



सत्यमेव जयते

Government of Rajasthan

# Rajasthan Status Report on Road Safety 2021

State Directorate of Revenue Intelligence  
D-Block, Vitt Bhawan  
Janpath Jaipur

**Accident: 3560**  
**Fatality: 1945**  
**Injury: 3385**

**SH**  
Ranthambore  
0 Kms

**Accident: 6424**  
**Fatality: 3829**  
**Injury: 6065**

**NH**  
Rajasthan  
0 Kms

15513 Kms

213982 Kms

10314 Kms

**Accident: 10967**  
**Fatality: 4269**  
**Injury: 9894**

**RURAL**  
District: Kumbhalgarh  
Pushkar  
0 Kms



आनन्द स्वरूप

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I.R.S.



सत्यमेव जयते

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## Foreword

The Road Transport comprises 87% of passenger traffic and 60% of freight traffic movement in the country. Road network is deeply penetrated throughout the country. In this context road safety is major concern of the governments. Today road traffic injuries are one of the major causes of deaths and disabilities with severe socioeconomic costs. With rising motorization and expanding road network, travel risks and traffic exposure grow at a much faster rate, as the growth of registered vehicles always outnumbers population growth and new roads constructed. The issue of road safety becomes even more important for Rajasthan, having one of the largest road networks in India. SDRI made attempt to prepare a report titled 'Rajasthan Status Report on Road Safety 2021'. As per the report, there were 20,951 incidences of road accidents during 2021 in which 10,043 people lost their lives and 19,344 persons were injured. At least 6.5 out of 100 people killed on roads across the India are from Rajasthan, according to Ministry of Road Transport & Highways (MoRTH). The road accidents severely affect victims and their family and the various aspects of the economy. Most affected age group in Road accidents is 18-45 years. Every year, approximately 10,043 people lost their lives on roads in Rajasthan, which is approximately 57 accidents and 27 deaths every day. The report concerns to all types of roads users such as pedestrians, motorcyclists, motorist as well as unauthorized roadside vendors and other encroachers. However, Rajasthan is committed to bring down fatalities caused by road accidents. The report analyses information on various aspects of road accidents in the Rajasthan during the year 2021. The relevant information for the purpose of this report has been collected from various sources which include various publications of Ministry of Road Transport & Highways- Government of India, Transport & Road Safety Department, Police Department, Public Works Department of Government of Rajasthan. The report on 'Road Accident in Rajasthan-2021' provides data/ information on various facets of road accidents in the country during the year 2021. This report comprises of eight chapters, taken together which covers almost all the aspects of road accident in Rajasthan namely, profile & trends of road accidents, Accidents by Road categories, causes of road accidents, Road Accident Fatalities, information relating to road accidents, fatalities & causes, performance of Million Plus Cities as well as various initiatives taken by the stake holders including the Government of Rajasthan.

Road traffic accidents are amenable to remedial actions and the Government has been implementing a multi-pronged road safety strategy based on 4-Es, namely Education, Engineering (both of roads and vehicles), Enforcement and Emergency Care.

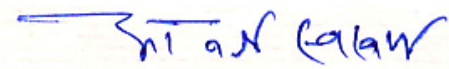
The chapter 1 provides a basic understanding and overview of road accidents in Rajasthan. The chapter 2 provides share and comparative analysis of National Highways, State Highways and Other Roads in total accidents, persons killed and injured in Rajasthan. The chapter 3 provides causes of Road accidents in Rajasthan, report thrust various factors played major role in accidents are human error, road condition/environment and vehicular condition. The chapter 4 describes the number of total accidents, fatal accidents and number of persons killed in road accidents over the period 2009 to 2021 in Rajasthan. The chapter 5 examines the performance of Million Plus Cities of Rajasthan (Jaipur, Jodhpur and Kota) in respect of road accidents. The chapter 6 elaborates on spatial and inter-temporal distribution of road accidents in the Rajasthan. Chapter 7 elaborates the road accidents mitigation major taken by Ministry of Road Transport and Highways (MoRTH), Transport and Road Safety Department and Police Department of the Government of Rajasthan. Chapter 8 carries the various suggestions for improving road safety in the State so that the road accidents, fatalities and injuries may be reduced.

I wish to record my appreciation for the support and cooperation provided by all my colleagues in SDRI who have worked tirelessly in improving and completing this document especially Sh. Hans Kumar Sharma, Sh. Abhishek Kumar and Sh. Nitish Siwach. I am especially thankful for valuable input, suggestions and analytical research provided by Smt. Suman Chandolia assistant professor, Department of Economics, University of Rajasthan.

The report provides understanding and analysis of the road accidents, persons killed and injured on various categories of roads in Rajasthan. Analysis and trends of road accidents will be useful for road safety, awareness, policy making and further initiatives.

Date: 15 May 2023

Place: Jaipur



Anand Swaroop

## Definitions

<i><b>Term</b></i>	<b>Definition</b>
<i>Accident Severity</i>	Number of persons killed per accident
<i>CAGR</i>	Compound Annual Growth Rate- is the mean annual growth rate of a figure over a specified period of time longer than one year.
<i>Fatal Accident</i>	A fatal accident is one in which one or more persons are killed a result of the accident, provided death occurs within 30 days.
<i>Grievous Injury Accident</i>	Includes both Serious injury and Major injury accidents.
<i>Head on collision</i>	Where the front ends of two vehicles hit each other in opposite directions.
<i>Major Injury Accident</i>	A major injury accident is defined as either for which a person is detained in hospital as an “in patient”, or if any one of the following injuries are sustained whether or not he or she is detained in the hospital: - fractures, concussions, internal injuries, crushing, severe cuts and lacerations or severe general shock requiring medical treatment but does not require ICU admission.
<i>Minor Injury Accident</i>	Minor accident is one in which there are no deaths or serious injuries, but a person is slightly injured. This will be an injury of minor nature such as a cut, sprain or bruise, where only first aid is required and does not require hospitalisation.
<i>MoRTH</i>	Ministry of Road Transport & Highways
<i>NH</i>	National Highways
<i>No Injury Accident (Damage only Accident)</i>	One in which no one is injured but damage to vehicle and/or property sustains.
<i>Pedestrian</i>	Any person other than a driver or passenger. Persons in or operating pedestrian conveyance such as perambulator, invalid chair without engine, pushcart etc or pulling a cycle are Pedestrians. Persons attending to a vehicle (e.g for change or tyre, repairing engine etc) moving on roller skates, etc are also pedestrians.
<i>PWD</i>	Public Works Department

<i>R<sup>2</sup></i>	R-squared (R <sup>2</sup> ) also known as coefficient of determination is a statistical measure that represents the proportion of the variance for a dependent variable that's explained by an independent variable or variables in a regression model.
<i>Road Accident Density</i>	Number of accidents per 100 Km of Road
<i>Road Accident Fatality Density</i>	Number of persons killed per 100 Km of Road
<i>Road Accident Fatality rate</i>	Number of Persons killed Per Ten Thousand Vehicles
<i>Road Accident Fatality Risk</i>	Number of Persons Killed per Lakh Population
<i>Road Accident Rate</i>	Number of Accidents Per Ten Thousand Vehicles
<i>Road Accident Risk</i>	Number of Accidents per Lakh Population
<i>Run off road</i>	This is a type of road traffic collision in which only one vehicle is involved. Contributing factors include such as loss of control or misjudging a curve or attempting to colliding with another road user or an animal. avoid
<i>Serious Injury Accident</i>	A serious injury accident is defined as either for which a person is detained in hospital as an “in patient” or if any one of the following injuries are sustained whether or not he or she is detained in the hospital: - fractures, concussions, internal injuries, crushing, severe cuts and lacerations or severe general shock requiring medical treatment and victim require ICU admission.
<i>SH</i>	State Highways
<i>Vehicle Density</i>	Number of Vehicles per Km of Road

## **Table of Contents**

<b>ROAD ACCIDENTS – PROFILE AND TRENDS .....</b>	<b>1</b>
<b>ROAD ACCIDENTS - AN OVERVIEW .....</b>	<b>2</b>
<b>PROFILE OF ROAD ACCIDENTS .....</b>	<b>5</b>
<b>TYPE OF ROAD ACCIDENTS .....</b>	<b>7</b>
<b>NATURE OF ROAD ACCIDENTS .....</b>	<b>9</b>
<b>LONG TERM TRENDS .....</b>	<b>12</b>
<b>ACCIDENT SEVERITY .....</b>	<b>15</b>
<b>NORMALIZED INDICATORS OF ROAD ACCIDENTS- LONG RUN TRENDS .....</b>	<b>16</b>
<b>ROAD NETWORK .....</b>	<b>20</b>
<b>REGISTERED MOTOR VEHICLES .....</b>	<b>21</b>
<b>ACCIDENTS BY ROAD CATEGORY .....</b>	<b>24</b>
<b>FATAL ACCIDENTS BY CATEGORY OF ROADS .....</b>	<b>26</b>
<b>LONG-RUN TREND .....</b>	<b>28</b>
<b>PROFILE FOR ROAD ACCIDENTS – NATIONAL HIGHWAYS .....</b>	<b>32</b>
<b>ROAD ACCIDENT FATALITIES ON NATIONAL HIGHWAYS .....</b>	<b>35</b>
<b>PROFILE OF ROAD ACCIDENTS – STATE HIGHWAYS .....</b>	<b>37</b>
<b>PROFILE OF ROAD ACCIDENTS – OTHER ROADS .....</b>	<b>39</b>
<b>CAUSES OF ROAD ACCIDENTS .....</b>	<b>41</b>
<b>HUMAN ERROR OR DRIVER’S FAULT .....</b>	<b>41</b>
<b>TRAFFIC RULES VIOLATIONS .....</b>	<b>41</b>
<b>DRIVING WITHOUT VALID DRIVER LICENSE .....</b>	<b>44</b>
<b>NON-USE OF SAFETY DEVICES - HELMETS AND SEATBELTS .....</b>	<b>45</b>
<b>ACCIDENTS BY ROAD ENVIRONMENT .....</b>	<b>46</b>
<b>ROAD ACCIDENTS CLASSIFIED BY ROAD FEATURES .....</b>	<b>48</b>
<b>ACCIDENTS BY ROAD JUNCTION TYPE &amp; TRAFFIC CONTROL .....</b>	<b>50</b>
<b>ROAD ACCIDENTS BY WEATHER CONDITION .....</b>	<b>52</b>
<b>ACCIDENTS CLASSIFIED BY VEHICLE CONDITION .....</b>	<b>53</b>
<b>OVERLOADING .....</b>	<b>55</b>
<b>ROAD ACCIDENTS FATALITY .....</b>	<b>57</b>
<b>LONG RUN TREND IN ROAD ACCIDENT FATALITIES .....</b>	<b>57</b>
<b>FATAL ROAD ACCIDENTS BY CATEGORY OF ROADS .....</b>	<b>59</b>
<b>FATALITY RATE .....</b>	<b>60</b>



<b>AGE PROFILE OF ROAD ACCIDENT VICTIMS .....</b>	<b>61</b>
<b>GENDER AND AGE PROFILE OF FATAL ROAD ACCIDENTS VICTIMS.....</b>	<b>63</b>
<b>GENDER WISE AGE PROFILE OF DRIVERS KILLED .....</b>	<b>65</b>
<b>GENDER WISE AGE PROFILE OF PASSENGERS KILLED.....</b>	<b>65</b>
<b>GENDER WISE AGE PROFILE OF PEDESTRIANS KILLED.....</b>	<b>66</b>
<b>PERSONS KILLED IN ROAD ACCIDENTS IN TERMS OF ROAD USER CATEGORIES .....</b>	<b>67</b>
<b>ROAD ACCIDENTS IN MILLION-PLUS CITIES.....</b>	<b>71</b>
<b>TOP 10 MILLION PLUS CITIES IN ROAD ACCIDENTS DURING 2021.....</b>	<b>72</b>
<b>TOP 10 MILLION-PLUS CITIES IN TERMS OF NUMBER OF FATALITIES IN 2021 .....</b>	<b>73</b>
<b>MILLION-PLUS CITIES OF RAJASTHAN ROAD ACCIDENTS AND PERCENTAGE CHANGE.....</b>	<b>75</b>
<b>CAUSES OF ACCIDENTS IN MILLION PLUS CITIES .....</b>	<b>77</b>
<b>SPATIAL AND INTER-TEMPORAL DISTRIBUTION OF ROAD ACCIDENTS .....</b>	<b>86</b>
<b>ROAD ACCIDENTS IN URBAN AND RURAL AREAS .....</b>	<b>86</b>
<b>MONTH-WISE DISTRIBUTION OF ROAD ACCIDENTS.....</b>	<b>87</b>
<b>TIME INTERVAL-WISE DISTRIBUTION OF ROAD ACCIDENTS .....</b>	<b>88</b>
<b>ROAD ACCIDENT MITIGATION MEASURES TAKEN BY STAKEHOLDER DEPARTMENTS .....</b>	<b>90</b>
<b>INITIATIVES TAKEN BY MINISTRY OF ROAD TRANSPORT AND HIGHWAYS (MORTH). ERROR!     BOOKMARK NOT DEFINED.</b>	
<b>INITIATIVES TAKEN BY TRANSPORT &amp; ROAD SAFETY DEPARTMENT OF GOVERNMENT OF     RAJASTHAN .....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</b>
<b>INITIATIVES TAKEN BY POLICE DEPARTMENT OF GOVERNMENT OF RAJASTHAN .....</b>	<b>102</b>
<b>PREVENTIVE MEASURES .....</b>	<b>104</b>
<b>INTENSIVE PUBLICITY AND AWARENESS DRIVE THROUGH ELECTRONIC, DIGITAL AND PRINT     MEDIA.....</b>	<b>105</b>
<b>STRENGTHENING OF ENFORCEMENT ACTIVITIES BY EXTENSIVE USE OF ELECTRONIC     MONITORING.....</b>	<b>109</b>
<b>IMPROVEMENT OF ROAD CONDITIONS BY ADHERING TO THE STANDARDS SPECIFIED FOR ROAD     ENGINEERING BY INDIAN ROAD CONGRESS .....</b>	<b>112</b>
<b>STRENGTHENING EMERGENCY RESPONSE AND MEDICAL CARE SYSTEMS.....</b>	<b>113</b>

## **EXECUTIVE SUMMARY**

1. The present volume of 'Report on Road safety in Rajasthan — 2021' provides information on various facets of road accidents in the State during the calendar year 2021. It has eight chapters and covers information relating to road accidents in the context of road length and vehicular population. Data/information provided in this report is sourced from Ministry of Road Transport & Highways (MoRTH), Transport & Road Safety Department, Police Department, and Public Works Department of Government of Rajasthan.
2. A total number of 20,951 road accidents have been reported in the State claiming 10,043 lives and causing injuries to 19,344 persons in the year 2021.
3. The percentage share of Rajasthan in road accidents, fatalities, and injuries as compared with All-India data is 5.08 percent, 6.52 percent and 5.03 percent respectively. Rajasthan ranks 9th in road accidents, 5th in fatalities and 9th in persons injured in the country in year 2021.
4. The road accident severity in general has been increasing over the years in Rajasthan, it was 36 in year 2009 which has gone up to 47.9 in the year 2021. There is a huge gap in road accident severity at the national level as compared with Rajasthan, the accident severity at national level was 25.8 in the year 2009 and was 37.3 in year 2021.
5. Out of the 20,951 accidents recorded in the State, 6,424(30.66%) took place on the National Highways (NH) passing through the State including Expressways, 3,560 (16.99%) on State Highways (SH) and the remaining 10,967 (52.35%) accidents on Other Roads in the year 2021.
6. Out of the 9,055 fatal accidents, 3,270 (36.11%) were reported on National Highways, 1,687 (18.63%) on State Highways and 4,098 (45.26%) on Other Roads in the year 2021. Hence, more than 50% of the road accidents and more than 45% percent of fatal accidents took place on Other Roads in the State.
7. The share of National Highways (4.30%) and the State Highways (6.47%) in the road network of State account for 10.77 percent and that of Other Roads account for 89.13 percent of road network in the State. However, the number of accidents (6,424), fatalities (3,829), and injuries (6,065) on National Highways are on the very higher side as compared with accidents (3,560), fatalities (1,945) and injuries (3,385) on State Highways in the State in the year 2021.



8. Rajasthan ranked 9th in terms of road accidents on National highways and it ranked 4th in terms of fatalities on National Highways in the country in year 2021. Tamil Nadu recorded the highest number of road accidents on National Highways, whereas the number of persons killed in road accident was the highest in Uttar Pradesh in the year 2021.
9. Road accidents are multi-causal and are often the result of interplay of various factors like (i) human error, (ii) road environment, and (iii) vehicular condition. Over speeding falling under the category of human error was found to be a major killer in the State, accounting for 82.01 percent of the persons killed followed by driving on the wrong side constituting 4.93% of the persons killed in the year 2021.
10. In respect of residential area, institutional area, market/commercial area and open area 61.65 percent of accidents, 68.62 percent of deaths, and 62.04 percent of injuries occurred in Open area category in the State in the year 2021, i.e., in the locations which normally do not have any human activities in the vicinity.
11. 76.44 per cent of accidents took place on straight roads, whereas accidents on curved roads, pothole roads, and steep grade together accounted for only 6.74 per cent of the total road accidents in 2021 in the State.
12. In the year 2021, 13.61 percent of road accidents, 12.98 percent of fatalities and 12.25 percent of injuries took place on uncontrolled junctions in the State where there were no traffic lights, police-controlled junctions and flashing signal/blinkers.
13. 85.39 percent of accidents, 86.26 percent of fatalities, and 85.92 percent of injuries in the State took place under sunny/clear weather conditions in the year 2021.
14. Maximum number of road accidents were caused by vehicles which were less than 5 years old (8,437) and the maximum number of fatalities in the State involved vehicles, which were in the age of 5-10 years (2,595) in the year 2021.
15. Young adults falling in the age group of 18 - 45 years accounted for 80.9 percent of fatalities whereas 93.3 percent people falling in the working age group of 18 – 60 years were killed in road accidents in the year 2021 in the State.
16. In respect of gender-wise age profile the fatalities in the age group of 18-45 years accounted for 89.68 percent of males and 10.32 percent of females. So far as the people in age group of 18-60 years is concerned this share was 89.25 percent of males and 10.75 percent of females in the year 2021 in the state.

17. In terms of road-user category, the share of two-wheelers in total fatality has been the highest (40.9%) during 2021 followed by the cars, jeeps and taxis road-users with 20.8 per cent of persons killed in road accidents.
18. Jaipur, Jodhpur, and Kota are the 3 million plus cities in Rajasthan which accounted for 14.92 per cent of the total number of accidents and 9.33 per cent of total accidents fatalities in the State in the year 2021. Jaipur ranked 10th in number of road accidents in the country and 4th in road accident fatalities in the country in the year 2021.
19. Under road feature category in million plus cities of Rajasthan, 84 per cent of accidents took place on straight roads, whereas accidents on curved roads, pothole roads, culvert, bridges, steep grade, and ongoing road works/ under construction together accounted for only 10.26 per cent of the total road accidents in the year 2021.
20. In million plus cities of Rajasthan 17.05 percent of road accidents, 15.9 percent of fatalities and 17.4 percent of injuries took place on uncontrolled junctions where there were no traffic lights, police-controlled junctions and flashing signal/blinkers.
21. 94.05 percent of accidents, 92.42 percent of fatalities, and 94.84 percent of injuries took place under sunny/clear weather conditions in the 3 million plus cities of the state in the year 2021.
22. Road accidents and accidents related killings are more in rural areas of the State as compared with the urban areas. 68.66 per cent of road accidents took place in rural areas while 31.34 percent of road accidents took place in urban areas in the year 2021. Similarly, in the same year 75.56 percent of road accident deaths took place in rural areas while 24.44 percent of road accident deaths took place in urban areas.
23. The initiatives taken by the Ministry of Road Transport & Highways, Transport & Road Safety Department of Government of Rajasthan and Department of Police, Government of Rajasthan has resulted in creation of institutional infrastructure for improving road safety based on Education, Engineering (both of roads and vehicles), Enforcement and Emergency Care in the State.
24. Suggestions to prevent road accidents, fatalities, and injuries and development of a system to provide immediate help to the victims of road accidents has also been incorporated in the report.

## **CHAPTER-1**

# **ROAD ACCIDENTS – PROFILE AND TRENDS**

- 1.1 Regulation and control of mechanically propelled vehicles falls in the concurrent list III of the eighth schedule of the constitution. The Motor Vehicles Act, 1988 has been enacted in exercise of the provision made at entry number 35 of list III of the Constitution of India. Prior to the enactment of this Act the Motor Vehicles Act, 1939 was in existence, which was repealed in year 1988 and thereafter the present Motor Vehicles Act, 1988 came into existence.
- 1.2 Motor Vehicles Act, 1988 has been amended from time to time in the year 1994, 2000, 2001, 2015 and in the year 2019 to adapt to the technological up gradation emerging in the road transport, passenger and freight movement and for addressing the issues relating to road safety, citizen facilitation, strengthening public transport, automation and computerization. With rapidly increasing growth in the Motor Vehicles, the country is facing an increasing burden of road accident injuries and fatalities. Therefore in order to improve road safety and transport system, large number of amendments were made in the Motor Vehicles Act, 1988 in the year 2019 to address safety and efficiency in the transport sector.
- 1.3 Road transport is the most important mode of transportation in the country both for freight and passengers. The road accidents caused by them are responsible for the loss of life as well as material also. Persons using road are expected to exercise proper care by using roads either as a pedestrian or as a driver or as a passenger. Exposure to adverse traffic environment is high in India because of the unprecedented rate of motorization and growing urbanization fuelled by high rate of economic growth. As a result, incidents of road accidents, traffic injuries and fatalities have remained unacceptably high. We need to prevent road accidents to decrease the death rate.
- 1.4 Every year lakhs of people lose their lives due to road accidents. Road traffic injuries are the leading cause of death globally and the principal cause of death in the age group of 15 to 49 years. During the calendar year 2021, a total of 4,12,432 accidents were recorded in the country in which 1,53,972 persons were killed and 3,84,448 persons were injured. On the other hand, road crashes in Rajasthan claimed 10,043

lives and caused injuries to 19,344 people during this year. Multiple factors are responsible for road accidents. Hence, multi-prong measures are required to reduce the number of accidents and fatalities. Hence, Ministry of Road Transport and Highways (MoRTH), Government of India and the Department of Transport and Road Safety, Government of Rajasthan have initiated a proactive policy approach towards road safety by initiating active participation of various stakeholders.

- 1.5 Road accidents cause economic loss, loss of life, loss of employment and permanent disability to lots of people and in a World Bank's report it was estimated that in India the accidents cost Rs. 5.96 lakhs crore or 3.14% of Gross Domestic Products (GDP). India accounts for 11% of global deaths in road accidents despite having 1% of the world's vehicles. Road traffic injuries are the 8<sup>th</sup> leading cause of deaths in the world.
- 1.6 State Directorate of Revenue Intelligence (SDRI), Government of Rajasthan decided to carry out an analysis of Road accidents, fatalities and injuries caused to people with reference to the national level trends on road accident parameters vis-à-vis State of Rajasthan. The relevant data has been obtained from various sources including publications and information available on portals/websites of Ministry of Road Transport & Highways (MoRTH) along with the relevant State departments of Government of Rajasthan which include Police Department, Public Works Department and Transport & Road Safety Department. In the light of the above data and information, an analysis has been done to identify the trends and factors responsible for road accidents, fatalities & injuries in Rajasthan. The analysis is primarily based on the parameters and Key Performance Indicator (KPIs) as formulated by MoRTH in its Annual Report "Road Accidents in India- 2021".

## **ROAD ACCIDENTS - AN OVERVIEW**

- 1.7 As per Ministry of Road Transport and Highways, a total number of 4,12,432 road accidents have been reported by Police Departments of States and Union Territories (UTs) in the country during the calendar year 2021, claiming 1,53,972 lives and causing injuries to 3,84,448 persons. Similarly, a total number of 20,951 road accidents have been reported in the State of Rajasthan during the calendar year 2021, claiming 10,043 lives and causing injuries to 19,344 persons. In the year 2020, a total of 19,114 road accidents claimed 9,250 lives and caused injuries to 16,769

persons. The number of road accidents in the State in the year 2021 increased by 9.61 percent on an average compared to previous year 2020. Similarly, the number of deaths and injuries on account of road accidents increased by 8.57 percent and 15.36 percent respectively (refer to Table 1.1). These figures translate, on an average, into 58 accidents and 28 deaths every day or 3 accidents and 1 death every hour in the State.

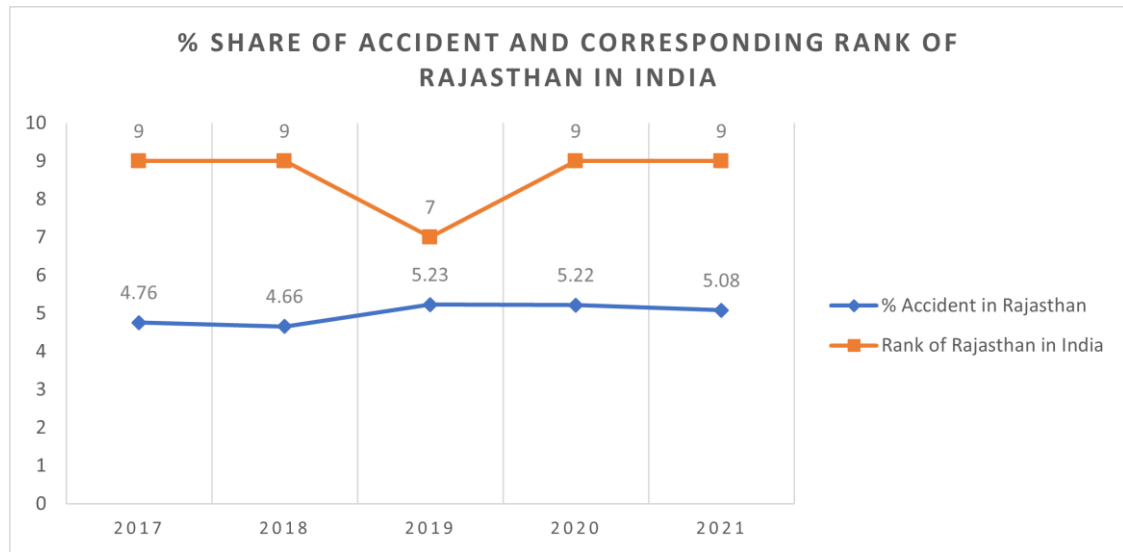
**Table 1.1: Table for Total Accidents, Fatalities, and Injuries in Rajasthan State from 2016 to 2021**

Years	Accidents	% Change over previous periods	Fatalities	% Change over previous periods	Persons Injured	% Change over previous periods
2016	23,066	-	10,465	-	24,103	-
2017	22,112	-4.14	10,444	-0.2	22,071	-8.43
2018	21,743	-1.67	10,320	-1.19	21,547	-2.37
2019	23,480	7.99	10,563	2.35	22,979	6.65
2020	19,114	-18.59	9,250	-12.43	16,769	-27.02
2021	20,951	9.61	10,043	8.57	19,344	15.36
		<b>% Share of Rajasthan</b>		<b>% Share of Rajasthan</b>		<b>% Share of Rajasthan</b>
<b>All India (2021)</b>	<b>412432</b>	5.08	<b>153972</b>	6.52	<b>384448</b>	5.03
<b>Rank of Rajasthan</b>	<b>9</b>	-	<b>5</b>	-	<b>9</b>	

So far as the Rank of Rajasthan in India in terms of total accidents, fatalities and injuries is concerned, it ranks 9<sup>th</sup>, 5<sup>th</sup> and 9<sup>th</sup> respectively.

