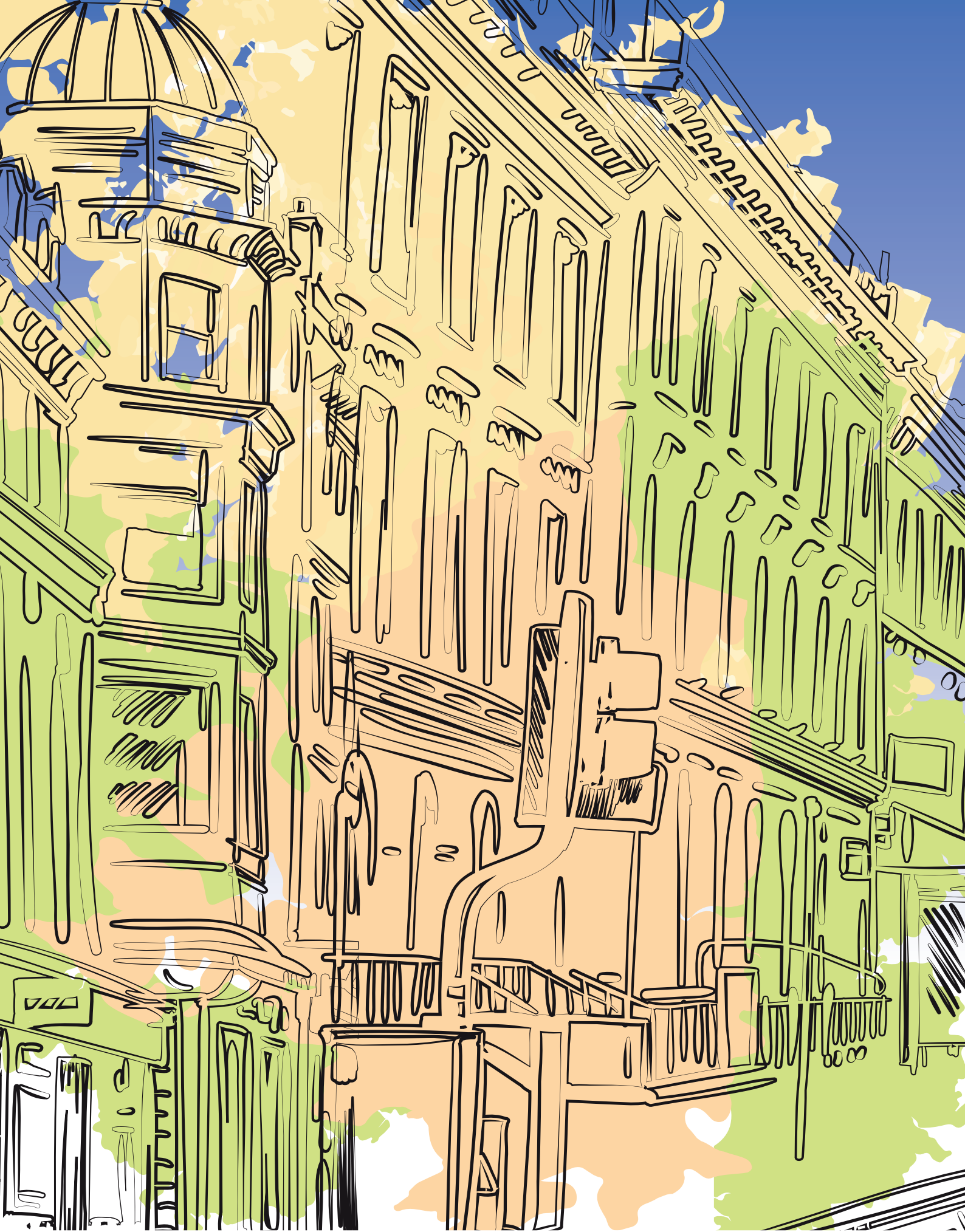
Besides the scientific study of the blackspots, United Way Mumbai has categorically worked towards mobilizing the community stakeholders in form of the Road Safety Advocacy Clubs right from the initial phase of the Slow Down project. These clubs comprise of various active citizens and representatives of community-based organisations in the neighbourhoods of the respective blackspots. This has ensured development of sense of ownership among the local community stakeholders towards the cause of road safety at large in their own neighbourhoods. The members of these clubs have been also introduced to the local officials of the respective traffic police divisions. United Way Mumbai has also shared with the club members the findings and recommendations of the Speed Observation Study with respect to the blackspots in their neighbourhood. Some of the members of these Road Safety Advocacy Clubs have been now independently pursuing and advocating with the local traffic officials and the municipal road department officials seeking implementation of the recommended measures for speed management.

United Way Mumbai is committed to continue mentoring the Road Safety Advocacy Clubs so as to help them in pursuing implementation of various recommended speed management measures at the respective blackspots. These members are also proving to be potential local resource for the Mumbai Traffic Police to drive the local Traffic Advisory Committees and ensure decentralized traffic management and road safety interventions across Mumbai.

Additionally, the office of Jt. Commissioner of Police, Traffic- Mumbai has also initiated a dialogue with the Road department of Municipal Corporation of Greater Mumbai seeking to implement the recommended measures of this report along with various other measures as recommended by the Mumbai Traffic Police. United Way Mumbai is committed to providing all the necessary support to the Mumbai Traffic Police and the BMC in this endeavor.

The initiatives such as the Slow Down project, have great potential in creating far reaching impact by way of influencing the development of speed management policy at the state level. United Way Mumbai is committed to provide inputs to the Motor Vehicle Department, Govt. of Maharashtra based on its learning during implementation of the project Slow Down.





**SLOW
DOWN**



A United Way Mumbai initiative