- 1.8 During the previous year 2020, at the State and the national level, an unprecedented decrease in accident and fatalities was reported (**Table 1.1**). This was primarily due to the unusual outbreak of Covid-19 pandemic and resultant stringent nation-wide lockdown particularly during March-April, 2020 followed by gradual unlocking and phasing out of the containment measures. Road accident on an average decreased by 10.77 percent, fatalities decreased by 4.92 percent, and injuries decreased by 15.82 percent in 2021 compared to 2019. Trend in total number of road accidents in Rajasthan as compared to total accidents in India, fatalities, and injuries during 2017 to 2021 is presented in the Chart 1.1.

**Chart 1.1: % Share of Road Accidents and corresponding rank of Rajasthan in India**



From the above chart, it is evident that except for year 2019 in which Rajasthan ranked 7<sup>th</sup>, it has ranked 9<sup>th</sup> in the remaining years in terms of total road accidents in the country. It is also evident that the percentage share of the accidents has gone up from 4.76% in the year 2017 to 5.08% in the year 2021. There is significant increase by 0.57% in percentage share in the year 2019 which resulted in worsening the State rank from 9<sup>th</sup> to 7<sup>th</sup> among the top 10 States/UTs in India.

- 1.9 Amongst the States, Tamil Nadu with 55,682 road accidents (13.5%) recorded the highest number of road accidents in 2021 followed by Madhya Pradesh (48,877 i.e., 11.9%), Uttar Pradesh (37,729 i.e., 9.1%), Karnataka (34,657 i.e., 8.4%), Maharashtra (29,477 i.e., 7.1%), Andhra Pradesh (21,556 i.e., 5.2%) and Telangana (21,315 i.e., 5.2%). Rajasthan ranked 9<sup>th</sup> having 20,951 road accidents accounting to 5.1% of total accidents in India.
- 1.10 Proactive approach towards road safety by Ministry of Road Transport & Highways and all stakeholders including the State of Rajasthan has in general contributed in reducing road causality over the years. Besides this, the implementation of the Motor Vehicle Amendment Act 2019, which became effective from 1<sup>st</sup> September, 2019 which included, inter-alia, provisions like stiff hike in penalties for traffic violations, electronic monitoring of the same, enhanced penalties for juvenile driving etc. These amendments were intended to create a deterrent effect on traffic violators and thereby resulting in improvement in Road Safety.



- 1.11 An accident, which results in death of one or more person, is a fatal accident. Total number of fatal road accidents in Rajasthan increased from 8,363 in 2020 to 9,055 in 2021, registering an increase of 8.27 percent corresponding to same period last year (**Table 1.4**). Fatal accidents constitute 43.22 percent of total accidents during 2021.

## PROFILE OF ROAD ACCIDENTS

- 1.12 During 2021, a total of 20,951 accidents were reported in the State of Rajasthan, of which, 9,055 (43.22 %) were fatal accidents in which 10043 persons were killed and 19344 persons were injured (**Table 1.2**). Total number of Road accidents in 2021 compared to the previous year 2020, increased on an average by 9.61 percent, the number of persons killed increased by 8.57 percent and the number of persons injured increased by 15.35 percent (**Table 1.2**). Since 2020 was an exceptional year, hence when a comparison is made with parameter of year 2021 with 2019 the number of accidents, fatalities and injuries has gone down by 10.77%, 4.92% and 15.81% which seems to be a positive sign in improvement of road safety.

**Table 1.2: Major Parameters of Road Accidents in Rajasthan - 2021 vis-à-vis 2020**

Parameter	2019	2020	2021	% Change
<b>Number of Accidents</b>	23480	19,114	20,951	9.61%
<b>Number of Persons killed</b>	10563	9,250	10,043	8.57%
<b>Number of Injury</b>	22979	16769	19344	15.35%
<b>Accident Severity (Persons killed per 100 accidents)</b>	44.98	48.39	47.93	-

The accident severity has gone down from 48.39 in year 2020 to 47.93 in year 2021 but still it is considerably higher than corresponding national severity which was 36 in year 2020 and 37.3 in year 2021.

- 1.13 In the year 2021, Road Category wise distribution of accidents and fatalities reveals that the National Highways with 4.30% share and State Highways with 6.47% share in total network in State together account for 47.65% of total accidents and 57.49% of fatalities in the State. So far as the rest of roads (Other Roads) are concerned,

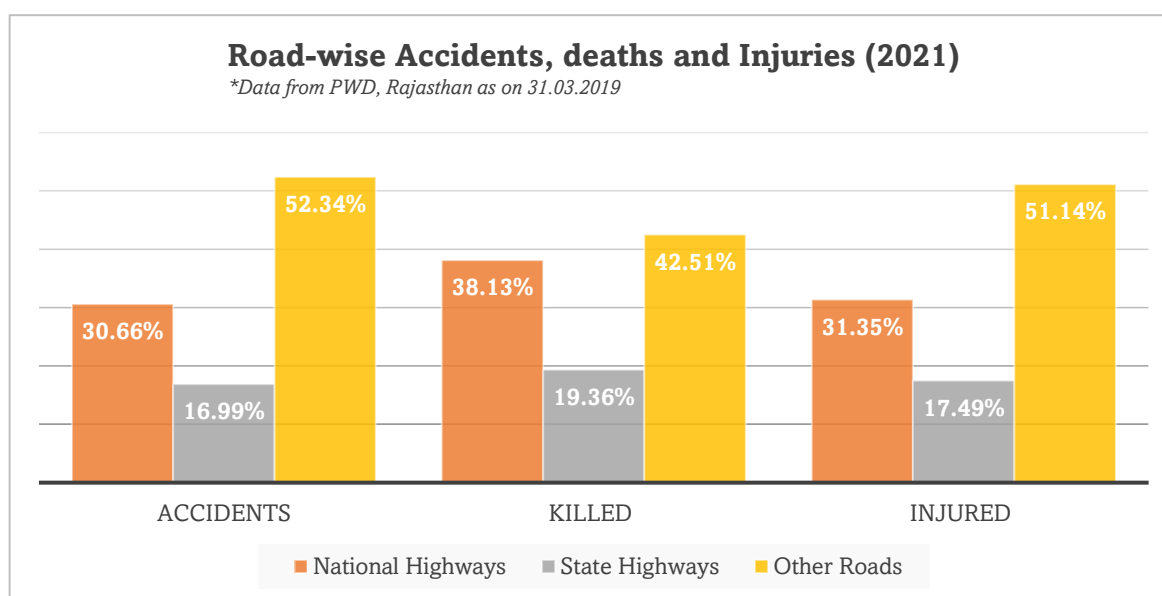
these account for 89.23% of road share and 52.34% of accidents and 42.15% of fatalities. During 2021, 30.66% of total accidents and 38.13% of total fatalities took place on National Highways (**Table 1.3** and **Chart 1.2**).

**Table 1.3: Total number of Accidents, Persons Killed and Injured by categories of Roads during 2021 in Rajasthan**

Category of Road	Accidents	Killed	Injured	Road Length in Kms as on 31.03.2019 (From PWD, Rajasthan) *
National Highways	6,424	3,829	6,065	10314.14
% Share in Total	30.66%	38.13%	31.35%	4.30%
State Highways	3,560	1,945	3,385	15513.80
% Share in Total	16.99%	19.36%	17.49%	6.47%
Other Roads	10,967	4,269	9,894	213982.57
% Share in Total	52.34%	42.51%	51.14%	89.23%
All Roads	20,951	10,043	19,344	239810.51

\*Data from PWD, Rajasthan has on 31.03.2019

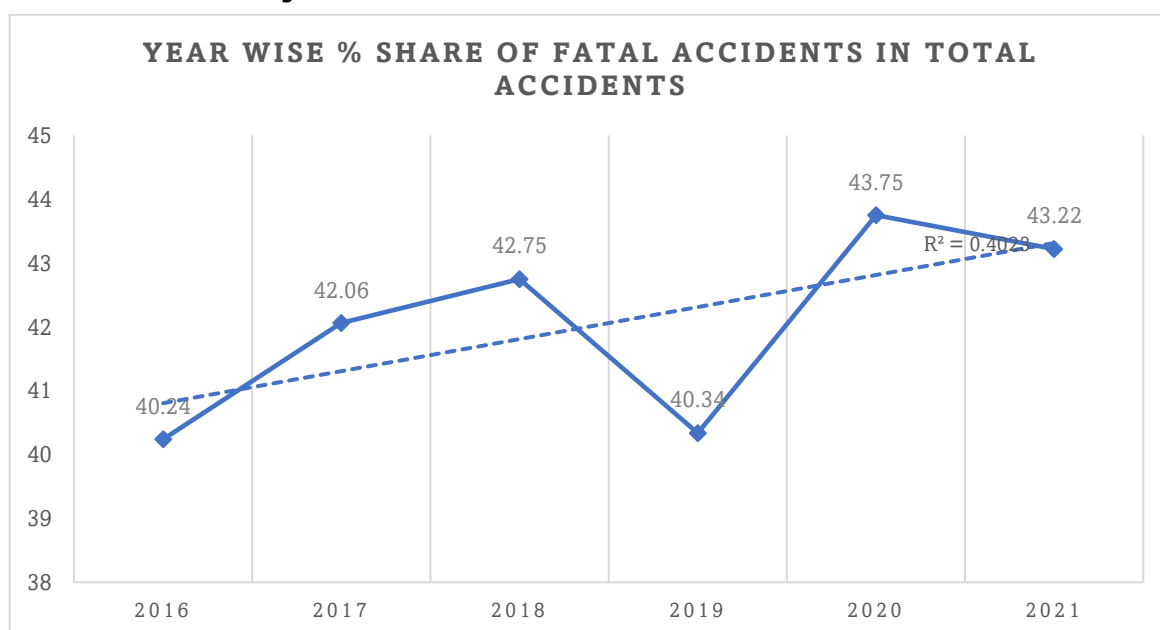
**Chart 1.2: Roads Accidents, Fatalities, and Injuries in Rajasthan during 2021 in percentage terms on various categories of Roads**



## TYPE OF ROAD ACCIDENTS

- 1.14 A road accident may cause loss of life/lives or grievous injury or minor injury or non-injury to road-users. An accident which resulted in death of one or more person is a fatal accident. Grievous injury accident is one in which one or more victims suffer serious injury requiring hospitalization (not necessarily in terms of IPC definition of grievous injury). Minor injury accident is when victim(s) does not require hospitalization.
- 1.15 During 2021 a total of 20,951 accidents were recorded, of which 9,055 (43.22%) were fatal accidents, 11,336 (54.11%) were injury (minor and grievous) causing accidents. Among injury causing accidents, 3,348 (29.53%) were grievous and 7,988 (70.47%) were minor injury causing accidents (**Table 1.4**). As compared to the previous year 2020, there is increase in total number of fatal accidents, minor injury accidents and non- injury accidents in 2021 (**Table 1.4**). In **Chart 1.3**, fatal accidents from year 2016 to year 2021 has been depicted. In year 2016 the share of fatal accidents in total accidents was 40.24 which has gone up to 43.22 in the year 2021. The break-up of types of road accidents has also been depicted in **Chart 1.4** which reflects that fatal and grievous injury accidents together accounted for 59.20% of total accidents during 2021.

**Chart 1.3: Year wise share (in percentage) of Fatal Accidents in Total Accidents in Rajasthan**

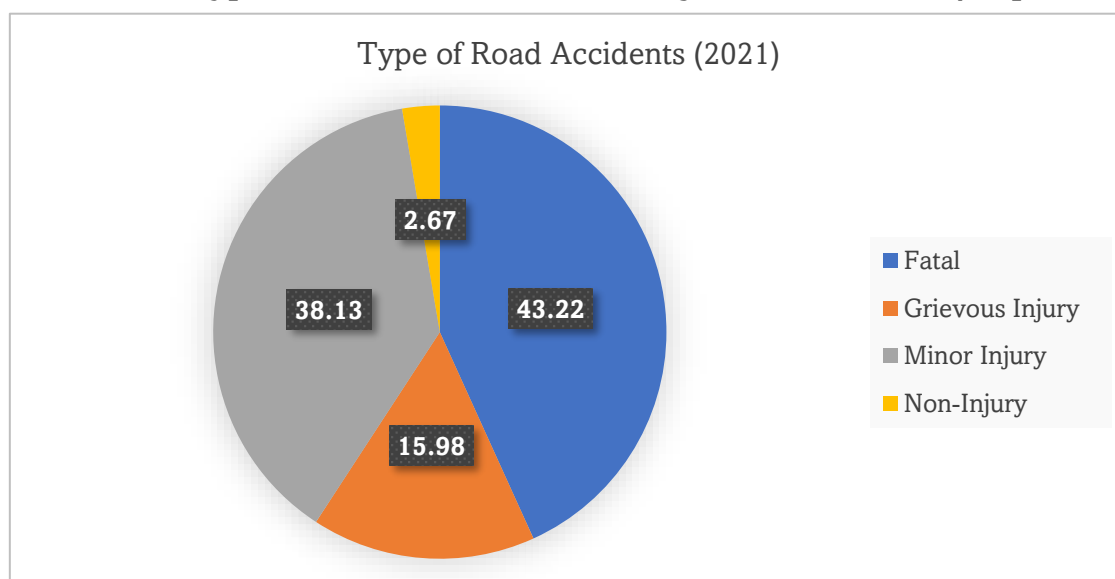


**Table 1.4: Total number of Fatal Accidents, Injury Accidents and Non-Injury Accidents in Rajasthan from 2016 to 2021**

Type of road accident	Parameter	2016	2017	2018	2019	2020	2021	All India (2021)
Fatal Accidents	Number	9,282	9,300	9,295	9,471	8,363	9,055	1,42,163
	% Change	-	0.19	-0.05	1.89	-11.7	8.27	-
	% Share in total	40.24	42.06	42.75	40.34	43.75	43.22	34.47
Grievous Injury Accidents	Number	3,786	4,017	3,990	4,226	3,045	3,348	1,26,394
	% Change	-	6.1	-0.67	5.91	-27.95	9.95	-
	% Share in total	16.41	18.17	18.35	18	15.93	15.98	30.64
Minor Injury Accidents	Number	9,260	8,110	7,701	8,966	7,202	7,988	1,19,633
	% Change	-	-12.42	-5.04	16.43	-19.67	10.91	-
	% Share in total	40.15	36.68	35.42	38.19	37.68	38.13	29
Non-Injury Accidents	Number	738	685	757	817	504	560	24,242
	% Change	-	-7.18	10.51	7.93	-38.31	11.11	-
	% Share in total	3.2	3.1	3.48	3.48	2.64	2.67	5.87
Total	Number	23,066	22,112	21,743	23,480	19,114	20,951	4,12,432
	% Change	-	-4.14	-1.67	7.99	-18.59	9.61	-

It is evident from the above chart that percentage share of fatal accidents in Rajasthan has remained more than 40% of total accidents which is on a very higher side and is matter of serious concern. For the year 2021, the percentage share of fatal accidents in Rajasthan was 43.22% which was higher than the National Average of 34.47% in the same year.

**Chart 1.4: Type of Road Accidents in Rajasthan in 2021 (in percent)**



## NATURE OF ROAD ACCIDENTS

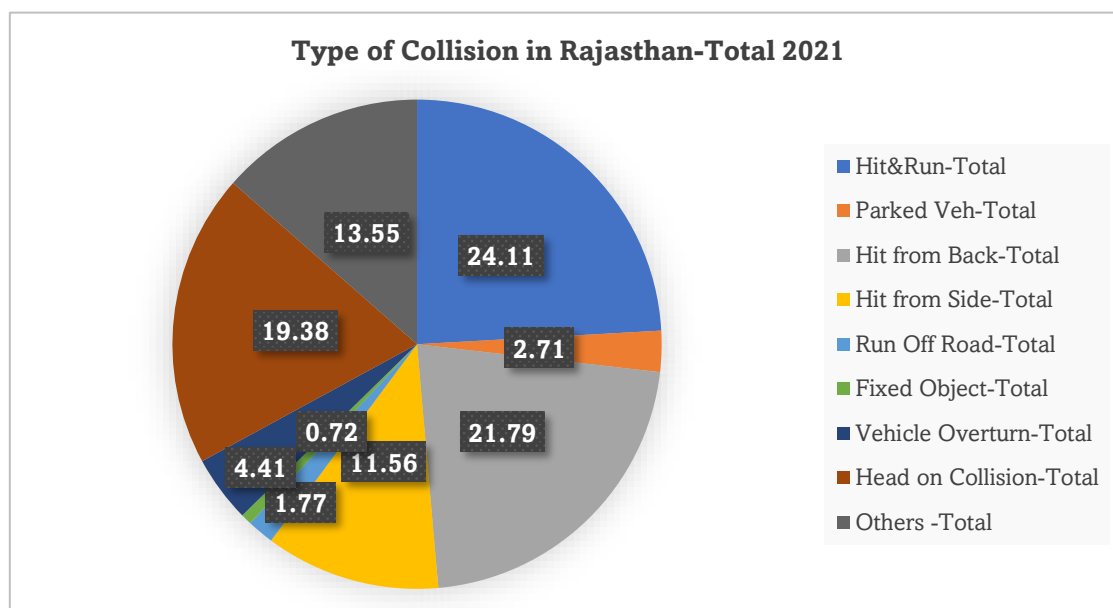
- 1.16 In terms of type of collision wise road accidents, they may be classified in to “Hit from Back”, “Head on Collision” and “Hit from Side” collision. Besides this, there is “Run off the Road” accident and “Hit & Run” accidents. In “Hit & Run” accident, the identity of the vehicle is not known. An analysis of such types of collision is depicted in **Chart 1.5** of this report.
- 1.17 Nature of accidents or collision types at aggregate State level data show increase in 2021 compared to 2020. 'Hit and Run' (24.11%) accounted for the largest share in total accidents and total number of persons killed (24.38%) during 2021 followed by 'Hit from Back' (21.79%) and (20.27%) respectively. A hit from the back or a rear-end collision occurs when a vehicle crashes into the one in front of it. Common factors contributing to rear- end collisions include driver's lack of attention or distraction, tailgating at junctions, panic stops and reduced traction due to wet weather or worn pavement.
- 1.18 The other major types of collision which caused death are 'Head-on collision' (21.94%), and 'Hit from side' (9.34%). The Motor Vehicle Amendment Act 2019 provides for enhanced rates of Rs. 2,00,000 on the death of a victim in Hit and Run as against Rs 25,000 earlier. Head-on collisions are known to occur on roads with narrow lanes, sharp curves, unseparated lanes for two-way traffic and also busy

stretches. Normally, the roads with the greatest risk of head-on collision are busy single-carriageway roads outside urban areas where speeds are highest. The greatest risk reduction in terms of head-on collision comes through the insertion of a median separation on the highways.

- 1.19 The people who are victim of Hit and Run cases do not get adequate compensation under the existing provisions of law. Hence, the State Government initiated a scheme “**Mukhyamantri Chiranjeevi Durghatna Bima Yojana**” to cover the persons who are victims of road accidents which also includes ‘Hit and Run’ road accident cases. This scheme provides for a compensation amounting to ₹5 Lakhs in case of death on account of road accidents and an amount extending up to ₹3 Lakhs in cases where a person is grievously injured. From May 2022 to May 2023, amount of ₹ 303.80 Crores has been disbursed to 6118 victims of road accidents under this scheme. This compensation is in addition to the amount payable to the victims under the provisions of the Motor Vehicles Act, 1988.
- 1.20 In order to save the life of a road accident victim it is important that such person is provided medical aid within one hour of the accident. This one hour is normally known as **golden hour** which means the time period lasting one hour following a traumatic injury during which there is highest likelihood of preventing death by providing prompt medical care. In order to motivate general public to carry the victims of road accidents at the earliest to the nearest hospital for medical care a scheme “**Mukhyamantri Chiranjeevi Jeevan Raksha Yojana**” has also been notified by the State Government. Under this scheme a cash award of ₹5000 and an appreciation certificate is issued to the person who carries a serious patient to the hospital. This scheme is unique in itself and would be instrumental in saving large number of human lives who are victims of road accidents.
- 1.21 Other categories of road accidents like ‘Run off the Road’ could happen due to loss of control by the driver due to excessive or inappropriate speed, distraction, misjudging a curve, attempting to avoid collision with another road user or an animal. The collision type wise percentage share of accidents has been depicted in **Chart 1.5** of this report.



**Chart 1.5: Road Accidents, Fatalities, and Injuries by Type of Collision in Rajasthan in 2021 (in percent)**



1.22 The bifurcation of road accidents based on the types of collisions have been depicted in the following table:

**Table 1.5: Road Accidents by type of collision in Rajasthan during 2020 and 2021**

Type of collision	2020			2021			% Change in 2021 over 2020		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Hit and run	4,650	2,401	4,074	5,052	2,448	4,681	8.65	1.96	14.9
% Share	24.33	25.96	24.29	24.11	24.38	24.2	-	-	-
With parked Vehicle	499	219	500	568	251	467	13.83	14.61	-6.6
% Share	2.61	2.37	2.98	2.71	2.5	2.41	-	-	-
Hit from Back	4,182	1,846	3,618	4,565	2,036	4,047	9.16	10.29	11.86
% Share	21.88	19.96	21.58	21.79	20.27	20.92	-	-	-
Hit from side	2,344	958	2,090	2,422	938	2,407	3.33	-2.09	15.17
% Share	12.26	10.36	12.46	11.56	9.34	12.44	-	-	-
Run off Road	301	163	311	371	201	315	23.26	23.31	1.29
% Share	1.57	1.76	1.85	1.77	2	1.63	-	-	-

Type of collision	2020			2021			% Change in 2021 over 2020		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
Fixed object	130	76	93	151	98	126	16.15	28.95	35.48
% Share	0.68	0.82	0.55	0.72	0.98	0.65	-	-	-
Vehicle overturn	947	470	938	923	514	893	-2.53	9.36	-4.8
% Share	4.95	5.08	5.59	4.41	5.12	4.62	-	-	-
Head on collision	3,579	1,945	3,023	4,061	2,203	3,923	13.47	13.26	29.77
% Share	18.72	21.03	18.03	19.38	21.94	20.28	-	-	-
Others	2,482	1,172	2,122	2,838	1,354	2,485	14.34	15.53	17.11
% Share	12.99	12.67	12.65	13.55	13.48	12.85	-	-	-
<b>Total</b>	<b>19,114</b>	<b>9,250</b>	<b>16,769</b>	<b>20,951</b>	<b>10,043</b>	<b>19,344</b>	<b>-</b>	<b>-</b>	<b>-</b>

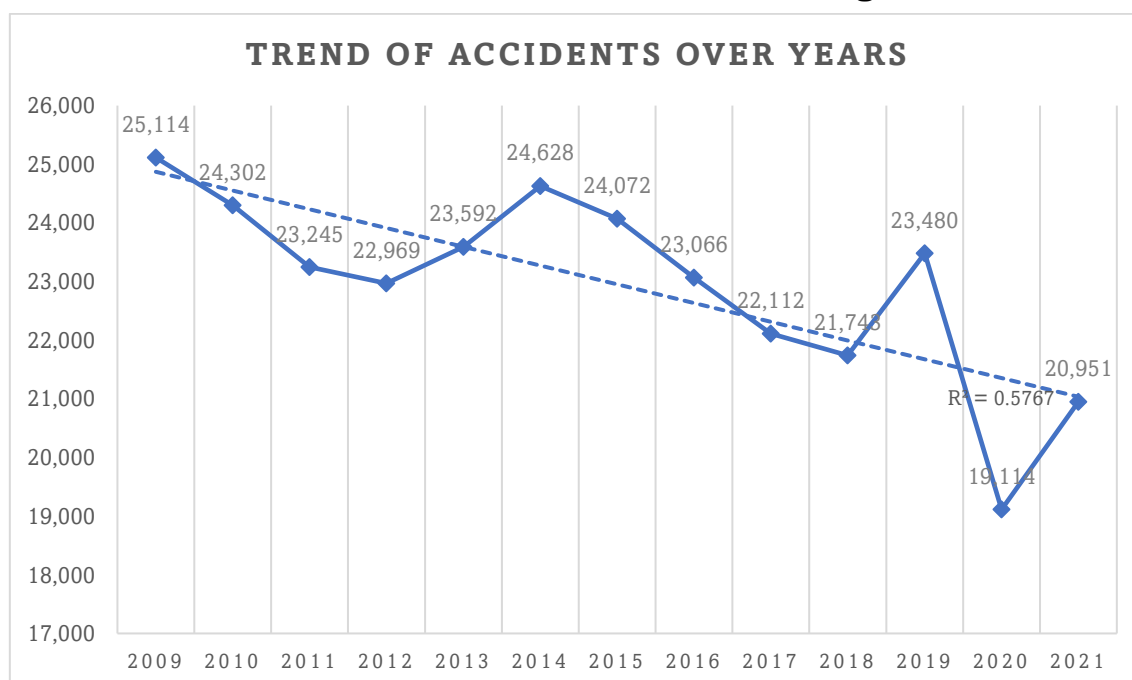
## LONG TERM TRENDS

- 1.23 Despite some fluctuations, road accident depicts a general decreasing trend over the years (**Chart 1.6**). The number of accidents has decreased from the year 2009 to year 2012 and from the year 2014 to year 2018. In the year 2019, number of accidents increased and thereafter due to Covid-19 pandemic it came from 23,480 in year 2019 to 19,114 in year 2020. If total accidents in year 2019 (23,480 accidents) is compared with accidents in year 2021 (20,951 accidents), it is evident that total number of accidents have decreased by 13.75%. Similarly, during the study of fatal accidents, it was found that during the years 2009 to 2021, the normal trend of fatal accidents has been on increasing side (**Chart 1.7**).
- 1.24 Analysing total persons killed in road accidents, it is observed that during year 2009 to year 2021, there is an increasing trend in number of persons killed over the years (**Chart 1.8**). However, so far as the trend of number of persons injured during the same period is concerned, it has a decreasing trend (**Chart 1.9**).

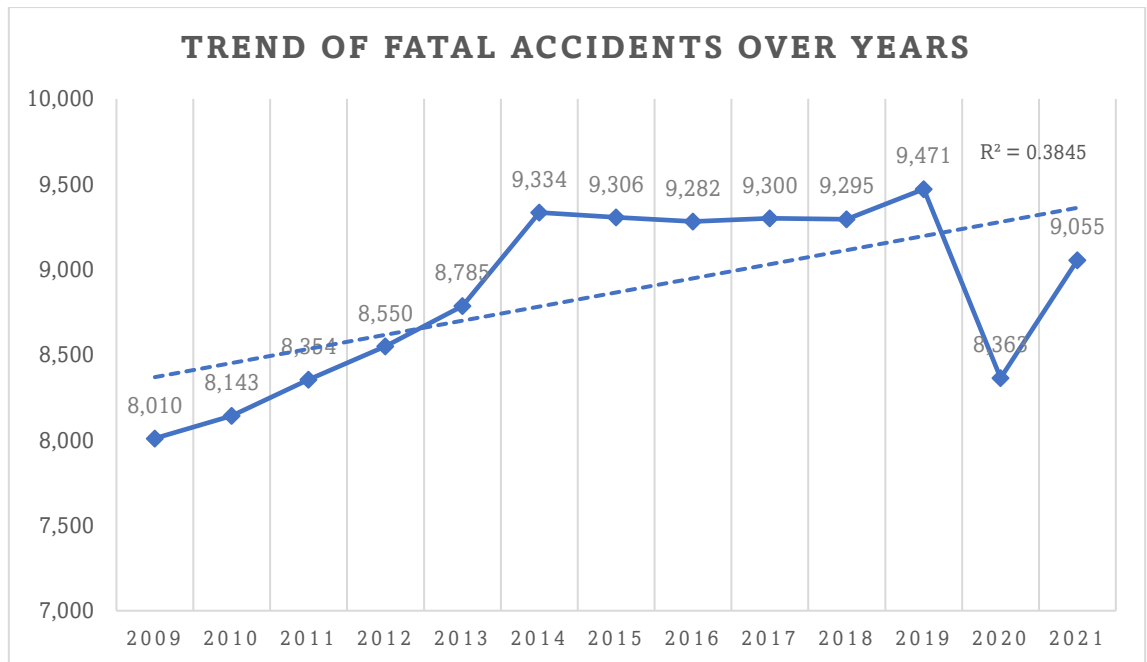
**Table 1.6: Long term trends in major Parameters of Road Accidents in Rajasthan from 2009 to 2021**

Year	Number of accidents		Number of persons	
	Total	Fatal	Killed	Injured
2009	25,114	8,010	9,045	32,317
2010	24,302	8,143	9,163	31,033
2011	23,245	8,354	9,232	28,666
2012	22,969	8,550	9,528	28,135
2013	23,592	8,785	9,724	27,424
2014	24,628	9,334	10,289	27,453
2015	24,072	9,306	10,510	26,153
2016	23,066	9,282	10,465	24,103
2017	22,112	9,300	10,444	22,071
2018	21,743	9,295	10,320	21,547
2019	23,480	9,471	10,563	22,979
2020	19,114	8,363	9,250	16,769
2021	20,951	9,055	10,043	19,344

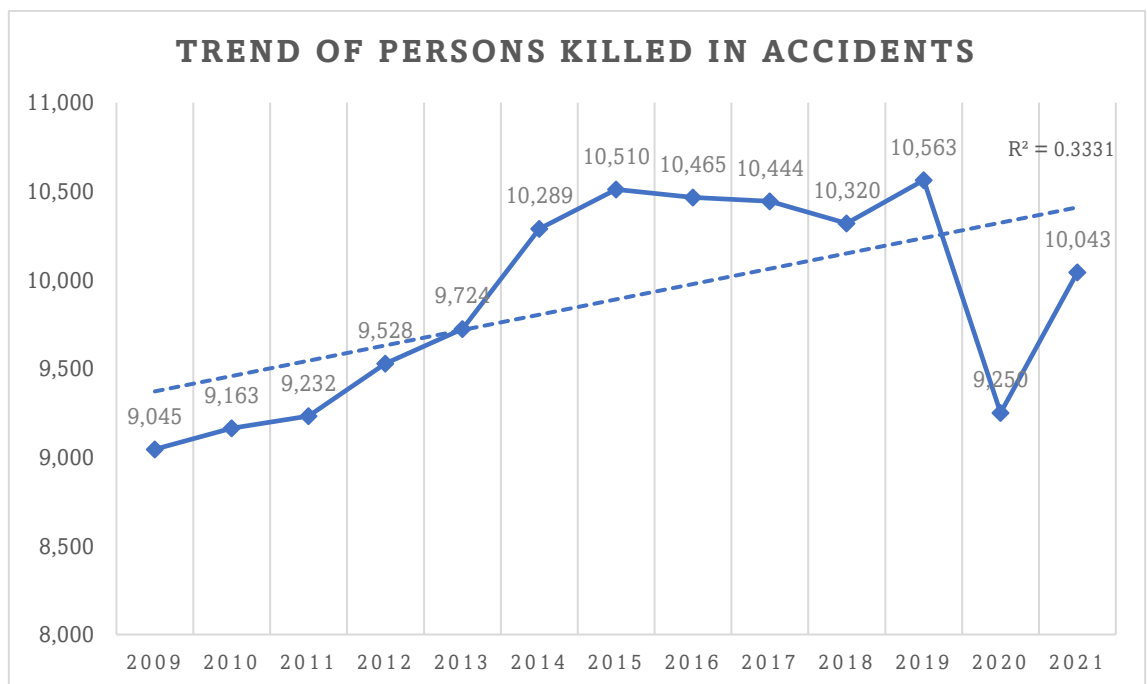
**Chart 1.6: Trend in the number of Road Accidents during 2009 to 2021**



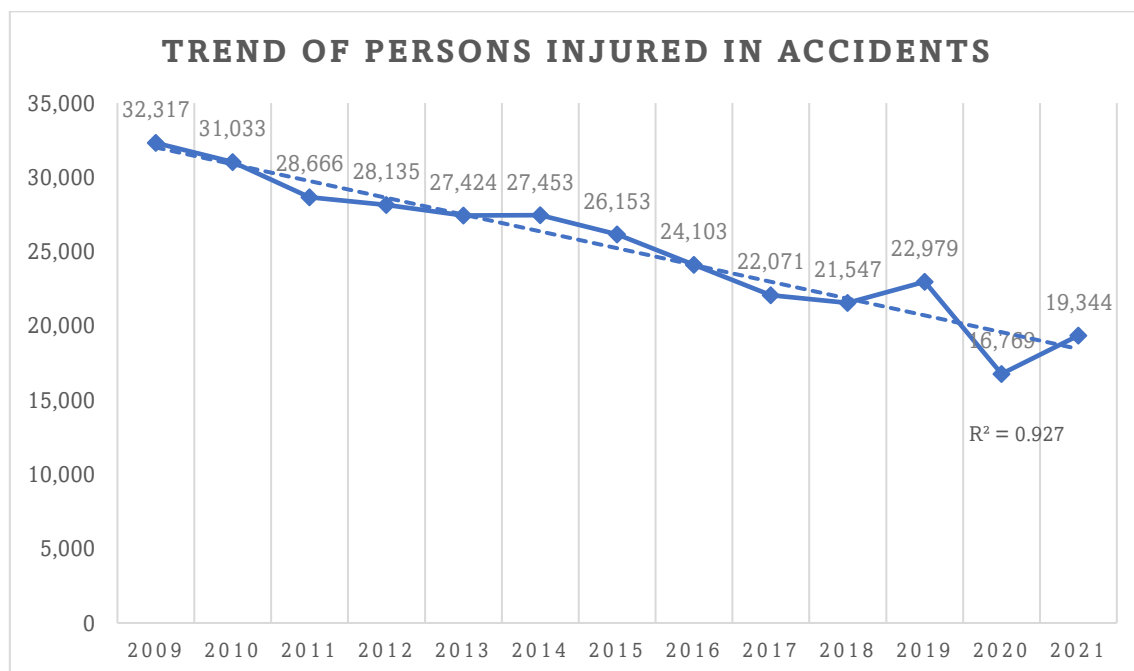
**Chart 1.7: Trend of Fatal Accidents during 2009- 2021**



**Chart 1.8: Trend of Persons Killed in Accidents during 2009- 2021**



**Chart 1.9: Trend of Persons Injured in Accidents during 2009- 2021**



## ACCIDENT SEVERITY

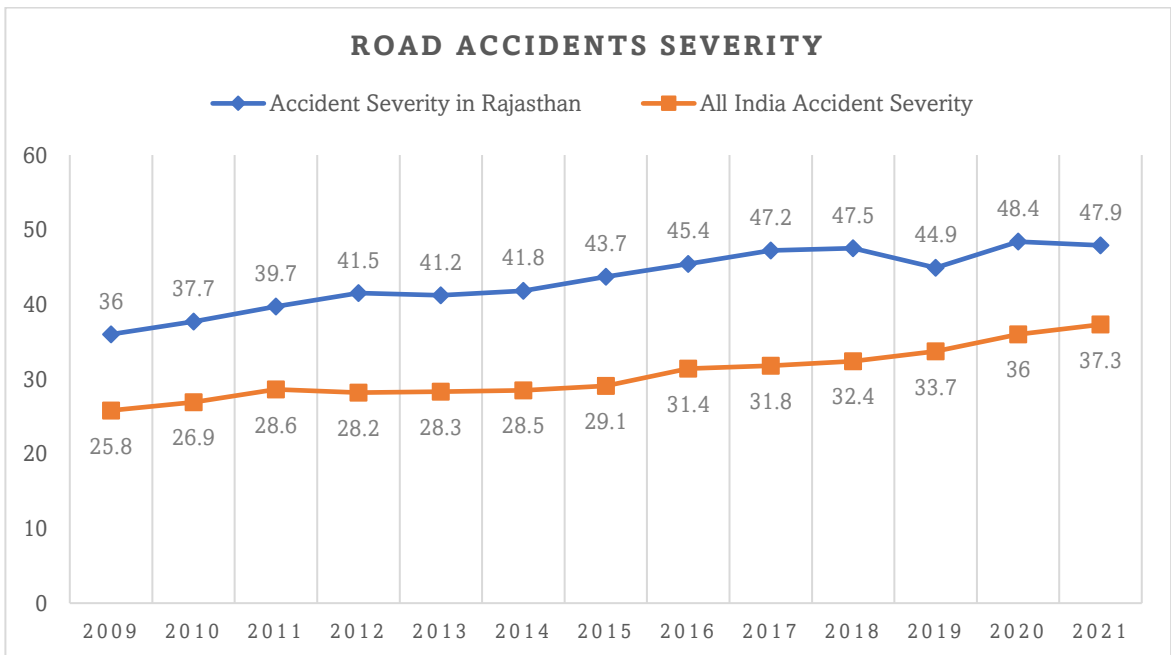
1.25 Road accident severity measured by the number of persons killed per 100 accidents decreased from 48.4 in 2020 to 47.9 in 2021 (**Chart 1.10**). Despite some marginal fluctuations, the accidents severity has been on increase since 2009. It underscores the need for improved trauma care and traffic calming measures which aim at reducing crash impact parameters. However, from year 2009 to year 2021, the National average of accident severity has always been lower than the accident severity in Rajasthan which is evident from the **Table 1.7**.

**Table 1.7: Accident Severity in Rajasthan as compared to All India from 2009 to 2021**

Year	Accident Severity in Rajasthan	All India Accident Severity
2009	36	25.8
2010	37.7	26.9
2011	39.7	28.6
2012	41.5	28.2
2013	41.2	28.3
2014	41.8	28.5

Year	Accident Severity in Rajasthan	All India Accident Severity
2015	43.7	29.1
2016	45.4	31.4
2017	47.2	31.8
2018	47.5	32.4
2019	44.9	33.7
2020	48.4	36
2021	47.9	37.3

**Chart 1.10: Road accidents severity during 2009 to 2021 in Rajasthan**



## NORMALIZED INDICATORS OF ROAD ACCIDENTS- LONG RUN TRENDS

- 1.26 An analysis has been done normalizing the road accidents and accidents related deaths over the years by the population and number of vehicles as given in the **Table 1.8**. This data has been compiled on the basis of the Road Accident Reports published by MoRTH for the years 2013, 2017 and 2021. The various normalized indicators are Road Accident Risk, Road Accident Fatality Risk, Road Accident Rate, Road Accident Fatality Rate, Road Accident Density and Road Accident Fatality Density.
- 1.27 It is submitted that Road Accident Risk is computed in terms of number of accidents per lakh population, Road Accident Fatality Risk is computed in terms of number of persons killed per lakh population, Road Accident Rate is computed in terms of



number of accidents per 10000 vehicles, Road Accident Fatality Rate is computed in terms of number of persons killed per 10000 vehicles, Road Accident Density in computed in terms of number of accidents per 100 kilometre of road and Road Accident Fatality Density in terms of number of persons killed per 100 kilometre of road. These parameters have been reported in **Table 1.8** of the report.

**Table 1.8: Indicators of road accidents and accidents related deaths over the years normalized by the population and number of vehicles in Rajasthan (2011-2021)**

Years	Road Accident Risk*	Road accident Fatality Risk (\$)	Road Accident Rate (#)	Road Accident Fatality Rate (##)	Road Accident Density (\$\$)	Road Accident Fatality Density (**)
2011	33.9	13.5	29.1	11.6	9.63	3.82
2012	32.8	13.6	25.6	10.6	9.49	3.83
2013	33.1	13.6	23.4	9.6	10.43	4.3
2014	34.7	14.5	22.0	9.2	10.21	4.26
2015	33.4	14.6	19.5	8.5	9.7	4.23
2016	31.6	14.3	16.9	7.7	9.07	4.11
2017	29.9	14.1	14.8	7.0	8.32	3.93
2018	29	13.8	13.4	6.3	6.94	3.29
2019	31	13.9	13.3	6.0	7.49	3.37
2020	24.9	12.1	9.9	4.8	-	-
2021	26.4	12.7	10.4	4.9	-	-

\*\*\*Figures of road length for the year 2020 are not finalised\*\*\*

(\*) Road Accident Risk: Number of Accidents per Lakh Population

(\$) Road Accident Fatality Risk: Number of Persons Killed per Lakh Population

(#) Road Accident Rate: Number of Accidents Per Ten Thousand Vehicles

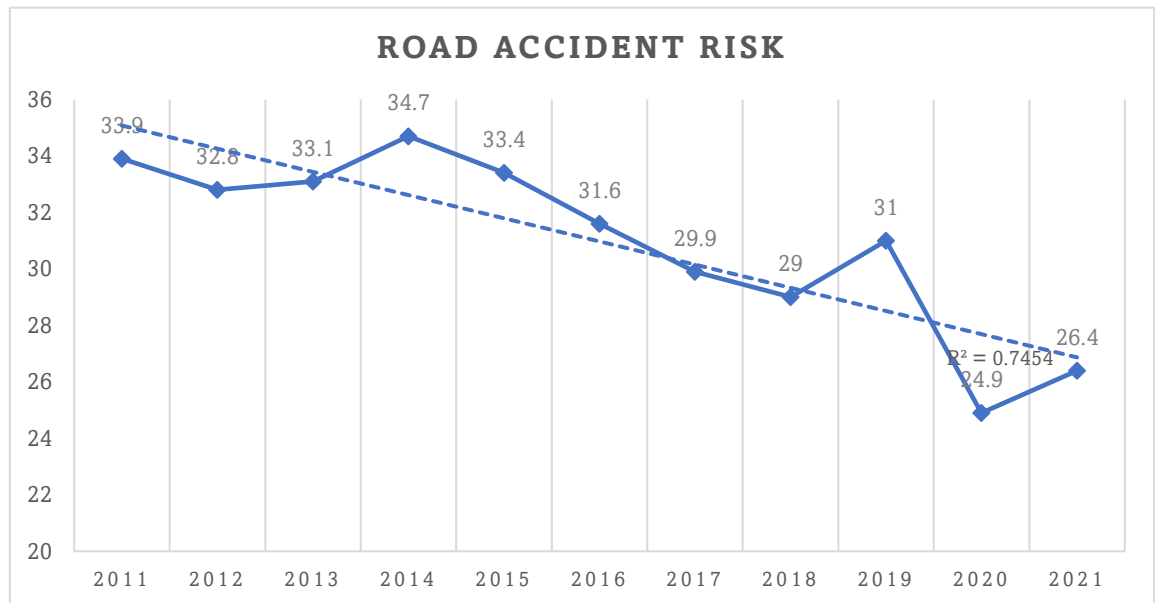
(##) Road Accident Fatality rate: Number of Persons killed Per Ten Thousand Vehicles

(\$\$) Road Accident Density: Number of accidents per 100 Km of Road

(\*\*) Road Accident Fatality Density: Number of persons killed per 100 Km of Road

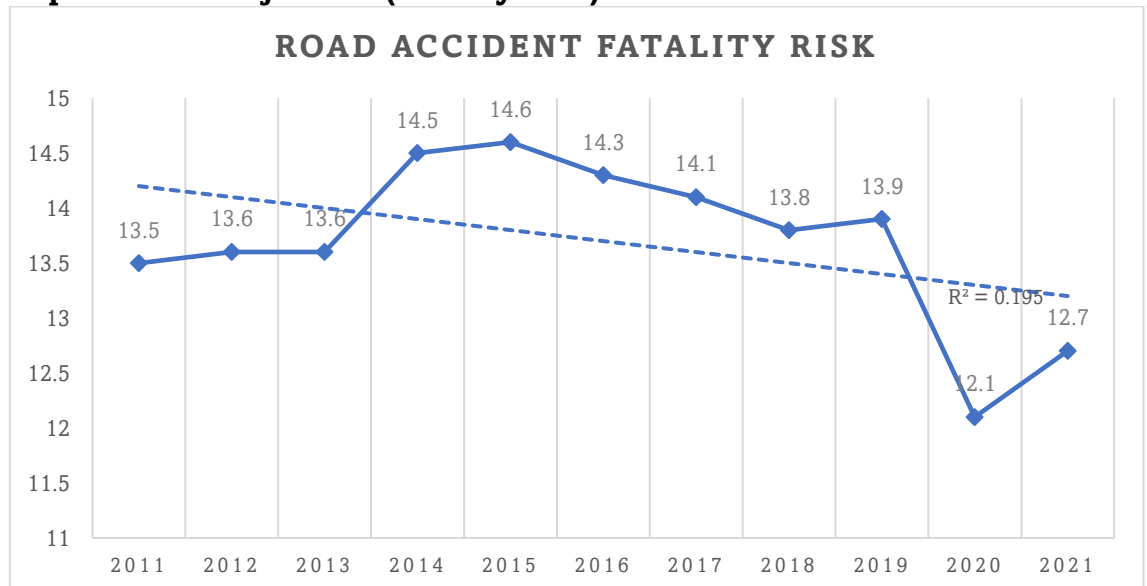
- 1.28 Road Accident Risk is a measure to observe the number of road accidents in the State in a year relative to the population for the year. It is expressed in terms of road accidents per lakh population, and which provides appropriate measure of incidence of accidents in the State. Number of accidents per lakh of population in Rajasthan do not reflect any uniform trend it has increased from 29 in 2018 to 31 in 2019 then it dropped to 24.9 in 2020 (**Table 1.8**). However Road Accident Risk in general shows a decreasing trend during years 2011 to 2021 having marginal fluctuations (**Chart 1.11**).

**Chart 1.11: Road Accident Risk during year 2011 – 2021 in Rajasthan**



1.29 Road Accident Fatality Risk is measured by the number of accident fatality (persons killed) in a year per 1,00,000 population. Accident fatality risk exhibits a decreasing trend during the year 2011 to 2021 with some marginal fluctuations (**Chart 1.12**).

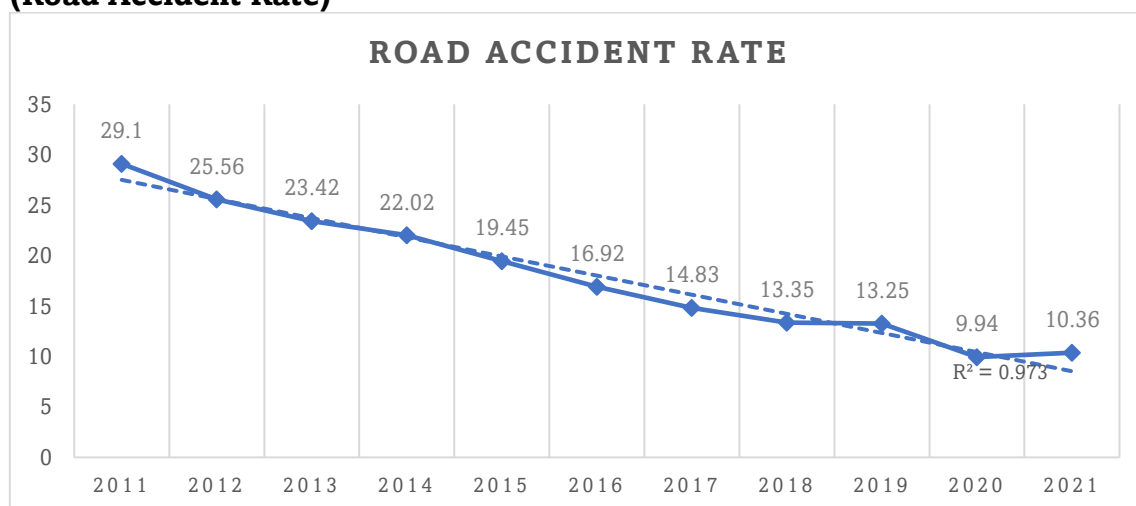
**Chart 1.12: Trend in number of Persons Killed in Accidents per lakh Population in Rajasthan (Fatality Risk)**



1.30 Road Accident Rate is measured by the number of road accidents per 10,000 vehicles, denotes rate of road accident relative to vehicular population. The long-run trend of road accident per 10,000 registered vehicles reveals high rate of

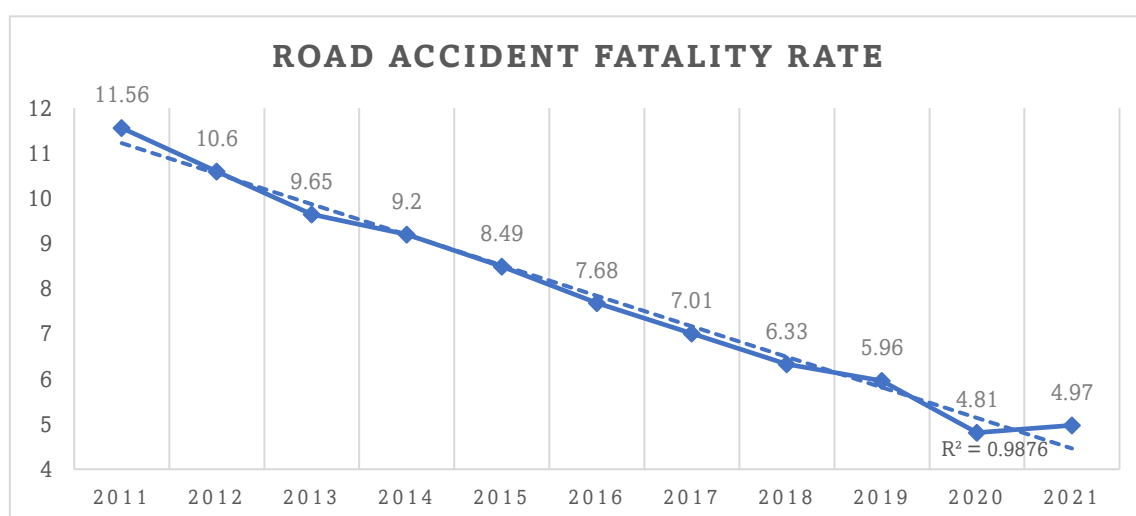
motorization in Rajasthan, as the ratio declines consistently over the years. **Chart 1.13** also depict overall downward trend in road accident rate in the state.

**Chart 1.13: Trend of number of accidents per 10,000 Vehicles in Rajasthan (Road Accident Rate)**



1.31 Road Accident Fatality Rate is another indicator which compares the number of fatality (persons killed) with the number of vehicles in the state. It is expressed in terms of road accident fatality per 10,000 vehicles. Both Road Accident Rate and Road Fatality Rate have shown similar declining trend in long term as well as in short term (**Chart 1.14**).

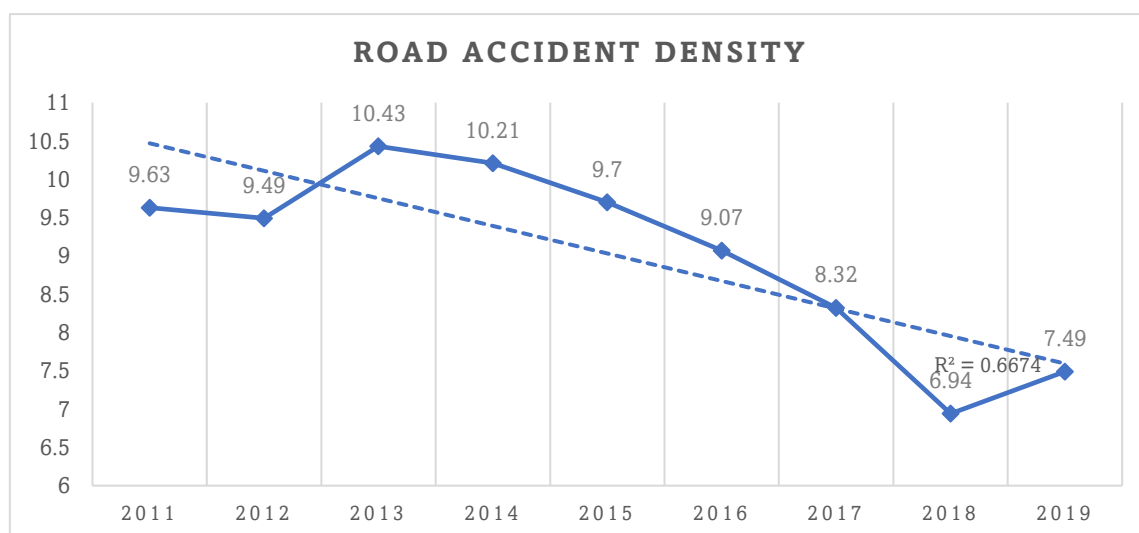
**Chart 1.14: Trend in number of Persons killed per 10,000 Vehicles in Rajasthan (Road Accident Fatality Rate)**



## ROAD NETWORK

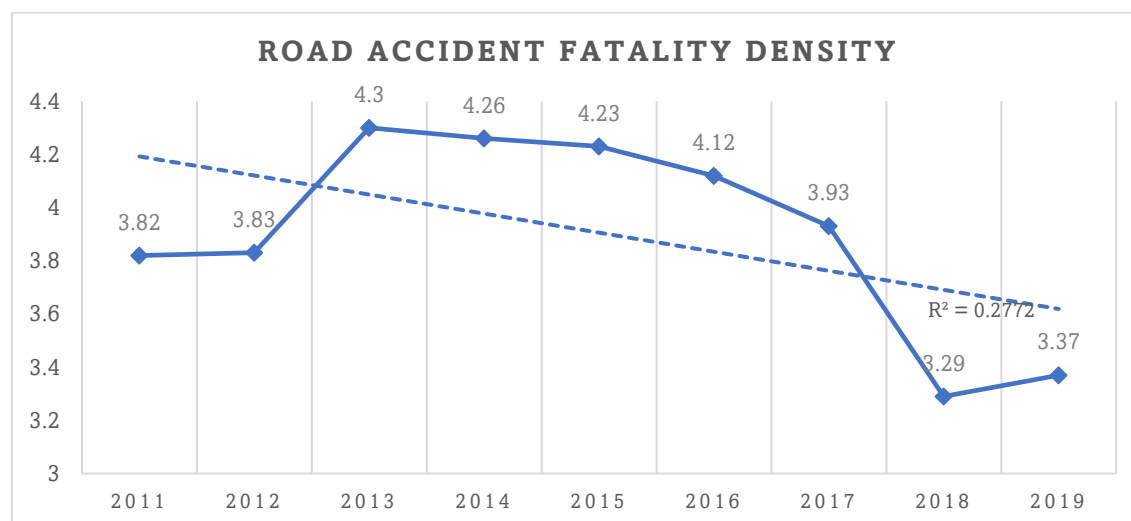
- 1.32 Road network in Rajasthan was 2.39 lakh km. up till March 2019. The state's road network consists of National Highways, State Highways, Districts roads, Rural and Village Roads. Over the years, there has been consistent improvement in road network across the State through the construction of new roads and up gradation of the existing roads.
- 1.33 Rajasthan's road density at 70.1 Km per 100 sq. km of area in 2018-19 was higher than that of many other States. National Highways constitute 4.3 per cent of the total road length of the State in 2019 (PWD road statistics, Rajasthan). The balance road networks comprises of State Highways (6.47%), District Roads (9.6%), Rural Roads (71%), Urban Roads (8.5%) and Project Roads (5.4%). Road Accident Density is measurement in terms of number of accidents per 100 Km. of road. During years 2011 to 2019, Road Accident Density has reflected a decreasing trend. It can be referred in **Chart 1.15**.

**Chart 1.15: Road Accident Density during year 2011 to year 2019**



- 1.34 Road Accident Fatality Density is measurement of number of persons killed per 100 km. of road in Rajasthan. Upon analysis, it is identified that it is on a declining trend during years 2011-2019 having some fluctuations. It can be seen in the **Chart 1.16** given below.

**Chart 1.16: Road Accident Fatality Density during year 2011 to year 2019 in Rajasthan**



## REGISTERED MOTOR VEHICLES

1.35 Sustained economic growth and increased per capita income has led to rapid growth of motorized vehicles in India. There has been consistent increase in number of vehicles registered over the years. 1,30,57,269 vehicles were registered in Rajasthan between Financial Year 2010-11 and 2020-21. The total number of registered motor vehicles in the State grew at a Compound Annual Growth Rate (CAGR) of 28.58 percent during this period. Composition of vehicular population in 2021 depicts the highest share of two-wheelers (75.9%) followed by cars, jeeps and taxis (10.9%), Tractors (6.5%), Trucks (3.67%) and buses (0.6%) (**Table 1.9**).

**Table 1.9: Registration of vehicles (major categories) in Rajasthan (2011-2021)**

Year	Two-Wheelers	Cars/Jeeps	Personalized Vehicles	Auto Rickshaw	Taxi Car/Jeep	Buses	Public Transport	Others	Total
1	2	3	4= (2+3)	5	6	7	8= (5+6+7)	9	10
2010-11	629265	88679	717944	7034	9775	4723	21532	82127	821603
2011-12	770024	97614	867638	7492	11736	5365	24593	105982	998213
2012-13	836120	101689	937809	7532	14695	5271	27498	121160	1086467
2013-14	865279	105808	971087	7648	10925	5276	23849	117459	1112395
2014-15	941091	117861	1058952	7368	8660	3758	19786	115851	1194589
2015-16	985776	124612	1110388	8570	8637	5168	22375	121825	1254588

Year	Two-Wheelers	Cars/Jeeps	Personalized Vehicles	Auto Rickshaw	Taxi Car/Jeep	Buses	Public Transport	Others	Total
1	2	3	4= (2+3)	5	6	7	8= (5+6+7)	9	10
2016-17	992418	127878	1120296	9849	11163	5863	26875	125815	1272986
2017-18	1063802	159135	1222937	8590	9354	5283	23227	138200	1384364
2018-19	1117325	164294	1281619	7764	8565	4337	20666	130434	1432719
2019-20	1188765	155136	1343901	16624	6542	5769	28935	139498	1512334
2020-21	721624	133740	855364	3407	1868	1038	6313	125334	987011
<b>Total</b>	<b>10111489</b>	<b>1376446</b>	<b>11487935</b>	<b>91878</b>	<b>101920</b>	<b>51851</b>	<b>245649</b>	<b>1323685</b>	<b>13057269</b>

From the above table percentage share of personalized vehicles in total vehicles comes to 97.90%

$$\{1,14,87,935 / (1,14,87,935 + 2,45,649)\} * 100 = 97.90\%$$

### 1.36 Computation of Compound Annual Growth Rate for Personalized Vehicles, Public Transport vehicles and Total Vehicles

**Formula: CAGR =  $\left[ \left( \frac{EV}{BV} \right)^{\frac{1}{n}} - 1 \right] * 100$**

Where, EV = Ending Value (Cumulative)

BV = Beginning Value

n = Time (in years)

$$\text{CAGR (Personalized Vehicles)} = \left[ \left( \frac{11487935}{717944} \right)^{\frac{1}{11}} - 1 \right] * 100 = 28.67\%$$

$$\text{CAGR (Public Vehicles)} = \left[ \left( \frac{245649}{21532} \right)^{\frac{1}{11}} - 1 \right] * 100 = 24.77\%$$

1.37 It is clarified that vehicles that are used as public service vehicles which includes Motor Cabs, Maxi Cabs, Omni Buses etc have been classified under the head “Public Transport” and vehicles such as Two Wheelers, Cars/ Jeeps have been classified under the head “Personalized Vehicles”. The class of vehicles classified as “Others” include Tractors, Trolleys/Trailers, Trucks, Construction Equipment vehicles etc and have been excluded for computation purposes since these vehicles are not used for passenger transportation.

1.38 It is clear from the above computation that number of vehicles under personalized transport category is very high accounting for 97.90% vehicles. The CAGR of vehicles during the years 2010-11 and 2020-21 is 28.67%. This implies that people opt for own means of transport over public transport which has resulted in high



vehicular growth of personalized vehicles. On the other hand, public transport vehicles are very less in comparison to personal vehicles and account for only 2.1% vehicles. Though the CAGR in public vehicle growth happens to be 24.77% which implies a very good growth in number of public service transport vehicles, but it is still not a very preferred mode of transport for general public on account of the wide gap in number of personalized vehicles and in number of public service vehicle.

## CHAPTER-2

# ACCIDENTS BY ROAD CATEGORY

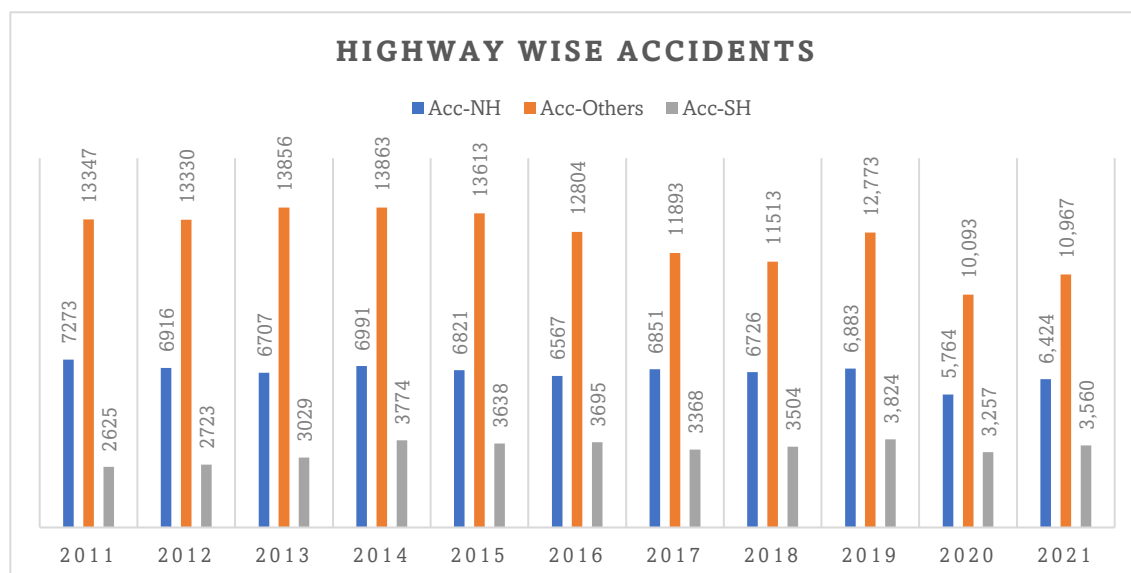
- 2.1 In this chapter an analysis of accidents have been made on the basis of category of roads namely, National Highways, State Highways and Other Roads. The category of other roads covers District Roads, Rural Roads, Urban Roads and Project Roads.
- 2.2 The total road length in Rajasthan is 2.39 lakh km (as on 31<sup>st</sup> March 2019), consisting of 10,314 km of National Highways, 15,514 km of State Highways, and 2,13,982 km of Other Roads (include District Roads, Rural Roads, Urban Roads, and Project Roads). In percentage term, National Highways shares 4.30 per cent, State Highways 6.47 per cent and other roads 89.23 per cent, respectively of the total road length in the State. The combined share of National Highways and State Highways is 10.77% of the total road network in Rajasthan. The percentage share of the three broad categories of roads in the total road length is highly uneven.
- 2.3 During 2021, 20,951 accidents were recorded in the State out of which, 6,424 (30.66%) took place on the National Highways (NH) including Expressways, 3,560 (16.99%) on State Highways (SH) and the remaining 10,967 (52.35%) on Other Roads (Table 2.1). Out of total 9,055 fatal accidents reported in 2021, 3,270 (36.11%) were on National Highways, 1,687 (18.63%) were on State Highways and 4,098 (45.26%) were on Other Roads (**Table 2.2 & Table 2.3**).
- 2.4 The percentage share of National Highways, State Highways and Other Roads in total accidents, persons killed and injured during 2021 reveals 30.66 percent of accident, 38.13 percent of death and 31.35 % of accidents related injuries took place on National Highways which shares only 4.30 percent of total road network in the Rajasthan. Highways (both National and State) accounted for only 10.77 % of total road network witnessed a disproportionately large share of accidents (47.65%) and (57.5%) accidents related fatalities during the year 2021 (**Table 2.1**), and thus it naturally becomes the focus of our attention. More accidents on these highways have been attributed to higher vehicle speeds and increasingly higher volume of traffic on these roads. During 2021 at All India level 4,12,432 accidents were reported of which 1,28,825 (31.24%) took place on National Highways including express way 96,382 (23.37%) on State Highways and the remaining 1,87,225 (45.4%)

on other roads. Out of total 1,42,163 fatal accidents reported in 2021, 50,923 (35.8%) on National Highways, 34,946 (24.6%) were on State Highways and 56,264 (39.6%) were on other roads (**Table 2.2 & Table 2.3**).

**Table 2.1: Road Accidents, Fatalities, and Injuries by Road Category in Rajasthan**

Category of Roads	2020			2021			% Change in 2021 over 2020		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
<b>National Highways</b>	5,764	3,320	5,096	6,424	3,829	6,065	11.45	15.33	19.01
<b>% Share</b>	30.16	35.89	25.41	30.66	38.13	31.35	-	-	-
<b>State Highways</b>	3,257	1,802	2,872	3,560	1,945	3,385	9.3	7.94	17.86
<b>% Share</b>	17.04	19.48	14.32	16.99	19.37	17.5	-	-	-
<b>Other Roads</b>	10,093	4,128	12,087	10,967	4,269	9,894	8.66	3.42	-18.14
<b>% Share</b>	52.8	44.63	60.27	52.35	42.51	51.15	-	-	-
<b>All Roads Rajasthan</b>	19,114	9,250	20,055	20,951	10,043	19,344	-	-	-

**Chart 2.1: Accidents, Persons Killed and Injured by Category of Roads during 2021 in Rajasthan**



2.5 Comparing Road Accidents, Fatalities and Injuries by Road categories in Rajasthan vis-à-vis India for the year 2021, it is evident that the percentage share of accidents

on National Highways in Rajasthan is 30.66% which is less than the national average of 31.24%. However, when comparison is made with reference to percentage share of persons killed (38.13%) and injured (31.35%) on National Highways in the state, it is evident that the share in both of these categories in the State is higher than the national average of 36.37% and 30.63% respectively. So far as the above comparison on the State highways is concerned, the percentage of accidents, persons killed, and persons injured is less than the national average in Rajasthan. However, the percentage figures on Other Roads in Rajasthan across the above three parameters is higher than the national average (Table 2.2).

**Table 2.2: Road Accidents, Fatalities, and Injuries by Road Category in Rajasthan and India (2020 and 2021)**

Category of Roads	Rajasthan 2021			All India 2021		
	Accidents	Killed	Injured	Accidents	Killed	Injured
<b>National Highways</b>	6,424	3,829	6,065	1,28,825	56,007	1,17,765
<b>% Share</b>	30.66	38.13	31.35	31.24	36.37	30.63
<b>State Highways</b>	3,560	1,945	3,385	96,382	37,963	92,583
<b>% Share</b>	16.99	19.37	17.5	23.37	24.66	24.08
<b>Other Roads</b>	10,967	4,269	9,894	1,87,225	60,002	1,74,100
<b>% Share</b>	52.35	42.51	51.15	45.4	38.97	45.29
<b>All Roads</b>	20,951	10,043	19,344	4,12,432	1,53,972	3,84,448

## FATAL ACCIDENTS BY CATEGORY OF ROADS

2.6 The distribution of fatal accidents across the three category of roads reveals that National Highways have significant share in total fatal accidents over the years 2016-2021. Trend in percent share of three categories of roads in terms of accidents, deaths and injuries in the State have stabilized with marginal fluctuations. The share of State Highways in total fatal accident has increased from 17.96 percent in 2016 to 18.63 percent in 2021, whereas that for National Highways increased from 34.07 percent to 36.11 percent during the same period (**Table 2.3**).

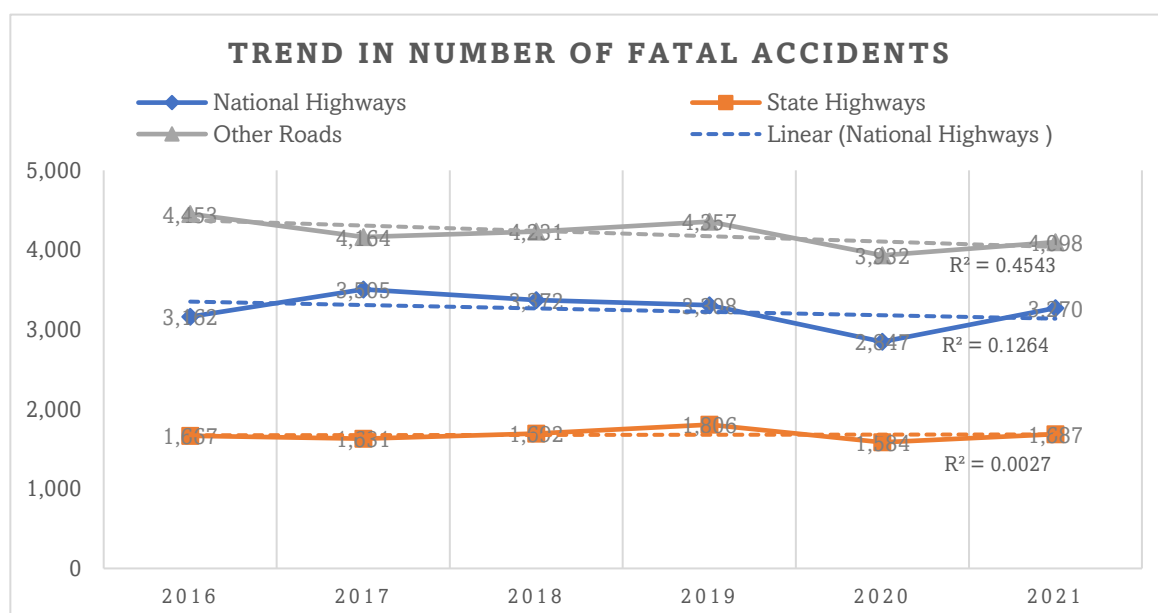
2.7 From the Chart 2.2, it can be understood that there is general decreasing trend of fatal accidents on Roads. National Highways and Other Roads have higher

magnitude of decrease year on year than the State Highways. In the year 2020, there is tangible decrease of fatal accidents across all category of roads (NH, SH, Others) particularly due to Covid-19 effect. The CAGR of fatal accidents on NH, SH and Other Roads is 35.38%, 34.95% and 33.52% respectively. It shows that fatal accidents on NH are growing at a faster pace than the other roads. Road category wise trend in number of fatal accidents have stabilized with marginal fluctuations during 2016 to 2020, thereafter, registered an increase in 2021 (**Chart 2.2**).

**Table 2.3: Fatal Accidents by Road Categories in Rajasthan from 2016 to 2021**

Fatal Accidents	2016	2017	2018	2019	2020	2021	All India (2021)
National Highways	3,162	3,505	3,372	3,308	2,847	3,270	50,953
YoY Growth	-	10.85	-3.79	-1.9	-13.94	14.86	17.4
% Share in Total	34.07	37.69	36.28	34.93	34.04	36.11	35.8
State Highways	1,667	1,631	1,692	1,806	1,584	1,687	34,946
YoY Growth	-	-2.16	3.74	6.74	-12.29	6.5	15.8
% Share in Total	17.96	17.54	18.2	19.07	18.94	18.63	24.6
Other Roads	4,453	4,164	4,231	4,357	3,932	4,098	56,264
YoY Growth	-	-6.49	1.61	2.98	-9.75	4.22	19.1
% Share in Total	47.97	44.77	45.52	46	47.02	45.26	39.6
All Rajasthan	9,282	9,300	9,295	9,471	8,363	9,055	1,42,163
YoY Growth	-	0.19	-0.05	1.89	-11.7	8.27	17.7

**Chart 2.2: Trend of Number of Fatal Accidents by category of roads in Rajasthan (2016-2021)**



## LONG-RUN TREND

2.8 Despite some fluctuations, the number of road accidents and the number of persons killed have stabilized over the years except for a slight increase recorded in 2021. If the figures of 2020 are compared with the figures of 2021 total number of accidents increased from 19,114 in 2020 to 20,951 in 2021, registered increase of 9.61 percent relative to same period last year. Similarly, total number of persons killed increased from 9,250 in 2020 to 10,043, in 2021, registered increase of 8.57 percent relative to same period in 2020. In case the year 2020 is excluded from the analysis due to COVID-19 the number of accidents, deaths, and injuries have been decreasing gradually (**Table 2.4**).

**Table 2.4: Major Parameters of Road Accidents by Road category in Rajasthan from 2014 - 2021**

Year	National Highways (Including Expressways)			State Highways			Other Roads			Total (All Roads)		
	Road Accident	Person killed	Persons Injured	Road Accident	Persons killed	Persons Injured	Road Accident	Persons killed	Persons Injured	Road Accident	Persons killed	Persons Injured
2014	6991	3598	7980	3774	1926	4243	13863	4765	15230	24628	10289	27453
2015	6,821	3,709	7,526	3,638	1,908	3,804	13,613	4,893	14,823	24,072	10,510	26,153
2016	6,567	3,737	7,023	3,695	1,928	3,887	12,804	4,800	13,193	23,066	10,465	24,103

Year	National Highways (Including Expressways)			State Highways			Other Roads			Total (All Roads)		
	Road Accident	Person killed	Persons Injured	Road Accident	Persons killed	Persons Injured	Road Accident	Persons killed	Persons Injured	Road Accident	Persons killed	Persons Injured
2017	6,851	4,066	7,085	3,368	1,973	3,552	11,893	4,405	11,434	22,112	10,444	22,071
2018	6,726	3,874	7,023	3,504	1,925	3,478	11,513	4,521	11,046	21,743	10,320	21,547
2019	6,883	3,870	7,002	3,824	2,041	3,890	12,773	4,652	12,087	23,480	10,563	22,979
2020	5,764	3,320	5,096	3,257	1,802	2,872	10,093	4,128	12,087	19,114	9,250	20,055
2021	6,424	3,829	6,065	3,560	1,945	3,385	10,967	4,269	9,894	20,951	10,043	19,344

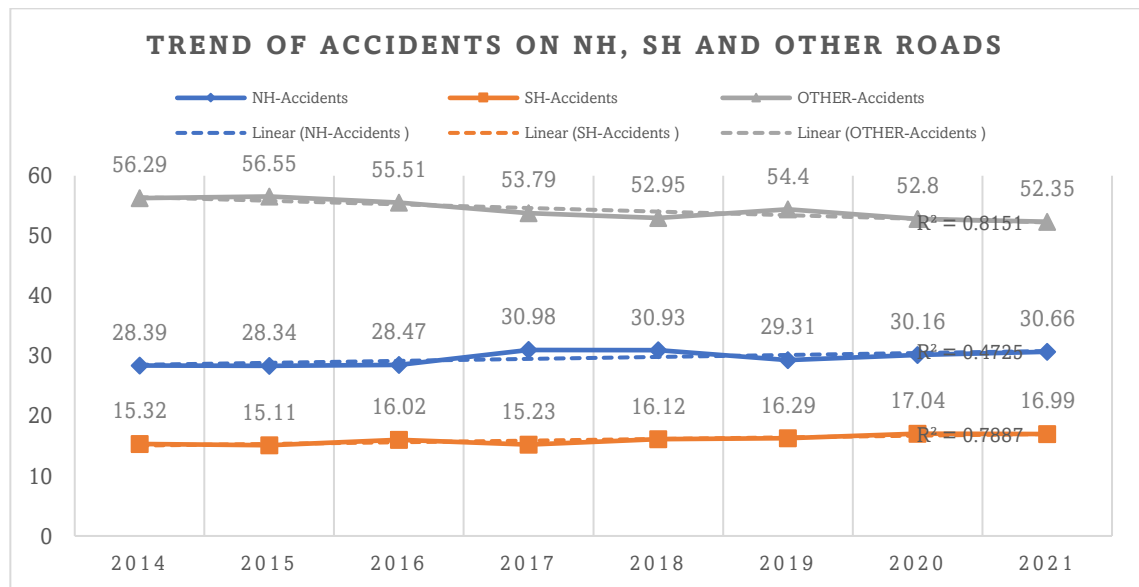
2.9 The percentage share of different categories of roads in total number of accidents, persons killed, and persons injured have remained largely stable with small fluctuations over the years 2014 to 2021 (Table 2.4 & Table 2.5). In percentage terms and in absolute terms also, share of road accidents, persons killed and injured on Highways have in general decreased except for the year 2021 when compared to previous year 2020. The distribution and percentage share of accidents and fatalities among the road categories underline the high accident and fatality rates and high accident severity on the National Highways and State Highways as compared to their share in the total road length of the state. 10.77 percent of NH and SH account for 47.65 percent of road accidents, 57.50 percent of road fatalities and 48.85 percent of accident injuries (**Table 1.3** and **Table 2.5**). However, in respect of Other Roads, parameters of accident show increasing trend both in absolute and relative terms in 2021 over the year 2020.

**Table 2.5: Long-run trend of road accidents, fatalities, and injuries by road categories in percent terms in Rajasthan from 2014 to 2021**

Year	National Highways			State Highways			Other Roads		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
2014	28.38	34.96	29.06	15.32	18.72	15.45	56.29	46.31	55.47
2015	28.34	35.29	28.78	15.11	18.15	14.55	56.55	46.56	56.68
2016	28.47	35.71	29.14	16.02	18.42	16.13	55.51	45.87	54.74
2017	30.98	38.93	32.1	15.23	18.89	16.09	53.79	42.18	51.81
2018	30.93	37.54	32.59	16.12	18.65	16.14	52.95	43.81	51.26
2019	29.31	36.64	30.47	16.29	19.32	16.93	54.4	44.04	52.6
2020	30.16	35.89	25.41	17.04	19.48	14.32	52.8	44.63	60.27
2021	30.66	38.13	31.35	16.99	19.37	17.5	52.35	42.51	51.15

2.10 From the **Chart 2.3**, it can be concluded that Accidents on National and State Highways in general has an increasing trend over years whereas accidents on other type of roads have in general observed a decreasing trend. The CAGR of accidents on NH, SH and Other Roads is 28.82%, 28.82% and 27.62% respectively. It shows that accidents on NH and SH are growing at same pace and accidents on Other roads is growing at marginally lesser pace than those on NH and SH.

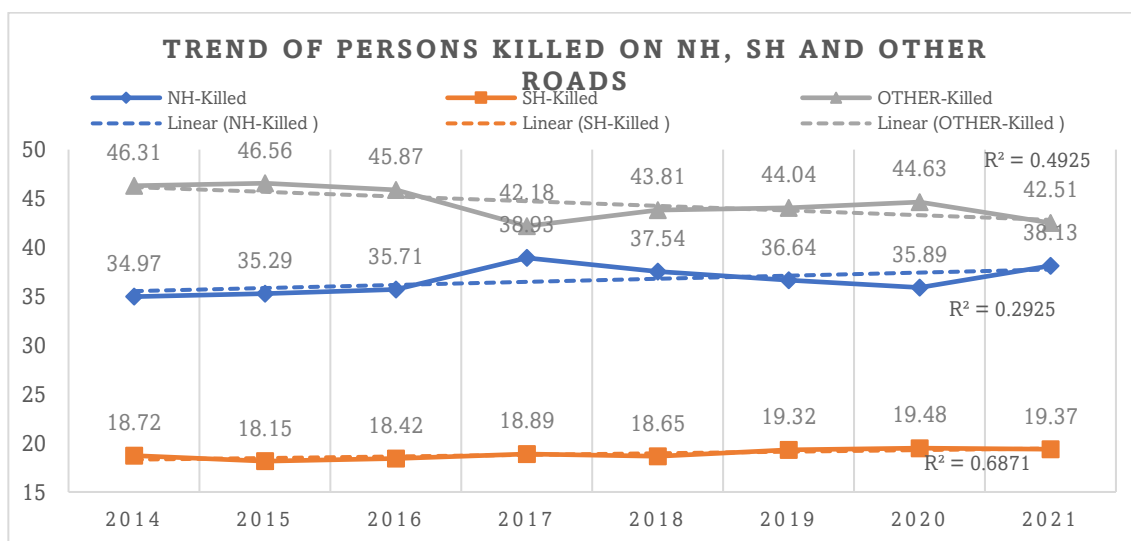
**Chart 2.3: Accidents by Road Categories during Year 2014 to Year 2021**



2.11 From the **Chart 2.4**, it is noticeable that fatality (persons killed in accidents) has in general an increasing trend on National Highways. It was highest in the year 2017 and it again reached almost the same level in year 2021. Fatality on Other type of roads has in general a decreasing trend and it reached its lowest in the year 2017. It marginally increased during year 2020 but came down next year i.e., in year 2021. On the State highways, fatalities have remained constant over the years with marginal fluctuations. It is also noticeable that post 2019, fatalities on SH have been increasing as compared to pre 2019 years. The CAGR of fatalities on NH, SH and Other Roads are 30.36%, 29.73% and 28.95% respectively. It shows that the fatality on NH is growing fastest followed by SH and Other roads.

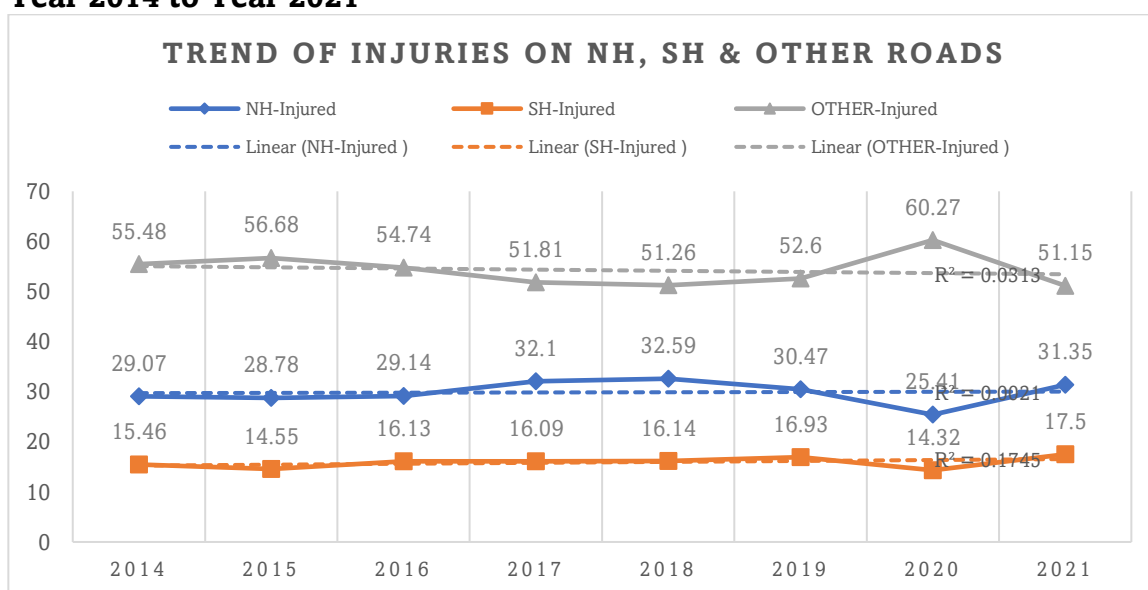


**Chart 2.4: Fatalities by Road Categories in Rajasthan from Year 2014 to Year 2021**



2.12 From the different trend lines in Chart 2.5, it can be clearly observed that percentage of injuries on NH, SH and Other Roads to total injuries have largely remained constant over the years with marginal fluctuations. It is also observed that during years 2015 to 2018, there is increase in accident injuries on NH but decrease on Other Roads. In year 2020, percent of injuries on NH and SH decreased but it increased on Other Roads in the same year. It can also be understood that accident injuries on State Highways have been lower than on NH and Other roads during the period 2014 to 2021.

**Chart 2.5: Percentage of Injuries in Rajasthan by Road Categories during Year 2014 to Year 2021**



## PROFILE FOR ROAD ACCIDENTS – NATIONAL HIGHWAYS

2.13 In this part of the report an analysis of National Highways in Rajasthan relating to following parameters have been made:

- (i) Road Accidents, fatalities, and Injuries during the year 2015 to 2021.
- (ii) Fatal Accidents on National Highways during the year 2016 to 2021.
- (iii) Status of number of Accidents on National Highways in Rajasthan as compared with top 10 States during the year 2018 to 2021.
- (iv) Status of number of fatalities in Rajasthan on National Highways in Rajasthan as compared with top 10 States during the year 2018 to 2021.
- (v) Road Accidents and fatalities on different category of National Highways in Rajasthan as compared with All India average for the year 2021.

2.14 In 2021, 20,951 road accidents were reported in the State, of which, 6,424(30.66%) were on National Highways 3,829 (38.13%) persons were killed and 6,065 (31.35%) persons were injured (**Table 2.2**). There has been a gradual decline in number of deaths and injuries on National Highways from 2017 to 2020 (**Table 2.6** and **Chart 2.6**). Road accidents casualties on National Highways saw an increase in 2021 as compared to 2020 which was due to Covid-19 pandemic and resultant nationwide lockdown. Total number of accidents, fatalities and injuries on national highways decreased in 2021 relative to same period in 2019.

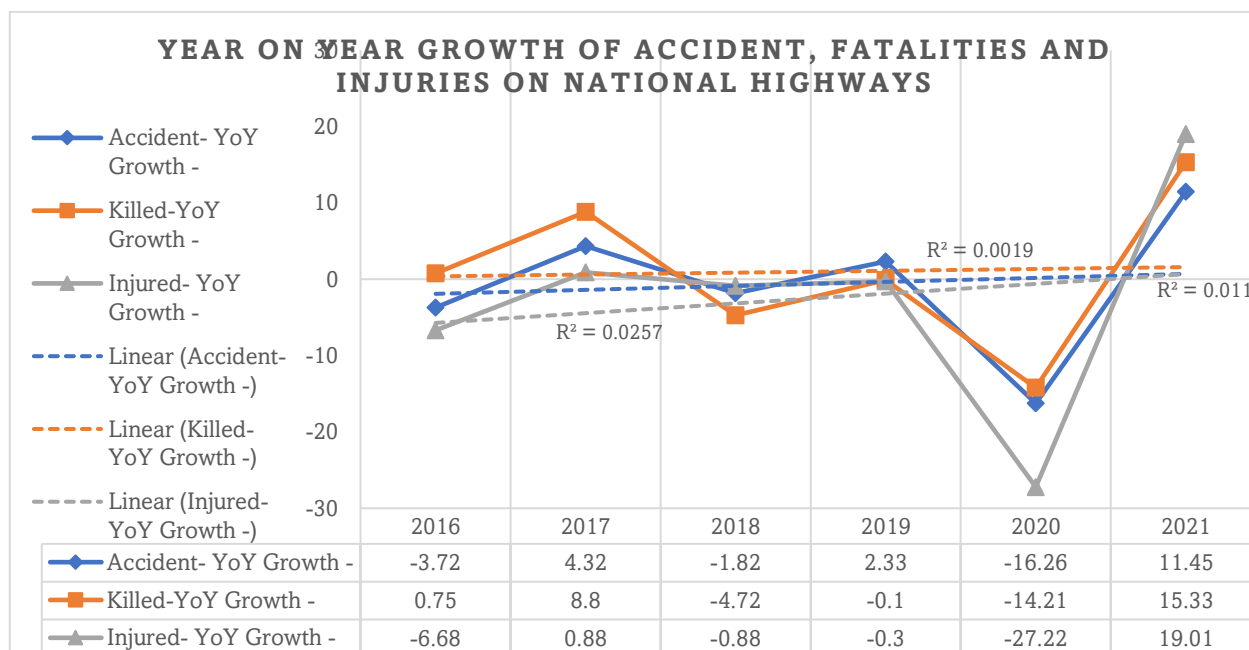
**Table 2.6: Road Accidents, Fatalities, and Injuries on National Highways and Year on Year Growth in Rajasthan from 2015 to 2021**

Year	Accidents	YoY Growth	Persons Killed	YoY Growth	Persons Injured	YoY Growth
2015	6,821	-	3,709	-	7,526	-
2016	6,567	-3.72	3,737	0.75	7,023	-6.68
2017	6,851	4.32	4,066	8.8	7,085	0.88
2018	6,726	-1.82	3,874	-4.72	7,023	-0.88
2019	6,883	2.33	3,870	-0.1	7,002	-0.3
2020	5,764	-16.26	3,320	-14.21	5,096	-27.22
2021	6,424	11.45	3,829	15.33	6,065	19.01

2.15 From the **Chart 2.6**, it can be observed that trend of accidents, fatalities and injuries all have an increasing trend. The highest increase is observed in the injuries on National highways followed by accidents and fatalities. It is submitted that the R<sup>2</sup>

values for trend lines are low showing less degree of confidence ( $R^2$  value near to 1 gives better confidence of association), the linear trends provide fair idea on the growth of accidents, fatalities, and injuries on NH.

**Chart 2.6: Trend of Year-on-Year growth of Accidents, Fatalities, and Injuries on National Highways in Rajasthan for the period 2016 to 2021**



2.16 During 2021, 3,270 fatal accidents took place on National Highways, whereas 2,847 fatal accidents were reported in 2020. Fatal accidents show a general increasing trend except for a sharp decline recorded in 2020 (**Table 2.7**). It is also observed that percentage of fatal accidents to total accidents have varied between 48% to 51% during year 2016 to 2021. In the year 2021, the share of fatal accidents to total accidents was reported as 51%. This implies the necessity of framing strong policy measures so that the percentage share of fatal accidents in total accidents maybe reduced/contained effectively.

**Table 2.7: Fatal Accidents on National Highways**

Year	Accidents	Fatal Accidents	Fatal Accidents (in %)
2016	6,567	3,162	48%
2017	6,851	3,505	51%
2018	6,726	3,372	50%
2019	6,883	3,308	48%
2020	5,764	2,847	49%
2021	6,424	3,270	51%

## Top 10 States in Number of Accidents on National Highways and the status of Rajasthan during 2018 to 2021

- 2.17 Top 10 States listed in the **Table 2.8** are selected on the basis of number of accidents which took place on National Highways as reported by States/UTs during the calendar year 2021. It was found that the same set of States which constituted top 10 in 2019 and 2020 constitutes the top 10 in 2021. Tamil Nadu retains its top position in 2021 for the sixth consecutive year with number of accidents 16,869 (13.1%) followed by Uttar Pradesh with 14,540 (11.3%) accidents, Karnataka with 11,462 (8.9%) accidents, and Madhya Pradesh with 11,030 (8.6%) accidents. Rajasthan ranked 9<sup>th</sup> in the order for number of accidents on national highways in the nation. During the period 2018-2021, Top Ten States have contributed 74.3 percent of total road accidents on National Highways (**Table 2.8**) in the nation.
- 2.18 In order to know the status of Rajasthan in number of accidents and road fatalities the data has been taken from the annual report of MoRTH published for the year 2021. It was found that Rajasthan ranked 9<sup>th</sup> and 4<sup>th</sup> in cases of road accidents and fatalities on National highways.

**Table. 2.8: Top 10 States in number of accidents on National Highways in India**

S. No.	States/UTs	2018	2019	2020	2021
1	Tamil Nadu	19,583	17,633	15,269	16,869
	% Share in Total	13.9	12.9	13.1	13.1
2	Uttar Pradesh	16,198	16,181	13,695	14,540
	% Share in Total	11.5	11.8	11.8	11.3
3	Karnataka	13,638	13,363	11,230	11,462
	% Share in Total	9.7	9.7	9.6	8.9
4	Madhya Pradesh	9,967	10,440	9,866	11,030
	% Share in Total	7.1	7.6	8.5	8.6
5	Andhra Pradesh	8,122	7,682	7,167	8,241
	% Share in Total	5.8	5.6	6.2	6.4
6	Kerala	9,161	9,459	6,594	8,048
	% Share in Total	6.5	6.9	5.7	6.2
7	Maharashtra	9,355	8,360	6,501	7,501
	% Share in Total	6.6	6.1	5.6	5.8
8	Telangana	6,487	7,352	6,820	7,214

S. No.	States/UTs	2018	2019	2020	2021
	% Share in Total	4.6	5.4	5.9	5.6
9	<b>Rajasthan</b>	<b>6,726</b>	<b>6,883</b>	<b>5,764</b>	<b>6,424</b>
	<b>% Share in Total</b>	<b>4.8</b>	<b>5.0</b>	<b>4.9</b>	<b>5.0</b>
10	Bihar	4,016	4,526	4,101	4,349
	% Share in Total	2.9	3.3	3.5	3.4
	<b>Total (Top 10)</b>	<b>1,03,253</b>	<b>1,01,879</b>	<b>87,007</b>	<b>95,678</b>
		73.3	74.3	74.7	74.3
	<b>Total (NH)</b>	<b>1,40,843</b>	<b>1,37,191</b>	<b>1,16,496</b>	<b>1,28,825</b>

## Road Accident Fatalities on National Highways

2.19 During 2021, a total of 3,829, accidents related deaths took place on National Highways in Rajasthan, which constitute about 38.13 percent of total accident deaths in the state. Number fatalities on National Highways reveals a general increasing trend since 2015 except for negative growth recorded in 2019 and 2020 (refer to Table 2.4 and 2.5). National Highways with 4.30 percent of total road network in the State shares about 38.13 percent of total fatalities need concern.

### Top 10 States in Number of Accident Fatalities on National Highways and the status of Rajasthan during 2018 to 2021

2.20 Top 10 States are selected on the basis of number of fatalities reported on National Highways during 2021. Uttar Pradesh retains its top position in road accident fatalities on National level in 2021 like 2020 with (8506) 15.2 percent of fatalities followed by Tamil Nadu (5263) 9.4%, Maharashtra (4080) 7.3%, and Rajasthan (3829) 6.8% which ranked 4th in the state-wise fatalities order. West Bengal is at the bottom (10<sup>th</sup> position) with a share of (2177) 3.9 percent (**Table 2.9**). Top Ten States together accounted for 72.5 percent of accident fatalities on National Highways in 2021.

**Table 2.9: Top 10 States in Number of Fatalities on National Highways in India**

S. No.	States/UTs	2018	2019	2020	2021
1	Uttar Pradesh	8,818	8,830	7,859	8,506
	% Share in Total	16.3	16.4	16.4	15.2
2	Tamil Nadu	4,492	3,956	3,203	5,263

S. No.	States/UTs	2018	2019	2020	2021
	% Share in Total	8.3	7.3	6.7	9.4
3	Maharashtra	4,088	3,799	3,528	4,080
	% Share in Total	7.6	7.1	7.4	7.3
4	<b>Rajasthan</b>	<b>3,874</b>	<b>3,870</b>	<b>3,320</b>	<b>3,829</b>
	<b>% Share in Total</b>	<b>7.2</b>	<b>7.2</b>	<b>6.9</b>	<b>6.8</b>
5	Andhra Pradesh	2,929	3,114	2,858	3,602
	% Share in Total	5.4	5.8	6.0	6.4
6	Bihar	3,051	3,436	3,285	3,517
	% Share in Total	5.6	6.4	6.8	6.3
7	Karnataka	3,986	3,842	3,330	3,487
	% Share in Total	7.4	7.1	6.9	6.2
8	Madhya Pradesh	2,601	2,904	3,022	3,389
	% Share in Total	4.8	5.4	6.3	6.1
9	Telangana	2,064	2,491	2,620	2,735
	% Share in Total	3.8	4.6	5.5	4.9
10	West Bengal	2,150	2,002	1,810	2,177
	% Share in Total	4.0	3.7	3.8	3.9
	<b>Total (Top 10)</b>	<b>38,053</b>	<b>38,244</b>	<b>34,835</b>	<b>40,585</b>
		70.4	71.0	72.6	72.5
	<b>Total (NH)</b>	<b>54,046</b>	<b>53,872</b>	<b>47,984</b>	<b>56,007</b>

## Road Accidents and Fatalities on different categories of National Highways during 2020 and 2021

- 2.21 National Highways are being controlled for the purpose of maintenance of road network by various agencies like National Highway Authority of India (NHAI), Public Works Department (PWD) of the concerned State through which the National Highway is passing and by other departments which include Local Municipal Bodies. The road accidents and fatalities have also been analysed on the basis of these three categories in the forthcoming paragraphs of the report.
- 2.22 In the year 2021, 91.49 percent (5,877) of accidents and 91.54 percent (3,505) of accidents related deaths in Rajasthan took place on National Highways falling under the administrative control of NHAI in 2021. National Highways falling under State PWD accounted for nearly 5.76 percent (370) of road accidents and 5.51 percent (211) of Road Accident deaths. The remaining 2.76 percent (177) accidents and 2.95

percent (113) Road Accident deaths are accounted for National Highways under other Departments (**Table 2.10**).

**Table 2.10: Road Accidents and Fatalities on different categories of NH in Rajasthan in 2020 and 2021 as compared with the All-India average for corresponding years.**

S. No.	Category	2020		2021		% Change in 2021 over 2020		All India 2021	
		Accident	Fatality	Accident	Fatality	Accident	Fatality	Accident	Fatality
1	National Highway under NHAI	5,191	3,021	5,877	3,505	13.22	16.02	90,071	41,810
	Share in total	90.06	90.99	91.49	91.54			69.9	74.7
2	National Highway Under State PWD	336	181	370	211	10.12	16.57	32,639	11,689
	Share in total	5.83	5.45	5.76	5.51			25.3	20.9
3	National Highway Under Other Departments	237	118	177	113	-25.32	-4.24	6,115	2,508
	Share in total	4.11	3.55	2.76	2.95			4.7	4.5
	<b>Total</b>	<b>5,764</b>	<b>3,320</b>	<b>6,424</b>	<b>3,829</b>			<b>1,28,825</b>	<b>56,007</b>

2.23 The percentage share of road accidents and fatalities on the National Highways under State PWD of Rajasthan is far less than the All India average both in the year 2020 and 2021. The percentage share of Rajasthan under this category is 5.76 and 5.51 percent as compared with All India average of 25.3% and 20.9% in road accidents deaths and road accidents fatalities respectively (**Table 2.10**).

### Profile of Road Accidents – State Highways

2.24 State Highways (SH) with 15,514 kilometres of road constitute 6.47 percent of total road network in the State (**Table 1.3**). In 2021, total of 20,951 road accidents were reported, of which, 3,560 were on State Highways (16.99%) killing 1,945 (19.37%) people and causing injury to 3,385 (17.5%) persons (**Table 2.11**). The number of

road accident on State Highways shows increasing trend during 2015 to 2020 except for a marginal decrease recorded in 2017 and 2020. However, total number of accidents increased from 3,257 in 2020 to 3,560 in 2021, but when compared with 2019, there is about 6.9 percent decline in total number of accidents in 2021.

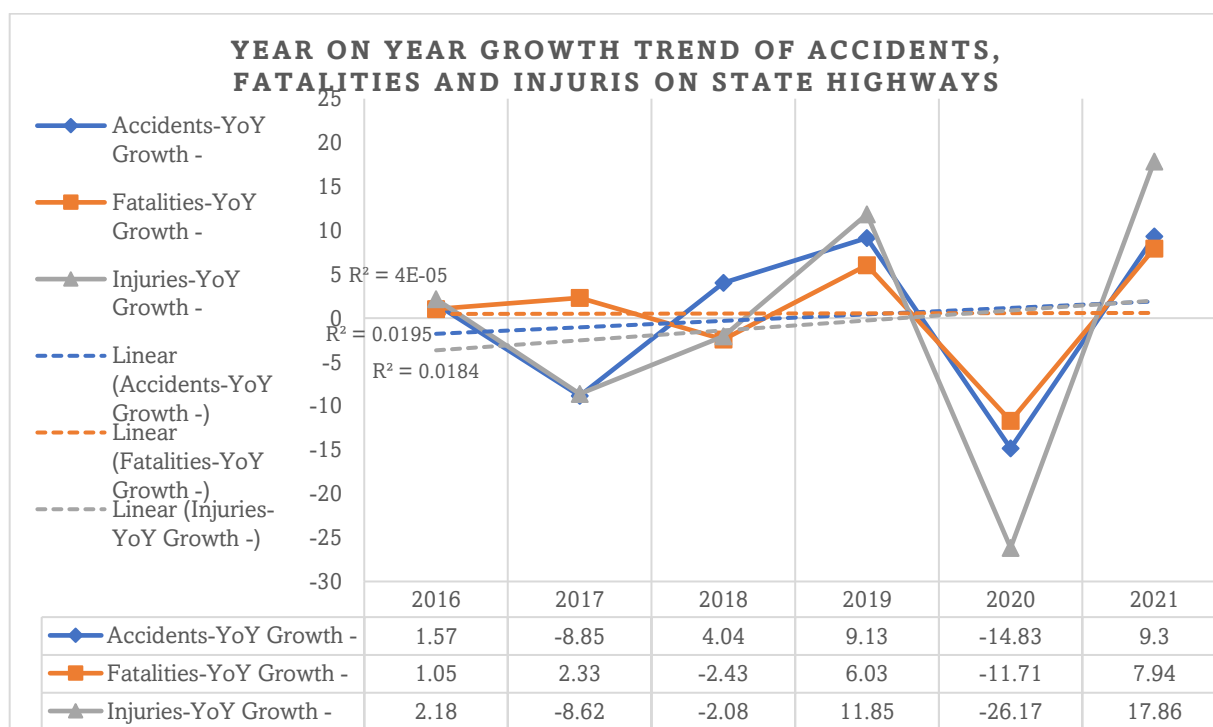
**Table 2.11: Total number of Accidents, Persons Killed and Injured on State Highways in Rajasthan from 2015 to 2021 vis-à-vis All India 2021**

Year	Accidents	YoY Growth	Persons Killed	YoY Growth	Persons Injured	YoY Growth
2015	3,638	-	1,908	-	3,804	-
2016	3,695	1.57	1,928	1.05	3,887	2.18
2017	3,368	-8.85	1,973	2.33	3,552	-8.62
2018	3,504	4.04	1,925	-2.43	3,478	-2.08
2019	3,824	9.13	2,041	6.03	3,890	11.85
2020	3,257	-14.83	1,802	-11.71	2,872	-26.17
2021	3,560	9.3	1,945	7.94	3,385	17.86
All India 2021	96,382	6.2	37,963	14.5	92,583	5.0

2.25 The number of road accident deaths and injuries on State Highways presented in **Chart 2.7** show increasing trend since 2016. There is sharp decrease in year 2020 in accidents, fatalities and injuries which was on account of the impact of lockdown and controlled vehicle movement during the year 2020. However, in year 2021, it again increased significantly but did not reach the level of year 2019. The reduction in road accidents, fatalities and injuries in year 2021 was to the extent of 6.90%, 4.70% and 12.98% respectively when compared with the year 2019 (**Table 2.11**).



**Chart 2.7: Year on year growth of accidents, fatalities, and injuries on States Highways in Rajasthan during the period 2016 to 2021.**



### Profile of Road Accidents – Other Roads

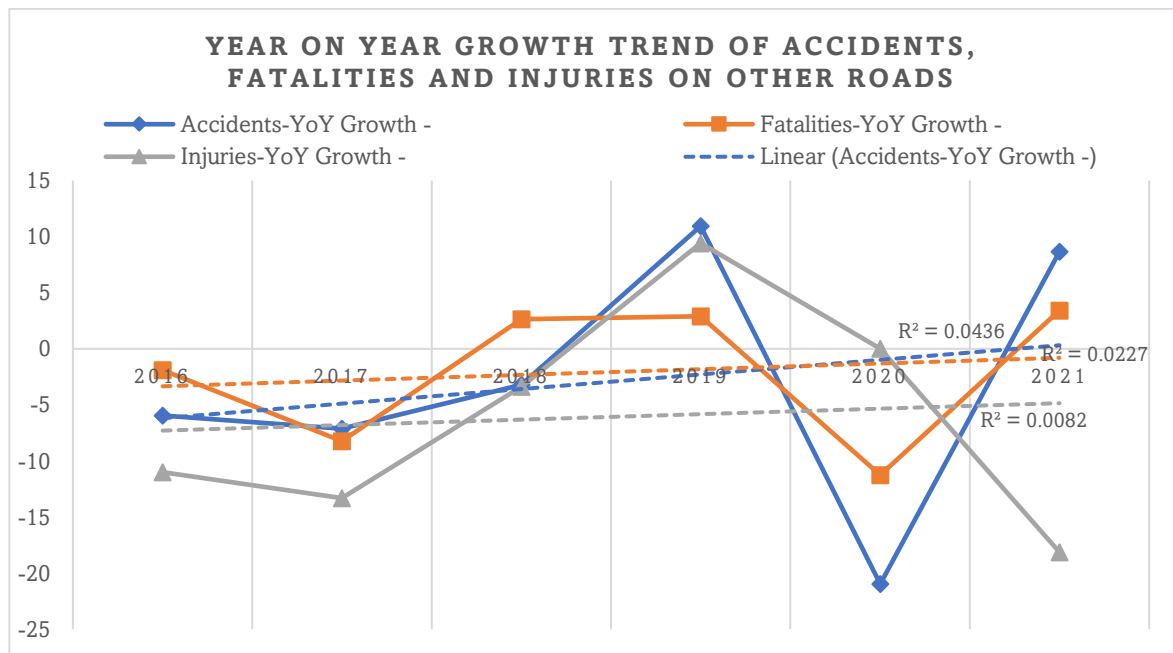
2.26 Other roads include District Roads, Rural Roads, Urban Roads, and Project Roads which together accounted for 89.23 percent (2,13,982 km) of total road network in the State. In 2021, 20,951 road accidents were reported, of which, 10,967 were on other roads, killing 4,269 persons and causing injury to 9,894 persons. The other roads share in road accidents was 52.35% of total road accidents and the share of fatalities was 42.51% of total fatalities in the State during 2021 (**Table 1.3 & Table 2.12**). Number of accidents and fatalities on other roads reveal a general increasing trend during 2016 to 2021 whereas trend of injuries has generally remained constant across the years (**Chart 2.8**).

**Table 2.12: Total number of Accidents, Persons Killed and Injured on Other Roads in Rajasthan from 2015 to 2021**

Year	Accidents	YoY Growth	Persons Killed	YoY Growth	Persons Injured	YoY Growth
2015	13,613	-	4,893	-	14,823	-

Year	Accidents	YoY Growth	Persons Killed	YoY Growth	Persons Injured	YoY Growth
2016	12,804	-5.94	4,800	-1.9	13,193	-11
2017	11,893	-7.11	4,405	-8.23	11,434	-13.33
2018	11,513	-3.2	4,521	2.63	11,046	-3.39
2019	12,773	10.94	4,652	2.9	12,087	9.42
2020	10,093	-20.98	4,128	-11.26	12,087	0
2021	10,967	8.66	4,269	3.42	9,894	-18.14
All India 2021	1,87,225	17.8	60,002	18.6	1,74,100	15.9

**Chart 2.8: Trend in number of accidents, fatalities and injuries on Other Roads in Rajasthan (2015-2021)**



## CHAPTER-3

### CAUSES OF ROAD ACCIDENTS

- 3.1 Road accidents are multi-causal and are the result of an interplay of various factors. The major causes of road accidents are lack of awareness/knowledge of traffic rules in general public, defective road engineering, use of defective/unfit vehicles on public roads, adverse road conditions and lack of enforcement activities by the concerned authorities. However in the annual report published by Ministry of Road Transport & Highways on Road Accidents it has broadly categorized the cause of accident into following heads:
- (i) human error or drivers fault
  - (ii) road condition/environment and
  - (iii) vehicular condition.

Hence, in this chapter, the analysis of causes of road accidents in Rajasthan has been made by SDRI on the basis of above three factors as data relating to other factors is not available with SDRI. The data relating to Rajasthan has been taken from the annual report “Road Accidents in India 2021” and other reports published by Ministry of Road Transport & Highways (MoRTH). Any strategy for designing the counter measures for containing road accidents should be based on a safe systems approach which includes promoting education in the field of road safety, road engineering, vehicular engineering and strict enforcement activities.

#### HUMAN ERROR OR DRIVER’S FAULT

- 3.2 Accidents falling under the category of human error includes
- (i) traffic rule violations,
  - (ii) driving without valid driver license and
  - (iii) non-use of safety devices.

#### TRAFFIC RULES VIOLATIONS

- 3.3 Traffic rule violations mainly include violations of over speeding, drunken driving, driving on wrong side/lane indiscipline, jumping of red light, use of mobile phone while driving a vehicle. Road accidents attributable to various types of traffic rule violations in Rajasthan reveals that '**over speeding**' constitute the main violation associated with road accidents, accidents-related deaths and injuries in Rajasthan.

During 2021, 'over speeding' accounted for 81.59 percent of the road accidents, 82.01 percent of total deaths and 80.9 percent of total injuries. The number of accidents due to 'over speeding' increased by 5.97 percent, fatalities by 4.70 percent and injuries by 11.46 percent in 2021 over the year 2020. 'Driving on wrong side' is the second most important cause accounting for 5.29 percent of the road accidents, 4.93 percent of road fatalities and 5.65 percent of injuries during 2021 (**Table 3.1**).

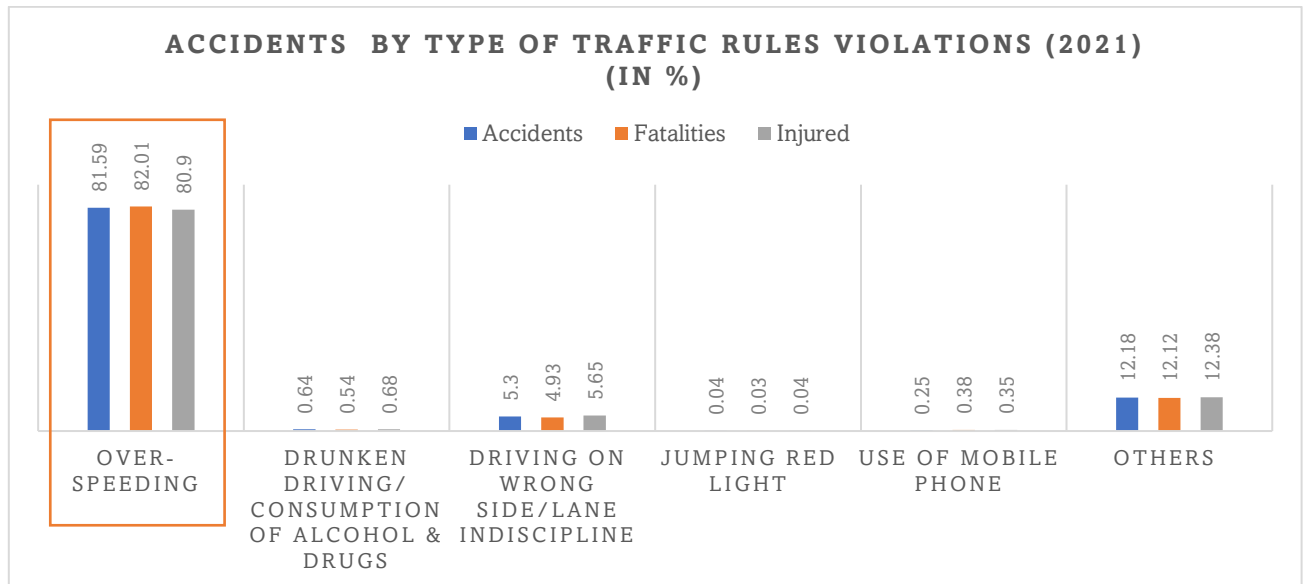
- 3.4 Drunken driving/consumption of alcohol & drugs, jumping of red light and use of mobile phones taken together accounted for 0.93 percent of total accidents and 0.95 percent of total deaths in Rajasthan. The others category which would include reasons like road environment, vehicular condition etc. accounted for almost 12.18 percent of the accidents, 12.12 percent of accidents related deaths and 12.38 percent of injuries. (**Table 3.1**)
- 3.5 Violation of any traffic rule constitutes human error or driver's fault. But from the perspective of road safety strategy the above violations such as over speeding and driving on wrong side does not constitute human error alone, but it also includes possible fault in road design. This approach opens the scope for including road engineering measures to address problems which are, prima facie, considered to be human error and enforcement issues.
- 3.6 The data relating to above traffic violations for the year 2020 and 2021 has been depicted in the **Table 3.1** and **Chart 3.1**

**Table 3.1: Road Accidents by Type of Traffic Rule Violations in Rajasthan during 2020 and 2021**

Category	2020			2021			% Change in 2021 over 2020		
	Accidents	Fatalities	Injured	Accidents	Fatalities	Injured	Accidents	Fatalities	Injured
Over-speeding	16,131	7,866	14,041	17094	8236	15650	5.97	4.7	11.46
% Share in total	84.39	85.04	83.73	81.59	82.01	80.9	-	-	-
Drunken driving/consumption of alcohol & drugs	161	63	138	135	54	132	-16.15	-14.29	-4.35
% Share in total	0.84	0.68	0.82	0.64	0.54	0.68	-	-	-
Driving on wrong	1,205	533	1,161	1110	495	1093	-7.88	-7.13	-5.86

Category	2020			2021			% Change in 2021 over 2020		
	Accidents	Fatalities	Injured	Accidents	Fatalities	Injured	Accidents	Fatalities	Injured
side/Lane indiscipline									
% Share in total	6.3	5.76	6.92	5.29	4.93	5.65	-	-	-
Jumping red light	21	7	15	9	3	8	-57.14	-57.14	-46.67
% Share in total	0.11	0.08	0.09	0.04	0.03	0.04	-	-	-
Use of mobile phone	68	45	51	52	38	67	-23.53	-15.56	31.37
% Share in total	0.36	0.49	0.3	0.25	0.38	0.35	-	-	-
Others	1,528	736	1,363	2,551	1,217	2,394	66.95	65.35	75.64
% Share in total	7.99	7.96	8.13	12.18	12.12	12.38	-	-	-
All Rajasthan	19,114	9,250	16,769	20,951	10,043	19,344	-	-	-

**Chart 3.1: Percent share of different types of traffic violations in Road Accidents in year 2021**



## DRIVING WITHOUT VALID DRIVER LICENSE

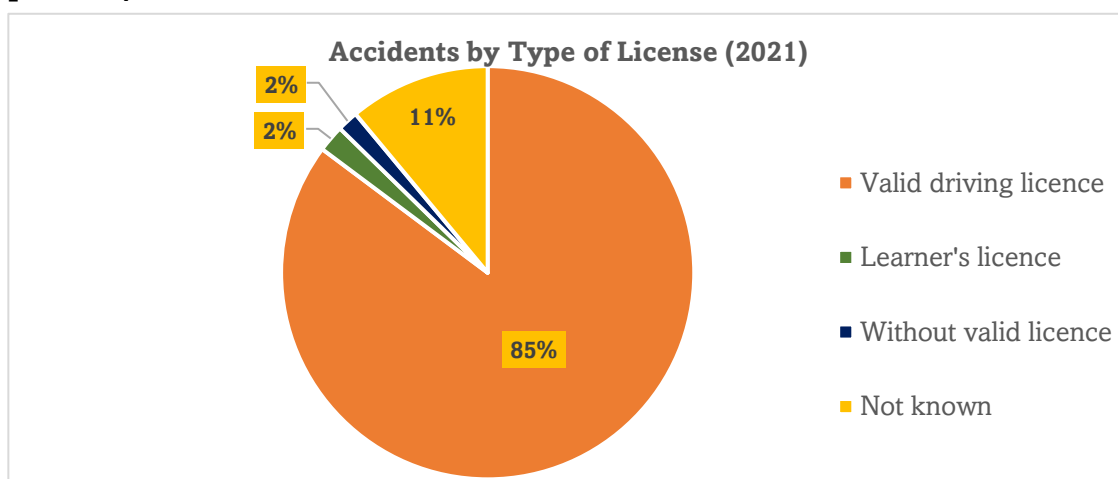
- 3.7 Vehicles driven by untrained and unqualified drivers are serious traffic hazard. Though the problem is basically an enforcement issue, it must also be addressed with better facilities and opportunities for training/skilling and evaluation/testing. In this regard MoRTH has long back initiated a scheme of opening of model Institute of Driving and Training Research (IDTRs) in most of the States of the country. Similarly in Rajasthan also the department of Transport and Road Safety has initiated the testing of drivers for grant of driving license on automated driving tracks in some of the Districts of the State.
- 3.8 During 2021, road accidents involving drivers with learner's licence and without valid licence together constitute 3.74 percent of total accidents in Rajasthan (**Table 3.2**). The number of accident cases involving drivers without valid driving licence has decreased from 372 in 2020 to 344 in 2021, registering a decline of 7.53 percent corresponding to the same period last year. There is need for improved enforcement and also for establishment of quality driving schools and testing centres. Accidents involving learner's license increased from 343 in 2020 to 439 in 2021, registering an increase of about 27.99 percent over 2020. It may be seen in the **Chart 3.2** that more than 85 percent of accident involve drivers with valid driving licences which is a matter of great concern and it indicates that the persons holding valid driving licenses are either very casual while driving the vehicle or are not fully trained and eligible for obtaining a driving license. It is expected that action against drivers involved in causing road accidents, fatalities and injuries may be initiated by the competent officers of the Transport department which includes disqualifying such delinquent drivers from holding driving licenses as provided in section 19 of the Motor Vehicles Act, 1988 and rule 21 of the Central Motor Vehicles Rules, 1989.

**Table 3.2: Road accidents by Type of License in Rajasthan from 2018 to 2021**

Type of Licence	2018	2019	2020	2021	% Change in 2021 over 2020
Valid driving licence	19206	21,114	16,634	17,852	7.32
% Share in total	88.33	89.92	87.03	85.21	-
Learner's licence	558	454	343	439	27.99
% Share in total	2.57	1.93	1.79	2.1	-

Type of Licence	2018	2019	2020	2021	% Change in 2021 over 2020
Without valid licence	548	514	372	344	-7.53
% Share in total	2.52	2.19	1.95	1.64	-
Not known	1431	1,398	1,765	2,316	31.22
% Share in total	6.58	5.95	9.23	11.05	-
<b>Total</b>	<b>21,743</b>	<b>23,480</b>	<b>19,114</b>	<b>20,951</b>	<b>9.61</b>

**Chart 3.2: Road accidents by type of license during 2021 in Rajasthan (in percent)**



## NON-USE OF SAFETY DEVICES - HELMETS AND SEATBELTS

3.9 Section 129 of the Motor Vehicles Act, 1988 provides for compulsory wearing of helmet while driving a motor-cycle and rule 138 (3) of the Central Motor Vehicles Rules, 1989 provides for wearing of a seat belt for the driver and the person seated in front seat or the persons occupying front facing rear seat while driving a four wheeled vehicle. It is an established fact that non- usage of safety devices such as helmets and seatbelts do not cause accidents but are critical for averting fatal and grievous injuries in the event of a road accident. Helmet is mandatory for all motorists on two-wheelers, barring few exemptions. During 2021, in Rajasthan a total of 2,909 persons were killed due to non-wearing of helmet, of which 2,019 (69.41%) persons were drivers and 890 (30.59%) were passengers. Similarly, for the same period, about 1,380 persons killed due to non- wearing of seat belt of which, 628 (45.51%) were drivers and remaining 752 (54.49%) were passengers (**Table 3.3**). Non-wearing of helmets caused injuries to 4,831 persons and non-wearing of seat belt caused injuries to 2,707 persons during 2021.

**Table 3.3: Persons killed and injured due to non-use of safety devices (helmets and seat belts) in Rajasthan during 2021 vis-à-vis All India 2021**

Category	Rajasthan 2021				All India 2021			
	Non wearing of Helmet		Non wearing of Seat Belt		Non wearing of Helmet		Non wearing of Seat Belt	
	Killed	Injured	Killed	Injured	Killed	Injured	Killed	Injured
<b>Drivers</b>	2019	2,734	628	945	32,877	57,264	8,438	16,416
<b>% Share in Total</b>	69.41	56.59	45.5	34.91	70.6	61.1	51.5	41.8
<b>Passenger</b>	890	2,097	752	1,762	13,716	36,499	7,959	22,815
<b>% Share in Total</b>	30.59	43.41	54.5	65.09	29.4	38.9	48.5	58.2
<b>Total</b>	2,909	4,831	1,380	2,707	46,593	93,763	16,397	39,231

3.10 In case a comparison is made with reference to the cases relating to non-use of safety devices like helmets and seat belts with reference to the All India figures of 2021 with the figures of same year of Rajasthan, the percentage of number of persons killed for non-wearing of helmet in Rajasthan was 6.24 whereas the percentage of number of persons killed for non-wearing of seat belt in Rajasthan was 8.41 percent of the All India cases. In case the persons killed for not wearing helmet and seat belts in Rajasthan is compared in percentage terms with reference to the All India level it is evident that the number of persons killed and injured under these two heads in the State is less than the All India level.

## ACCIDENTS BY ROAD ENVIRONMENT

3.11 The category of road environment includes-

- (i) accidents happening in a particular geographical area (residential, institutional, market/ commercial area, etc.),
- (ii) those related to the type of road features including straight, curved, steep, etc.,
- (iii) type of junction & type of traffic control,
- (iv) weather condition, etc.

3.12 Indicators of neighbourhoods reveal a general increase in number of accidents, fatalities, and injuries in Rajasthan in 2021 relative to 2020. Residential areas, institutional areas and market/commercial areas tend to have traffic congestion and hence, higher exposure to road accidents. The data for 2021, however, reveals 61.65 percent of accidents, 68.62 percent of death and 62.04 percent of injuries occurred

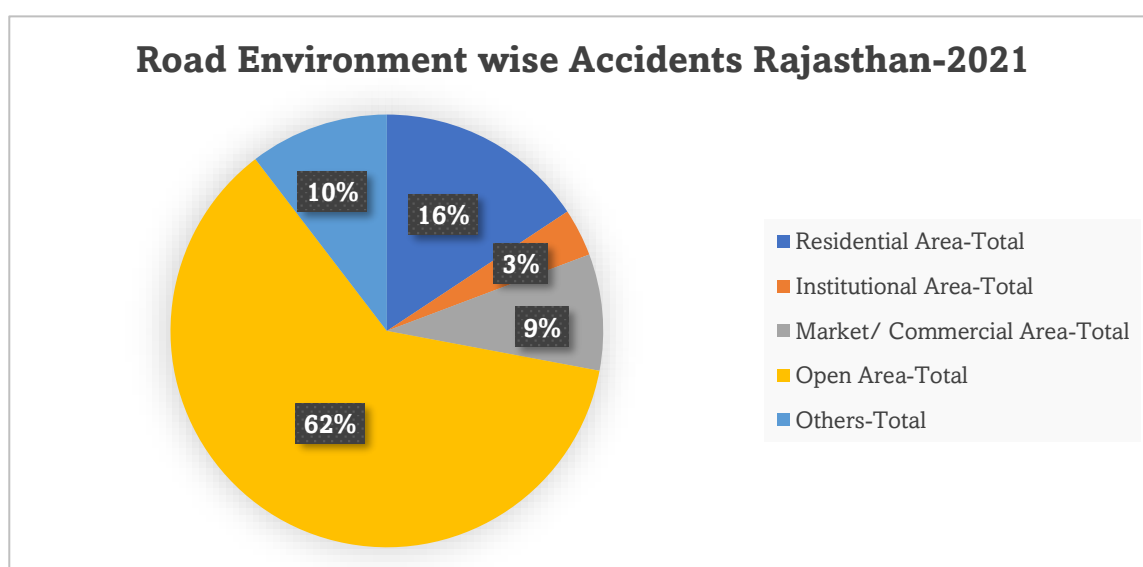


in open area, i.e., locations which normally do not have any human activities in the vicinity. Residential area is in the second place with 15.7 per cent of total accidents and 12.93 per cent of total fatality and 15.59 percent of total injuries. Market/commercial areas accounted for 8.69 percent of total accidents, 5.79 percent of fatalities and 9.27 percent of injuries (**Table 3.4** and **Chart 3.3**).

**Table 3.4: Accidents classified by type of neighbourhoods (Residential area, institutional area and market/commercial area, open area, etc.) in Rajasthan during 2021**

Area	Total accidents			Persons killed			Persons Injured		
	2020	2021	% Change	2020	2021	% Change	2020	2021	% Change
Residential Area	2878	3,290	14.32 %	1131	1,299	14.85 %	2,529	3,015	19.22 %
% Share in total	15.06	15.7	0.64%	12.23	12.93	0.7 %	15.08	15.59	0.51 %
Institutional Area	672	745	10.86%	228	248	8.77 %	633	666	5.21 %
% Share in total	3.52	3.56	0.04 %	2.46	2.47	0.01 %	3.77	3.44	-0.33 %
Market/ Commercial area	1,808	1,821	0.72 %	694	582	-16.14 %	1,691	1,793	6.03 %
% Share in total	9.46	8.69	-0.77 %	7.5	5.79	-1.71 %	10.08	9.27	-0.81 %
Open Area	11,972	12,916	7.89 %	6,335	6,892	8.79 %	10,405	12,001	15.34 %
% Share in total	62.63	61.65	-0.98 %	68.49	68.62	0.13 %	62.05	62.04	-0.01 %
Others	1,784	2,179	22.14 %	862	1,022	18.56 %	1,511	1,869	23.69 %
% Share in total	9.33	10.4	1.07 %	9.32	10.18	-0.86 %	9.01	9.66	0.65 %
<b>Total</b>	<b>19114</b>	<b>20951</b>	<b>9.61 %</b>	<b>9250</b>	<b>10043</b>	<b>8.57 %</b>	<b>16769</b>	<b>19344</b>	<b>15.36 %</b>

**Chart 3.3: Accident classified by type of Neighbourhoods in Rajasthan in 2021**



- 3.13 Institutional area accommodating institutions such as schools, colleges, hospitals, or large government establishments also tend to have traffic congestion on account of vehicular and pedestrian traffic. The share of accidents occurring in institutional area in the total accidents in Rajasthan is lower and is 3.56 percent of total accidents, 2.47 percent of fatalities and 3.44 percent of persons injured in the year 2021. The cause of lesser number of accidents, fatalities and injuries in residential, institutional and commercial areas as compared with open areas may be explained in terms of better enforcement of traffic rules in these areas. The higher rate of accidents, fatalities and injuries may be as a result of lower enforcement presence, thereby prone to dangerous driving and traffic rules violations. This problem of open area may be handled by enforcing electronic surveillance by using speed guns, CCTVs and by use of other technological tools.
- 3.14 It is submitted that by enacting the Motor Vehicles (Amendment) Act, 2019 a new section 136-A has been enacted in the Motor Vehicles Act, 1988 where in electronic monitoring and enforcement of road safety on the National Highways, State Highways, roads or in any urban city within a State up to a specified population has been provided. In this regard rule 167A has also been notified in the Central Motor Vehicles Rules, 1989 on 11.08.2021 wherein use of electronic enforcement devices such as speed camera, CCTV camera, speed gun, body wearable camera, dashboard camera, automatic number plate recognition (ANPR), weigh in machine (WIN) and other technology based equipments have been allowed for electronic monitoring and enforcement of road safety. Besides this, 132 non attainment/million plus cities in India under National Clean Air Programme (NCAP) have been notified under this rule for placing of electronic enforcement devices. Five cities of Rajasthan namely Alwar, Jaipur, Jodhpur, Kota and Udaipur fall in this rule.

## **ROAD ACCIDENTS CLASSIFIED BY ROAD FEATURES**

- 3.15 Road features such as sharp curves, potholes and steep grade tend to be accident prone because it takes skill, extra care and alertness to negotiate these road features. The data containing various road features along with number of accidents, fatalities, and injuries for the years 2020 and 2021 is given in **Table 3.5** of this report. The parameters indicate decrease in year 2021 as compared with the year 2020 have been indicated in green colour and those parameters which have registered an increase have been indicated in red colour in **Table 3.5**. During 2021, there has been substantial decrease across accidents, fatalities and injuries on curved roads,

culverts, potholes and at ongoing road works/under-construction road sites. When these factors are combined, they account for 10.52% of accidents, 9.80% of fatalities and 10.57% of total injuries during year 2020 these three parameters have registered a decline of 6.68% of accidents, 6.46% of fatalities and 6.70% of total injuries in year 2021.

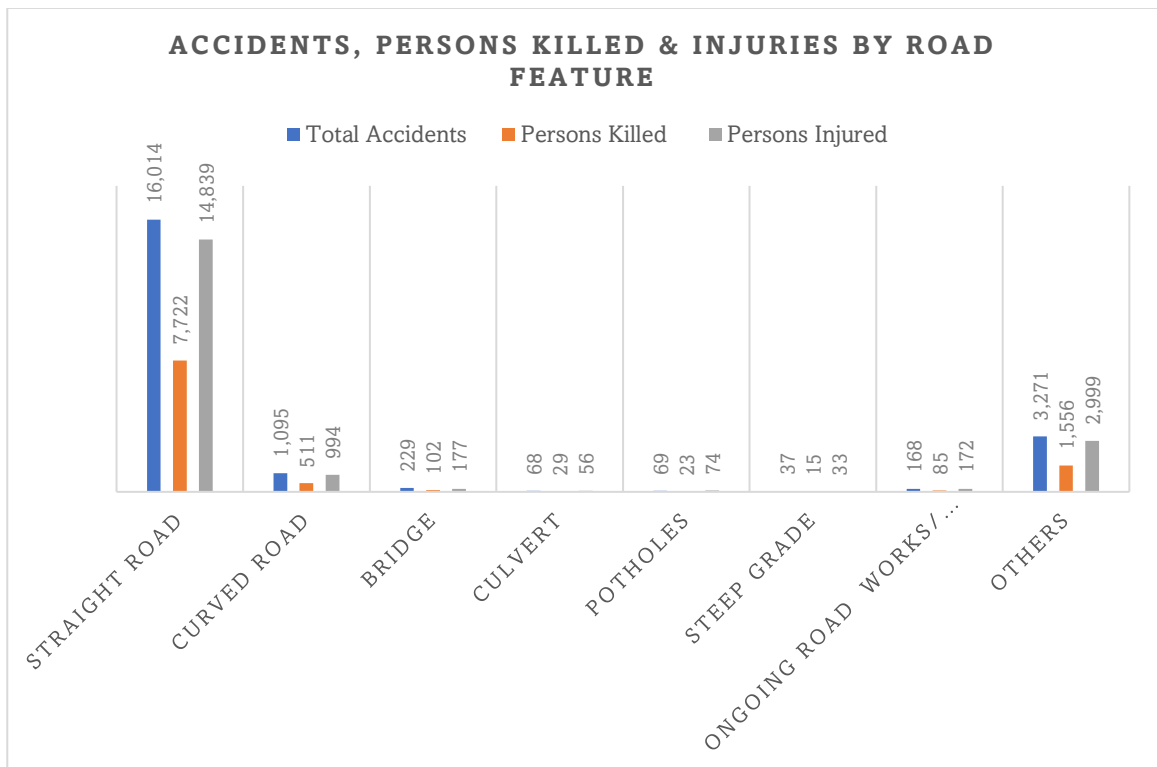
3.16 It is also observed that more than 73% of accidents fatalities and injuries have taken place on straight roads in both the years. It also increased in year 2021 as compared with 2020 by 13.98% in total accidents, 12.58% in fatalities and 20.07% in injuries which is a major cause of concern. Vehicle speed tends to be high on straight roads in open areas which is responsible for the high percentage of road accidents, persons killed and injured on these roads in year 2021 (**Table 3.4, Table 3.5** and **Chart 3.4**). The data, however, suggests that road safety measures must not be ignored even on straight road stretches which are normally considered to be less risky, but which require more supervision and vigilance on these stretches of roads by way of electronic enforcement devices.

**Table 3.5: Road Feature wise accidents, fatalities and injured in Rajasthan during year 2020 and 2021**

Road Feature	Total Accidents			Persons Killed			Persons Injured		
	2020	2021	% Change	2020	2021	% Change	2020	2021	% Change
<b>Straight Road</b>	14,050	16,014	13.98	6,859	7,722	12.58	12,359	14,839	20.07
<b>% Share in Total</b>	73.51	76.44	-	74.15	76.89	-	73.7	76.71	-
<b>Curved Road</b>	1,445	1,095	-24.22	642	511	-20.4	1,264	994	-21.36
<b>% Share in Total</b>	7.56	5.23	-	6.94	5.09	-	7.54	5.14	-
<b>Bridge</b>	218	229	5.05	93	102	9.68	194	177	-8.76
<b>% Share in Total</b>	1.14	1.09	-	1.01	1.02	-	1.16	0.92	-
<b>Culvert</b>	129	68	-47.29	46	29	-36.96	122	56	-54.1
<b>% Share in Total</b>	0.67	0.32	-	0.5	0.29	-	0.73	0.29	-
<b>Potholes</b>	120	69	-42.5	50	23	-54	127	74	-41.73
<b>% Share in Total</b>	0.63	0.33	-	0.54	0.23	-	0.76	0.38	-
<b>Steep Grade</b>	39	37	-5.13	14	15	7.14	27	33	22.22
<b>% Share in Total</b>	0.2	0.18	-	0.15	0.15	-	0.16	0.17	-

Road Feature	Total Accidents			Persons Killed			Persons Injured		
	2020	2021	% Change	2020	2021	% Change	2020	2021	% Change
<b>Ongoing road works/ Under construction</b>	317	168	-47	168	85	-49.4	259	172	-33.59
<b>% Share in Total</b>	1.66	0.8	-	1.82	0.85	-	1.54	0.89	-
<b>Others</b>	2,796	3,271	16.99	1,378	1,556	12.92	2,417	2,999	24.08
<b>% Share in Total</b>	14.63	15.61	-	14.9	15.49	-	14.41	15.5	-
<b>Total</b>	19,114	20,951	9.61	9,250	10,043	8.57	16,769	19,344	15.36

**Chart 3.4: Accidents, Persons killed and Injuries by Road Feature in Rajasthan in 2021**



### ACCIDENTS BY ROAD JUNCTION TYPE & TRAFFIC CONTROL

3.17 Road junctions are points where the traffic merges and hence are more prone to accidents. However, the data of Rajasthan reflects that only 15.46 percent of the accidents in 2021 took place at various types of junctions defined in the **Table 3.6** and about 84.54 percent of the accidents took place in the 'Others' category.

Similarly, about 14.07 percent of fatalities took place on various junctions in 2021. Within the Junction's category, 'T-Junction' accounts for the largest share of accidents, persons killed and injured followed by 'Staggered Junction'. In year 2021, both combined accounted for 7.92% of total accidents, 7.36% of fatalities and 7.04% of injuries (**Table 3.6**).

**Table 3.6: Accident by Type of Road Junctions in Rajasthan in 2020 and 2021**

Junction Type	Total Accidents			Persons Killed			Persons Injured		
	2020	2021	% Change	2020	2021	% Change	2020	2021	% Change
<b>T-Junction</b>	907	909	0.22	374	386	3.21	812	756	-6.9
<b>% Share in Total</b>	4.75	4.34	-	4.04	3.84	-	4.84	3.91	-
<b>Y-Junction</b>	185	360	94.59	78	165	111.54	156	294	88.46
<b>% Share in Total</b>	0.97	1.72	-	0.84	1.64	-	0.93	1.52	-
<b>Four arm Junction</b>	489	492	0.61	151	179	18.54	441	394	-10.66
<b>% Share in Total</b>	2.56	2.35	-	1.63	1.78	-	2.63	2.04	-
<b>Staggered Junction</b>	698	749	7.31	362	354	-2.21	654	605	-7.49
<b>% Share in Total</b>	3.65	3.58	-	3.91	3.52	-	3.9	3.13	-
<b>Round about Junction</b>	447	730	63.31	209	329	57.42	354	646	82.49
<b>% Share in Total</b>	2.34	3.48	-	2.26	3.28	-	2.11	3.34	-
<b>Others*</b>	16,388	17,711	8.07	8,076	8,630	6.86	14,352	16,649	16
<b>% Share in Total</b>	85.74	84.54	-	87.31	85.93	-	85.59	86.07	-
<b>Total</b>	<b>19,114</b>	<b>20,951</b>	<b>9.61</b>	<b>9,250</b>	<b>10,043</b>	<b>8.57</b>	<b>16,769</b>	<b>19,344</b>	<b>15.36</b>

3.18 All junction types have different types of traffic control measures such as traffic light signals, police-controlled signals, stop sign signals, flashing signals/blinkers and uncontrolled signals. **Table 3.7** reveals highest number of accidents, persons killed and injured took place on uncontrolled crossings and accounted for 13.61% of the total accidents, 12.98% of the people killed and 12.25% of the people injured in 2021. Further, it is noted that the maximum reduction in the number of accidents, persons killed and persons injured took place under the category of 'Flashing signal/blinker' type of traffic control. The data also signify that wherever there is a system of traffic control junction the number of accidents, persons killed and injuries are low as compared with the "Uncontrolled Traffic Junctions". Steps may be taken to convert more and more uncontrolled traffic junctions into controlled traffic junctions so that the accidents, fatalities and injuries may be contained effectively.

**Table 3.7: Accidents, Persons Killed and Injured by Type of Traffic Control in Rajasthan in 2020 and 2021**

Traffic Control	Number of accidents			Persons killed			Persons Injured		
	2020	2021	% Change	2020	2021	% Change	2020	2021	% Change
<b>Traffic light signal(a)</b>	218	211	-3.21	80	44	-45	181	166	-8.29
<b>Share in Total</b>	1.14	1.01	-	0.86	0.44	-	1.08	0.86	-
<b>Police Controlled(b)</b>	40	55	37.5	15	10	-33.33	38	56	47.37
<b>Share in Total</b>	0.21	0.26	-	0.16	0.1	-	0.23	0.29	-
<b>Stop Sign(c)</b>	28	67	139.29	22	35	59.09	24	60	150
<b>Share in Total</b>	0.15	0.32	-	0.24	0.35	-	0.14	0.31	-
<b>Flashing Signal/Blinker(d)</b>	59	55	-6.78	38	20	-47.37	42	44	4.76
<b>Share in Total</b>	0.31	0.26	-	0.41	0.2	-	0.25	0.23	-
<b>Uncontrolled (e)</b>	2,381	2,852	19.78	1,019	1,304	27.97	2,132	2,369	11.12
<b>Share in Total</b>	12.46	13.61	-	11.02	12.98	-	12.71	12.25	-
<b>Others</b>	16,388	17,711	8.07	8,076	8,630	6.86	14,352	16,649	16
<b>Share in Total</b>	85.74	84.54	-	87.31	85.93	-	85.59	86.07	-
<b>Total</b>	<b>19,114</b>	<b>20,951</b>	<b>9.61</b>	<b>9,250</b>	<b>10,043</b>	<b>8.57</b>	<b>16,769</b>	<b>19,344</b>	<b>15.36</b>

## ROAD ACCIDENTS BY WEATHER CONDITION

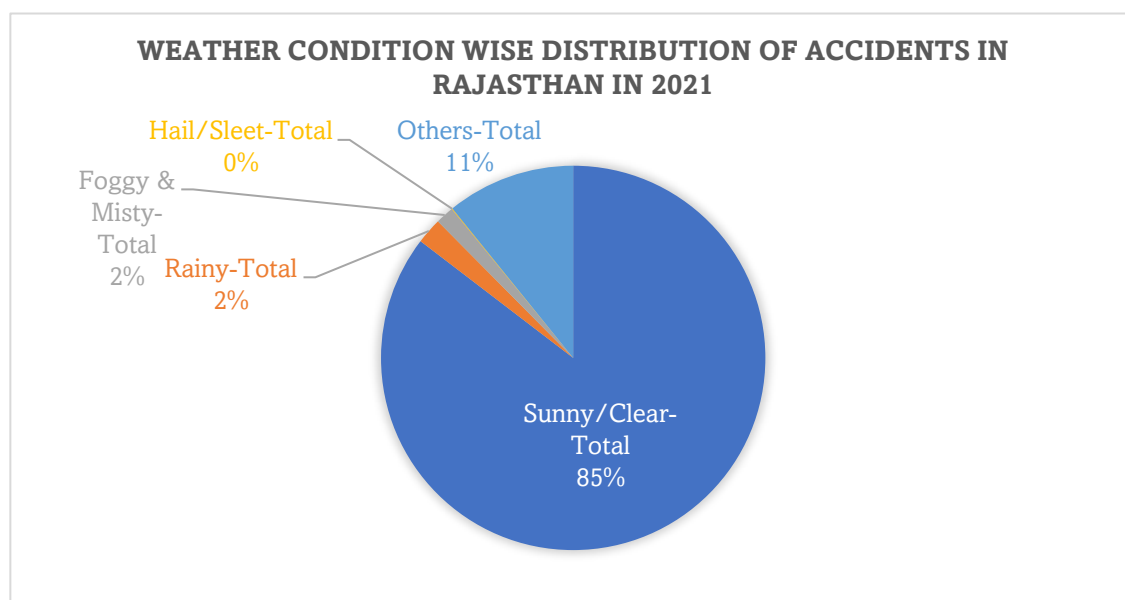
3.19 Weather condition affects road surface condition and the visibility of the motorist, thereby increasing the chances of mishaps. Adverse weather conditions such as heavy rain, thick fog and hailstorms make driving riskier as visibility reduces and road surface gets slippery. The data of road accidents of Rajasthan for 2021, however, reflects that almost more than 85% of the accidents and fatalities took place under sunny/clear weather conditions (**Table 3.8** and **Chart 3.5**). Accidents under adverse weather conditions such as rainy, foggy and hail/sleet accounted for only 3.79% of total road accidents during 2021.

**Table 3.8: Road Accidents by Weather Condition in Rajasthan in 2020 and 2021**

Weather condition	Number of Accidents			Persons Killed			Persons Injured		
	2020	2021	% Change	2020	2021	% Change	2020	2021	% Change
Sunny/clear	16,579	17,890	7.91	7,989	8,663	8.44	14,475	16,621	14.83
% Share in total	86.74	85.39	-	86.37	86.26	-	86.32	85.92	-
Rainy	202	458	126.73	67	165	146.27	164	435	165.24

Weather condition	Number of Accidents			Persons Killed			Persons Injured		
	2020	2021	% Change	2020	2021	% Change	2020	2021	% Change
% Share in total	1.06	2.19	-	0.72	1.64	-	0.98	2.25	-
Foggy & misty	501	322	-35.73	257	160	-37.74	554	337	-39.17
% Share in total	2.62	1.54	-	2.78	1.59	-	3.3	1.74	-
Hail/ sleet	45	13	-71.11	19	10	-47.37	40	12	-70
% Share in total	0.24	0.06	-	0.21	0.1	-	0.24	0.06	-
Others	1,787	2,268	26.92	918	1,045	13.83	1,536	1,939	26.24
% Share in total	9.35	10.83	-	9.92	10.41	-	9.16	10.02	-
Total	19,114	20,951	9.61	9,250	10,043	8.57	16,769	19,344	15.36

**Chart 3.5: Road accidents by weather condition during 2021 in Rajasthan (in percent)**



## ACCIDENTS CLASSIFIED BY VEHICLE CONDITION

3.20 Age of vehicles involved in road accidents furnished some light on prevalence of aged or over-aged vehicles on the roads, accidents due to vehicle defects, assuming that old vehicles tend to have more frequent malfunction and the number and share of old vehicles would be high in total accidents. In 2021, a total of 8,437 road accidents took place in Rajasthan involving vehicles of less than 5 years of age and the highest number of deaths i.e., 2,595 took place involving vehicles of 5-10 years of age (**Table 3.9**).

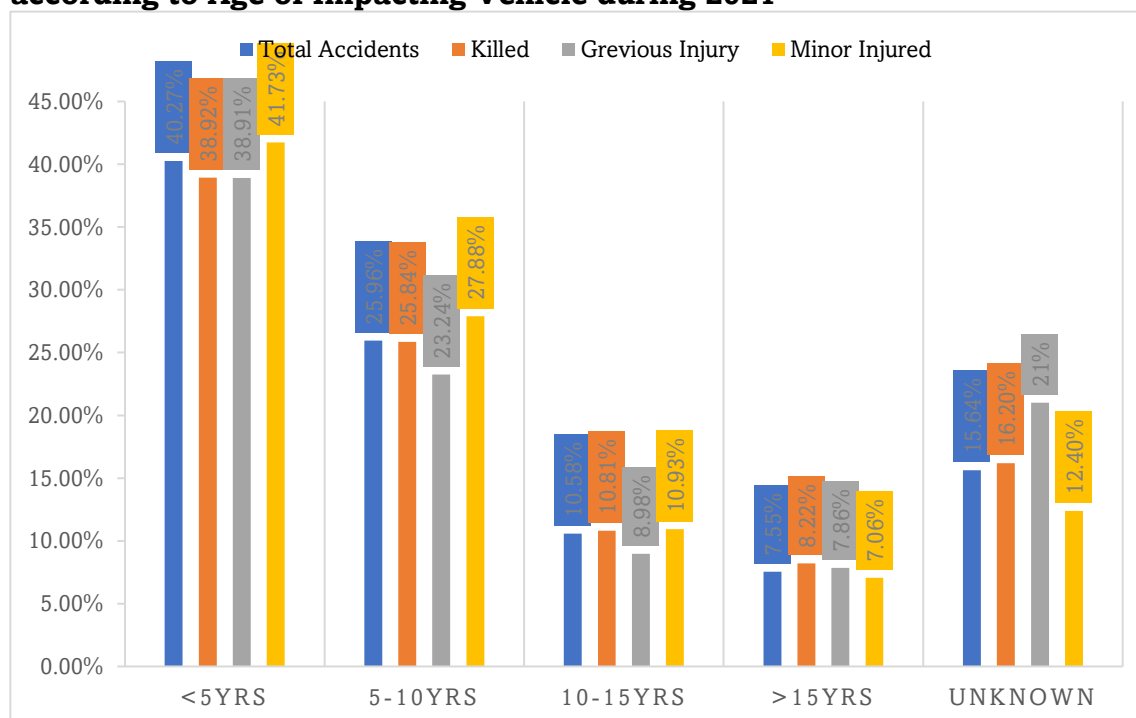
**Table 3.9: Accidents classified according to Age of Impacting Vehicle during 2021 vis-à-vis All India 2021**

Impacting Vehicle Age	Rajasthan-2021	All India-2021	% of Rajasthan in India
<5Yrs- Total Accidents	8,437	1,26,704	6.66
<5Yrs-Killed	2,014	46,543	4.33
<5Yrs- Grievous Injury	3,909	54,027	7.24
<5Yrs-Minor Injured	5,913	68,090	8.68
5-10Yrs- Total Accidents	5,439	1,16,046	4.69
5-10Yrs-Killed	2,595	41,168	6.3
5-10Yrs- Grievous Injury	1,203	50,954	2.36
5-10Yrs-Minor Injured	3,950	61,748	6.4
10-15Yrs- Total Accidents	2,217	53,781	4.12
10-15Yrs-Killed	1,086	20,291	5.35
10-15Yrs-Grievous Injury	465	23,662	1.97
10-15Yrs-Minor Injured	1,548	25,871	5.98
>15Yrs- Total Accidents	1,581	45,563	3.47
>15Yrs-Killed	826	19,389	4.26
>15Yrs- Grievous Injury	407	17,171	2.37
>15Yrs-Minor Injured	1,000	23,136	4.32
Unknown- Total Accidents	3,277	70,130	4.67
Unknown-Killed	1,627	26,485	6.14
Unknown-Grievous Injury	1,087	26,455	4.11
Unknown-Minor Injured	1,757	33,162	5.3

3.21 Road accident statistics for 2021 reveals vehicles with age below 10 years accounted for more than 66.23 percent of accident and 64.76 percent of death during 2021 (**Chart 3.6**). The vehicles with 10-15 years of age, accounted for 10.58 percent of accidents, vehicles over 15 years accounted for 7.55 percent of total accidents and vehicles with age not known accounted for another 15.64 percent of the total accidents in 2021. Similarly, vehicles 10-15 years of age, accounted for 10.81 percent of accidents related deaths, vehicles of over 15 years accounted for 8.22 percent of accidents related deaths and vehicles with age not known accounted for another 16.20 percent of the total accidents related deaths.



**Chart 3.6: Accidents in Rajasthan as percentage of India classified according to Age of Impacting Vehicle during 2021**



## OVERLOADING

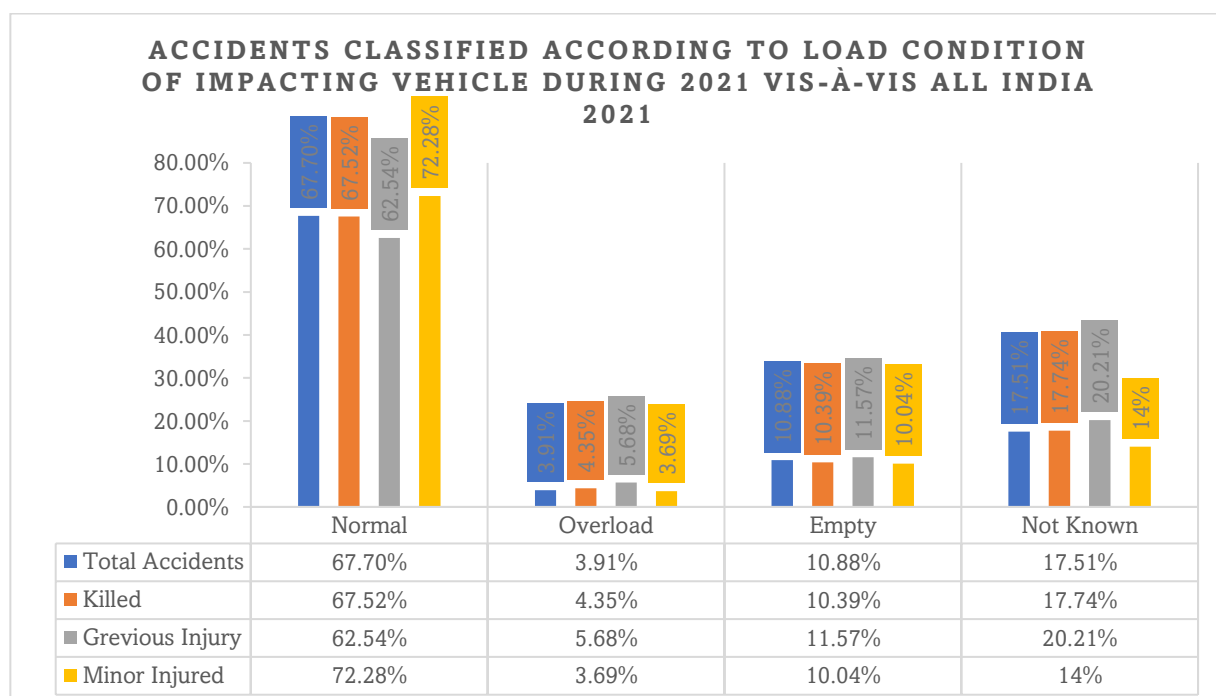
3.22 Overloaded vehicles and vehicles with loads protruding/hanging are road traffic hazard, risking accident for itself and for other road users. Overloaded vehicles accounted for a share of 3.91 percent of total accidents, 4.35 percent of total killed and 9.05 percent of the injured in 2021 (**Chart 3.7**). Further, it will be noted that largest number of accidents, accident-related deaths, and injuries are recorded in the category of normally loaded vehicles (**Table 3.10**).

**Table 3.10: Accidents classified according to Load Condition of Impacting Vehicle during 2021 vis-à-vis All India 2021**

Load Condition	Rajasthan-2021	India-2021	% of Rajasthan in India
Normal- Total Accidents	14,183	2,43,840	5.82
Normal-Killed	6,781	84,914	7.99
Normal-Grievous Injury	3,237	1,07,116	3.02
Normal-Minor Injured	10,240	1,30,166	7.87
Overload- Total Accidents	820	25,020	3.28
Overload-Killed	437	11,011	3.97
Overload-Grievous Injury	294	11,065	2.66
Overload-Minor Injured	523	14,453	3.62

Load Condition	Rajasthan-2021	India-2021	% of Rajasthan in India
Empty- Total Accidents	2,279	68,353	3.33
Empty-Killed	1,043	27,534	3.79
Empty-Grievous Injury	599	27,861	2.15
Empty-Minor Injured	1,422	31,550	4.51
Not Known- Total Accidents	3,669	75,219	4.88
Not Known-Killed	1,782	30,513	5.84
Not Known-Grievous Injury	1,046	26,236	3.99
Not Known-Minor Injured	1,983	36,001	5.51

**Chart 3.7: Accidents classified according to the Load Condition of Impacting Vehicles during 2021 vis-à-vis All India in 2021**



From the **Chart 3.7**, it can be observed that percentage share of accidents by overload vehicles is minimum and it accounts for only 3.91% of total accidents, 4.35% of total deaths, 3.69% of minor injuries and 5.68% of grievous injuries. On the other hand, normally loaded vehicles alone accounted for 67.70% of accidents, 67.52% of deaths, 62.54% of grievous injuries and 72.28% of minor injuries.

## CHAPTER-4

### ROAD ACCIDENTS FATALITY

4.1 Expansion in the road network, surge in motorization and a rising population of the State contribute towards increasing numbers of road accidents, accident-related injuries and fatalities. The number of accidents in the country in the year 2021 was 412432 out of these 142163 (34.46%) were fatal accidents and the number of persons killed in these fatal accidents were 153972. So far as Rajasthan is concerned the total number of road accidents were 20951 out of which 9055 (43.22%) were fatal accidents in which 10043 persons were killed. Road accident injuries are the leading causes of deaths and disabilities. The number of total accidents, fatal accidents and number of persons killed in road accidents over the period 2009 to 2021 is shown in **Table 4.1**.

**Table 4.1: Trends of the number of Accidents, Fatal Accident and number of persons killed in Rajasthan (2009-2021)**

Year	Total Accidents	Fatal Accidents	Persons Killed
2009	25,114	8,010	9,045
2010	24,302	8,143	9,163
2011	23,245	8,354	9,232
2012	22,969	8,550	9,528
2013	23,592	8,785	9,724
2014	24,628	9,334	10,289
2015	24,072	9,306	10,510
2016	23,066	9,282	10,465
2017	22,112	9,300	10,444
2018	21,743	9,295	10,320
2019	23,480	9,471	10,563
2020	19,114	8,363	9,250
2021	20,951	9,055	10,043

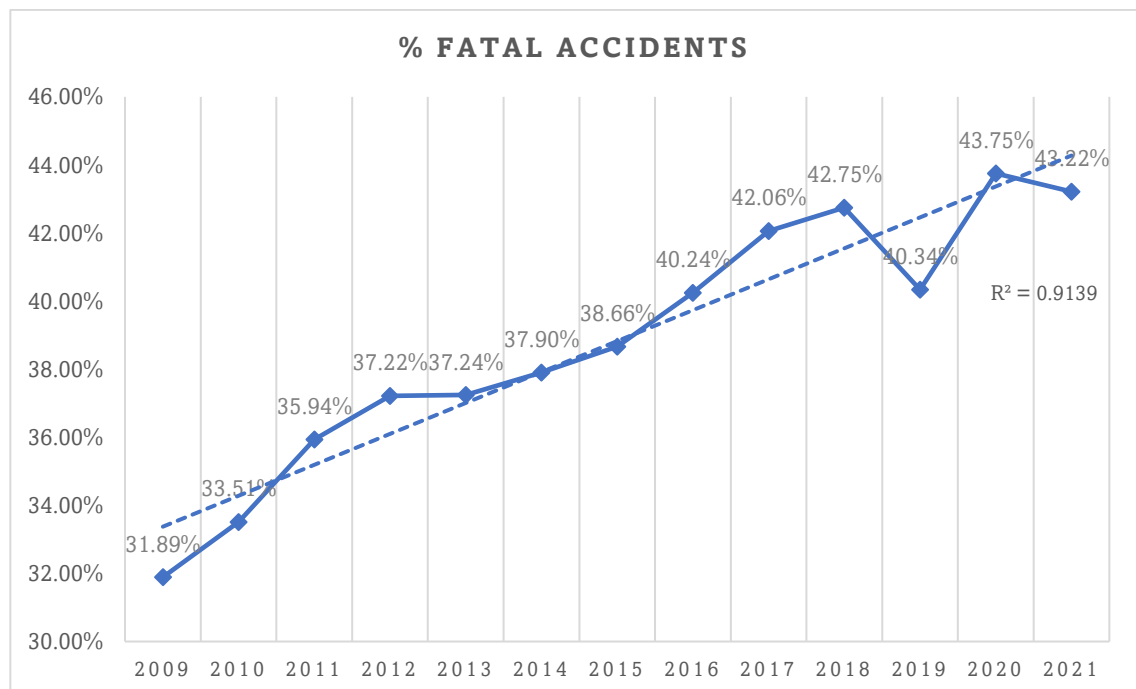
#### LONG RUN TREND IN ROAD ACCIDENT FATALITIES

4.2 Despite some marginal fluctuations, the long run trend of fatal accidents has been growing every year. The **Chart 4.1** shows a growth in fatal accidents accepts for a decrease in year 2020 due to Covid-19 and it again increased in year 2021. In year

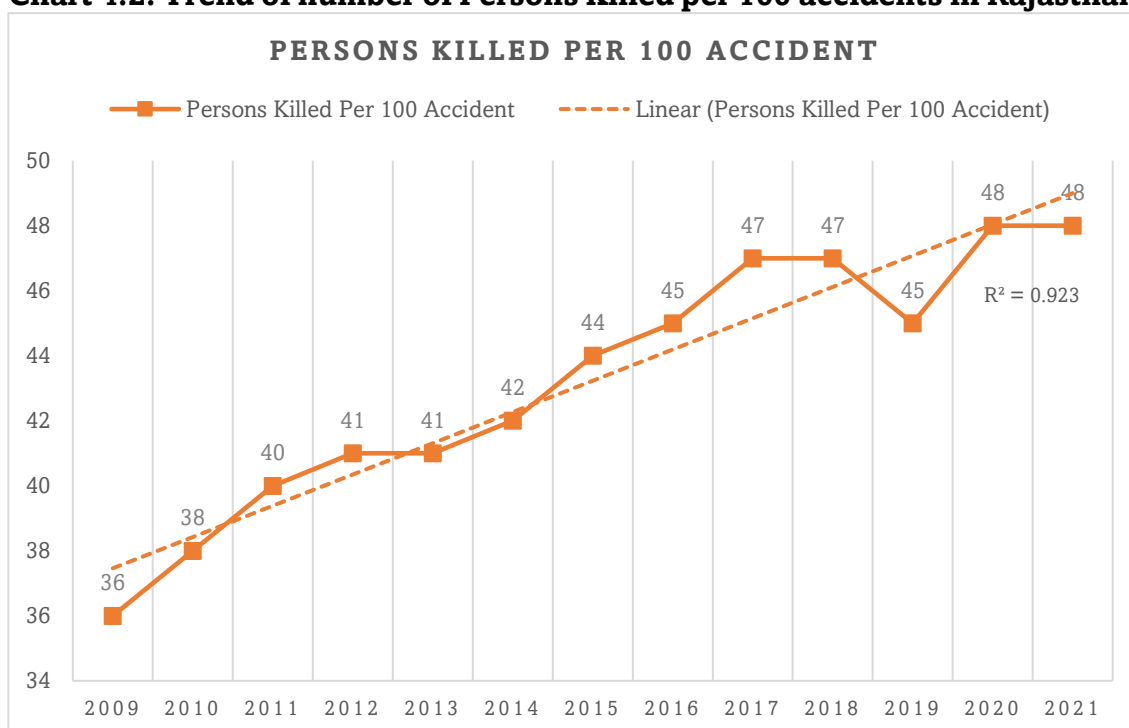
2009, percentage of fatal accidents to all the accidents was (8010) 31.89% that has reached to (9055) 43.21% in year 2021 registering a growth of 11%. This is very significant number for the State and it clearly indicates that almost every second accidents is a fatal accident.

4.3 With the rise in number of fatal accidents the corresponding number of persons killed in the fatal accidents is also growing up. In the year 2009, number of individual deaths per 100 accidents was 36 that increased to 48 in year 2021. It is submitted that the number of deaths per 100 accidents signify the severity of accidents. The trend of growth in severity of accidents shows an upward trend. Road safety authorities should focus on reducing number of fatal accidents and minimize fatality to the lowest level by improving the road infrastructure. Lot of steps have been taken by MoRTH in improving the safety related technology in Motor Vehicles which directly results in reducing the severity of accidents. **Chart 4.2** describes the increasing trend in number of persons killed per 100 accidents in Rajasthan.

**Chart 4.1: Trend of number of Persons Killed in road accidents**



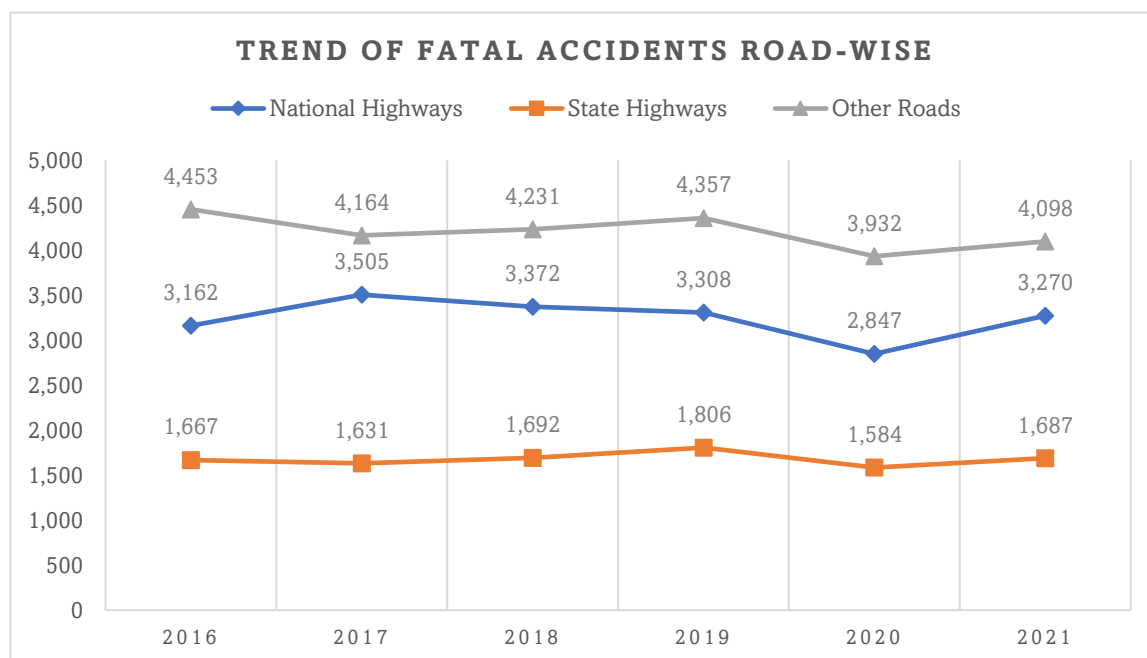
**Chart 4.2: Trend of number of Persons Killed per 100 accidents in Rajasthan**



## FATAL ROAD ACCIDENTS BY CATEGORY OF ROADS

4.4 A road accident may cause loss of life/lives or grievous injury or minor injury or non-injury to road-users. An accident which resulted in death of one or more person is a fatal accident. In 2021, out of 20,951 road accidents, 9,055 (43.2%) were fatal accidents (**Table 4.1 & Chart 4.1**). The trend of fatal road accidents by category of road presented in the **Chart 4.3** shows less number of fatal accidents took place on State Highways during 2017 to 2021 as compared to fatal accidents on National Highways and Other Roads. Trend of total number of fatal accidents on National Highways and Other Roads have remained largely stable fluctuating over very small margins over the years. There has been a significant decline in fatal accidents during 2020 recorded by all categories of roads on account of Covid-19.

**Chart 4.3: Trends in number of Fatal Accidents by category of roads in Rajasthan (2017-2021)**

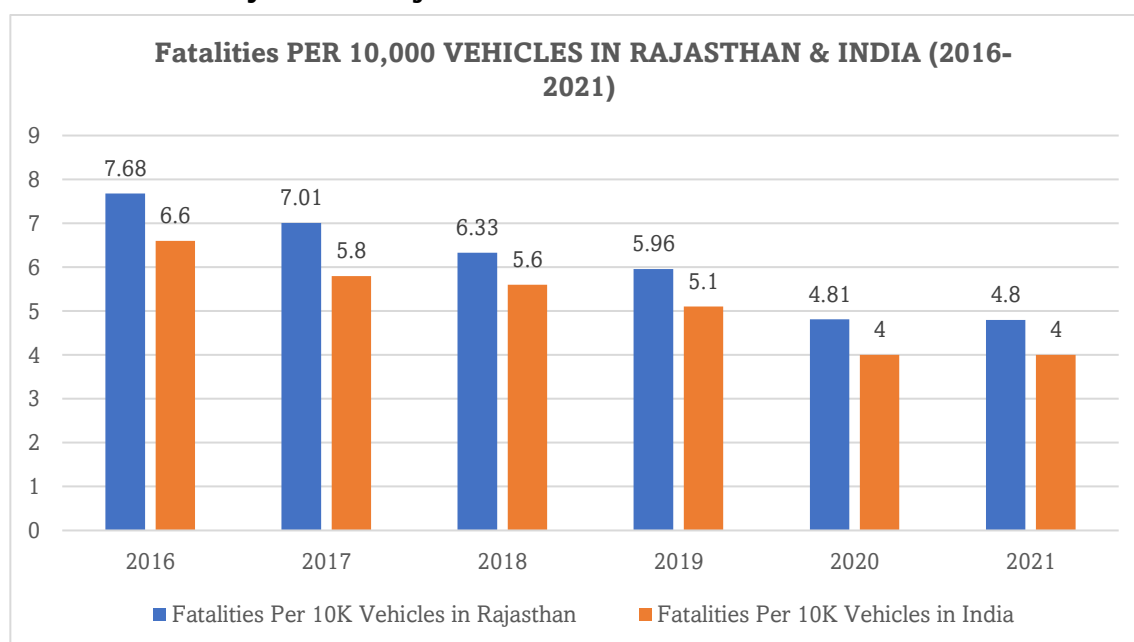


## FATALITY RATE

- 4.5 Fatality rate is used to explain road accidents relative to vehicular population in the country. It is measured by the number of road accident fatalities (persons killed) per 10,000 vehicles. State average accident fatality rate has been declining over the years and has remained at 4.8 in 2021 (**Chart 4.4**).
- 4.6 The fatality rate is useful for comparing road safety across States, particularly those with similar levels of motorization. Comparing the number of road fatalities in relation to the number of vehicle-kilometres driven (total distance travelled by motor vehicles) provides a better indicator for assessing the risk of travelling on a given road network. The number of traffic deaths in relation to the number of registered vehicles sometimes serve as an approximation for the fatality rate in the absence of data on distance travelled.
- 4.7 Road traffic-related fatality rate differs among the States. During 2021, Sikkim (8.7) recorded highest fatality rate followed by Bihar (6.8). About fifty percent of States have fatality rate above National average of 4.0 during 2021. Rajasthan with a fatality rate of 4.8 in 2021 is above the National average fatality rate. Union Territories

recorded fatality rate lower than National average. It may be noted that the States like Kerala (2.1), Tamil Nadu (2.5), Gujarat (2.3) and Maharashtra (3.1) have larger share in total accident and persons killed in 2021, however, recorded fatality rate lower than the National average. Generally, States with larger share of road network and registered motor vehicles accounted for relatively higher fatality rate. However, Maharashtra has largest roads network (628715 Kms with 11.6 % share in 2019) and highest number of registered motor vehicles in the country (37.78 million, 11.5% in 2020), recorded fatality rate 3.1, which is lower than national average. In Rajasthan the road network is 239810 Kms and the number of vehicles registered as on 31.03.2021 was 2,02,23,021.

**Chart 4.4: Fatality Rate of Rajasthan vis-à-vis All India from 2016 to 2021**



## AGE PROFILE OF ROAD ACCIDENT VICTIMS

4.8 Age profile of fatal road accident victims during the last three years in Rajasthan presented in **Table 4.2** and **Chart 4.4** reveals road accident victims largely constitute young people in the age groups of 18-25, 25-35 and 35-45. This age profile together accounted for around 80.90 percent of accident deaths in the year 2021. The data of last three years has been depicted in **Table 4.2**. The percentage of persons killed in the above three age profiles at National Level was 67.60% in the year 2021. Road accident victims largely constitute of young people in the productive age underscoring major implication on economic cost of road accidents,

apart from their emotional and psychological impact. Changes in demographic composition, coupled with greater mobility among younger age group, result in a higher proportion of younger age groups and a lower proportion of senior citizens among traffic fatalities.

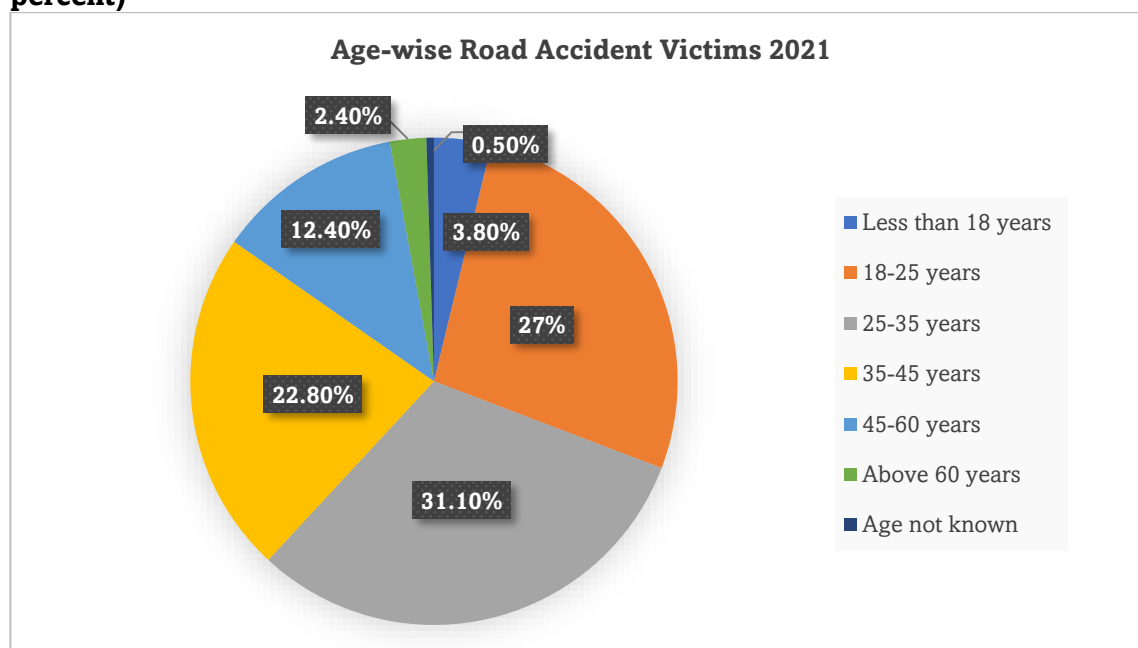
4.9 The working age group of 18-60 years accounted for 93.30 percent of total road accident deaths (**Table 4.2**) in the State. The percentage change in Road deaths in the age group of less than 18 years went down by 3.5% in 2021 as compared with year 2020.

**Table 4.2: Age profile of Road Accident victims in Rajasthan during 2019 to 2021**

Age-Group	Number of Persons Killed			% Change in 2020 over 2019	% Change in 2021 over 2020
	2019	2020	2021		
Less than 18 years	501	396	382	-20.9	-3.5
% Share in total	4.7	4.3	3.8	-	-
18-25 years	3,043	2,407	2711	-20.9	12.6
% Share in total	28.8	26.0	27.0	-	-
25-35 years	3,525	2,863	3124	-18.8	9.1
% Share in total	33.4	31.0	31.1	-	-
35-45 years	2,302	2,086	2287	-9.4	9.6
% Share in total	21.8	22.6	22.8	-	-
45-60 years	1,030	1,161	1244	12.7	7.1
% Share in total	9.7	12.6	12.4	-	-
Above 60 years	146	229	241	56.8	5.2
% Share in total	1.4	2.5	2.4	-	-
Age not known	16	108	54	575.0	-50.0
% Share in total	0.2	1.2	0.5	-	-
<b>Total</b>	<b>10,563</b>	<b>9,250</b>	<b>10,043</b>	-	-



**Chart 4.5: Age profile of Road Accident victims during 2021 in Rajasthan (in percent)**



## GENDER AND AGE PROFILE OF FATAL ROAD ACCIDENTS VICTIMS

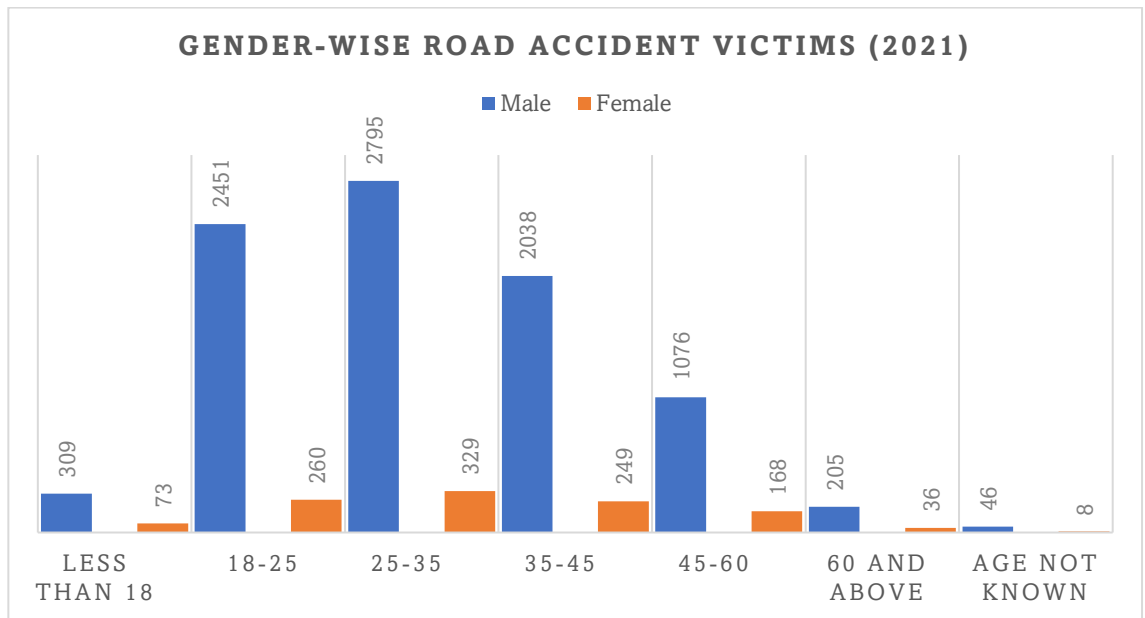
4.10 The gender-wise comparison of road accident deaths for the year 2021 in Rajasthan reveals that total number of males and females killed were 8,920 (88.8%) and 1,123 (11.2%) respectively (**Table 4.3**). The number of males and females killed in year 2021 in the country were 133025 (86.4%) and 20947 (13.6%) respectively. The gender-wise distribution of fatal road accident victims in Rajasthan in the year 2021 reflects largest number of deaths recorded in the age group of 18-45 years. In the age group of 18-45 years, number of males killed was 7,284 and female killed was 838. (**Chart 4.6**)

**Table 4.3: Gender-wise age profile of Road accident victims in Rajasthan (2019-2021)**

Age-Group	2019		2020		2021		% CHANGE IN 2020 OVER 2019		%CHANGE IN 2021 OVER 2020	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Less than 18 years	389	112	326	70	309	73	-16.2	-37.5	-5.2	4.3
<b>% Share in total</b>	<b>4.2</b>	<b>9.2</b>	<b>4.0</b>	<b>6.8</b>	<b>3.5</b>	<b>6.5</b>	-	-	-	-
18-25 years	2,721	322	2,181	226	2451	260	-19.8	-29.8	12.4	15.0
<b>% Share in total</b>	<b>29.1</b>	<b>26.4</b>	<b>26.5</b>	<b>22.1</b>	<b>27.5</b>	<b>23.1</b>	-	-	-	-

Age-Group	2019		2020		2021		% CHANGE IN 2020 OVER 2019		%CHANGE IN 2021 OVER 2020	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
25-35 years	3,130	395	2,523	340	2795	329	-19.4	-13.9	10.8	-3.2
<b>% Share in total</b>	<b>33.5</b>	<b>32.4</b>	<b>30.6</b>	<b>33.3</b>	<b>31.3</b>	<b>29.3</b>	-	-	-	-
35-45 years	2,049	253	1,852	234	2038	249	-9.6	-7.5	10.0	6.4
<b>% Share in total</b>	<b>22.0</b>	<b>20.7</b>	<b>22.5</b>	<b>23.0</b>	<b>22.8</b>	<b>22.2</b>	-	-	-	-
45-60 years	921	109	1,039	122	1076	168	12.8	11.9	3.5	37.7
<b>% Share in total</b>	<b>9.8</b>	<b>9.0</b>	<b>12.6</b>	<b>12.0</b>	<b>12.0</b>	<b>15.0</b>	-	-	-	-
Above 60 years	120	26	203	26	205	36	69.1	0.0	0.9	38.5
<b>% Share in total</b>	<b>1.3</b>	<b>2.1</b>	<b>2.4</b>	<b>2.5</b>	<b>2.3</b>	<b>3.2</b>	-	-	-	-
Age not known	14	2	105	3	46	8	650.0	50.0	-56.2	166.6
<b>% Share in total</b>	<b>0.1</b>	<b>0.1</b>	<b>1.3</b>	<b>0.3</b>	<b>0.5</b>	<b>0.7</b>	-	-	-	-
<b>Total</b>	<b>9,344</b>	<b>1,219</b>	<b>8,229</b>	<b>1,021</b>	<b>8,920</b>	<b>1,123</b>	<b>-11.9</b>	<b>-16.2</b>	<b>8.4</b>	<b>9.9</b>
Share of male and female	<b>88.4</b>	<b>11.6</b>	<b>88.9</b>	<b>11.1</b>	<b>88.8</b>	<b>11.2</b>	-	-	-	-

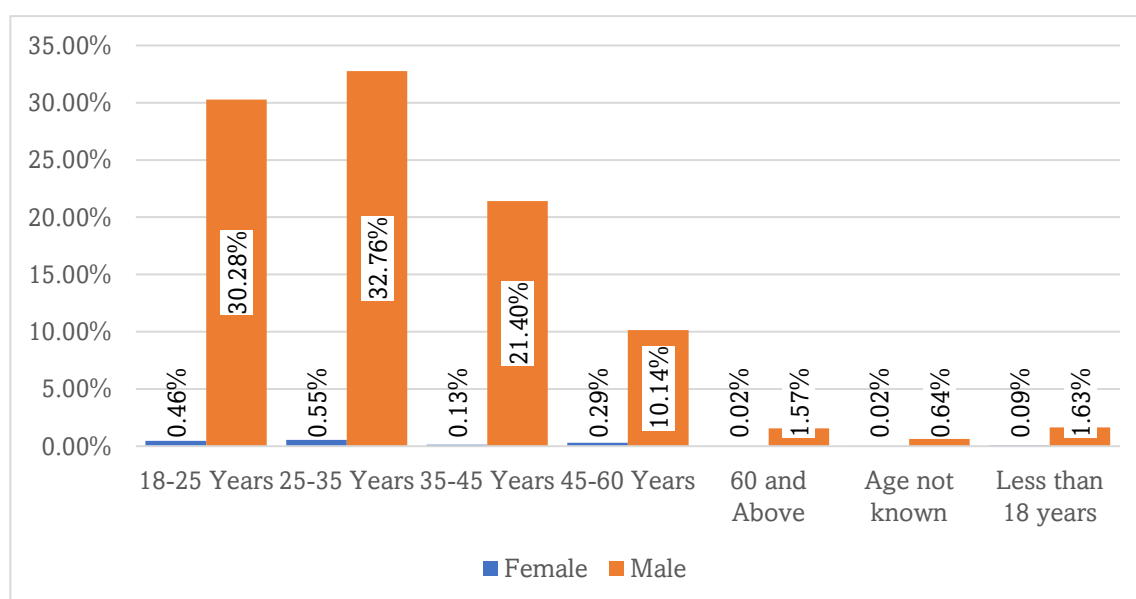
**Chart 4.6: Gender-wise age profile of Road accident victims in Rajasthan (2021)**



## GENDER WISE AGE PROFILE OF DRIVERS KILLED

4.11 The gender-wise comparison of total drivers killed during the year 2021 in Rajasthan is given in the **Chart 4.7**. A total of 4,456 (98.44%) Male and 71 (1.56%) female drivers were killed due to road accidents in 2021. So far as the gender-wise drivers killed during the year 2021 in the country is concerned 68,150 (96.9%) male and 2,155 (3.1%) female drivers were killed due to road accidents. Age wise profile of fatalities reveals 3,823 (72.3%) Male and 52 (2.4%) Female drivers were killed at the young age group of 18-45 years in Rajasthan were as it was 50,819 (72.3%) male and 1,696 (2.4%) female drivers were killed in the age group of 18-45 years. This highlights the need for setting up of Driving Training Centre (DTC) to provide quality training to commercial vehicle drivers to improve road and environment safety and strengthen overall mobility on roads.

**Chart 4.7: Gender-wise age profile of total drivers killed during 2021 (in percent share)**



## GENDER WISE AGE PROFILE OF PASSENGERS KILLED

4.12 The gender-wise comparison of total passengers which were killed during the year 2021 in Rajasthan has been presented in the **Chart 4.8**. Total number of 3,312 (79.71%) Male and 843 (20.29%) female passengers were killed due to road accident in 2021. So far as the number of passengers during the year 2021 in the country is

concerned 37,155 (74.4%) male and 12,803 (25.6%) female passengers were killed due to road accidents in 2021. **Chart 4.8** reveals among the young people's age group of 18-45, total number of 2,608 (62.7%) killed were male passengers and 640 (15.4%) killed were female passengers. Whereas at the national level total number of 26,220 (52.5%) killed were male passengers and 8,159 (16.3%) killed were female passengers.

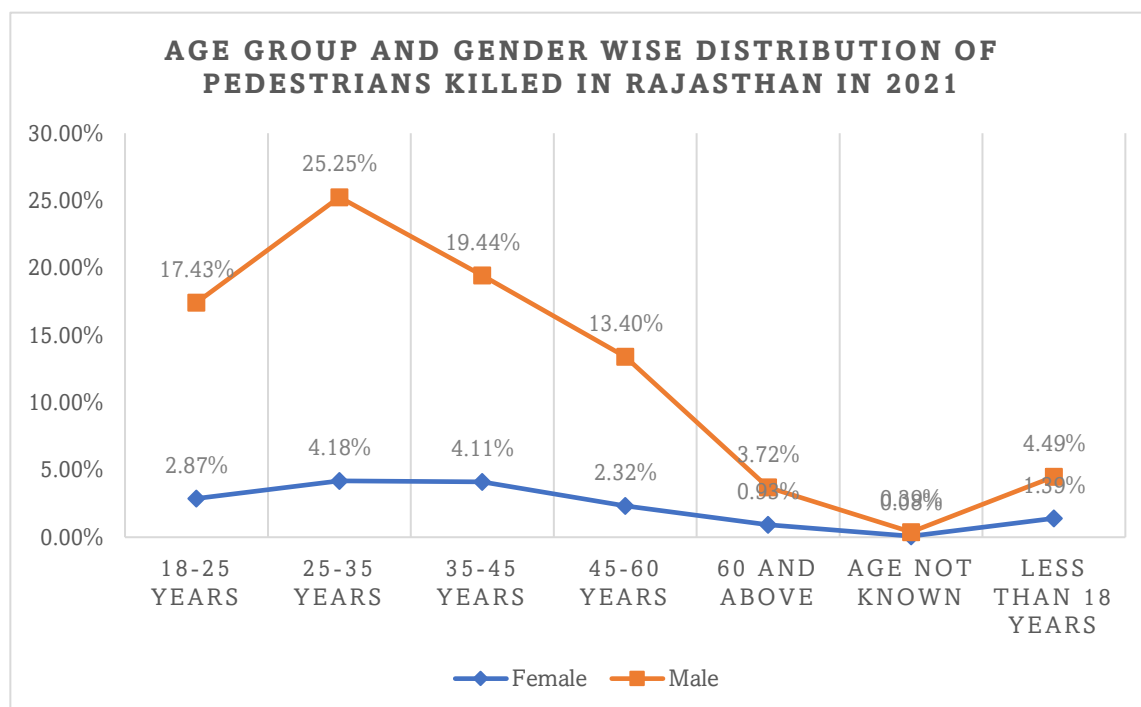
**Chart 4.8: Gender-wise age profile of total Passenger killed in Rajasthan in 2021 (in percent)**



## GENDER WISE AGE PROFILE OF PEDESTRIANS KILLED

4.13 The gender-wise comparison of total pedestrians killed during the year 2021 in Rajasthan has been depicted in the chart 4.9. Total number of 1,086 (84.12%) male and 205 (15.88%) female pedestrians were killed due to road accident in 2021. So far as the national/all India level is concerned the total number of 23,551 (80.8%) male and 5,593 (90.2%) female pedestrians were killed during the year 2021 due to road accidents. **Chart 4.9** show 802 (62.12%) Male and 144 (11.15%) Female pedestrians were killed at the young age group of 18-45 years in Rajasthan whereas 12,190 (41.8%) male and 2,426 (8.3%) female pedestrians were killed in the young age group of 18-45 years.

**Chart 4.9: Gender-wise age profile of total Pedestrians Killed during 2021 in Rajasthan (percent share)**



## PERSONS KILLED IN ROAD ACCIDENTS IN TERMS OF ROAD USER CATEGORIES

- 4.14 A road-user is one who uses a road for movement or transportation as a pedestrian or cyclist or motorist (driver and passenger). Vehicle occupants benefit most from the reduction in road deaths. Data on road-user wise accident victims helps in recognizing vulnerable categories which helps the authorities to put special attention on the most vulnerable section.
- 4.15 The data in **Table 4.4** reveals the road user categories, Two-wheelers with a share of 40.9% constitute the largest number of road accident deaths (4,111). Cars, Taxis, Vans & LMVs are next highest contributor with a share of 20.8 percent (2091) in 2021. At national level the two wheelers with a share of 45.1% constitute the largest number of road accident deaths (69385) pedestrians are the next highest contributor with the share of 18.9% (29124) followed by cars, taxies, vans and LMVs with 12.9% (19811). The share of car, taxies, vans and LMVs as well as absolute number of deaths have declined in 2021 as compared to 2020.

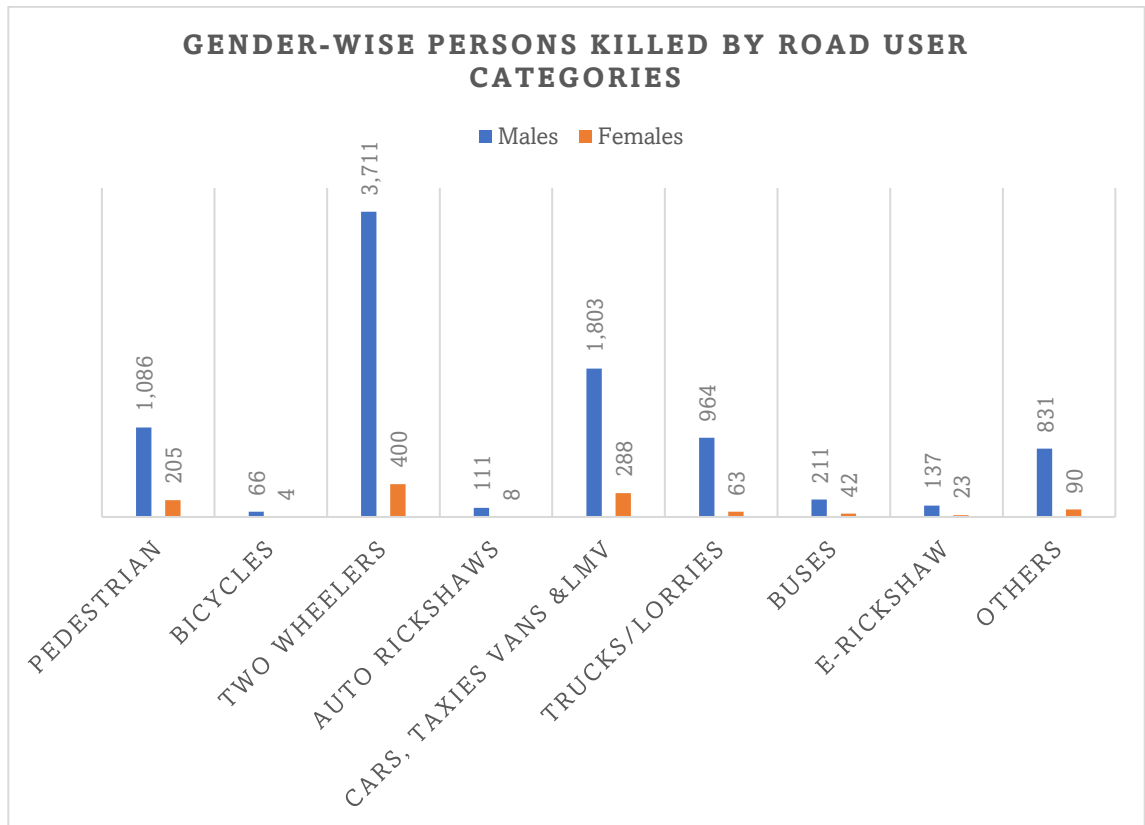
- 4.16 Truck and Lorries account for a share of 10.2 percent (1027) in total person killed in 2021. The percentage share as well as the absolute numbers of deaths under this category has declined in 2021 as compared to 2020 in the State. So far as the these category of vehicles are concerned there share at national level is 6.2% (9476) in total persons killed in 2021. The share as well as absolute number of deaths have declined in 2021 as compared to 2020.
- 4.17 Further Auto-Rickshaws contributed to another 1.2% (119), and buses accounted for 2.5% (253) of the Road Users those are killed in 2021 in Rajasthan. At national level these figures are 3.9% (5966) and 2% (3106) for auto-rickshaws and buses respectively.
- 4.18 Gender wise profile of persons killed in road accident in terms of road user category is presented in the Chart 4.10, reveals two wheelers have the highest share (40.9%) followed by cars, taxis and vans (20.8%) and pedestrians (12.9%). The share of male killed is higher than that of female in all road user categories. (Chart 4.9)

**Table 4.4: Comparison of Persons killed in road accidents in terms of road user categories during 2019 to 2021**

Road-user category	Persons killed 2019	Persons killed 2020	Persons killed 2021	% Change 2021 over 2020
Pedestrian	1,443	1,066	1,291	21.1
share in Total	13.7	11.5	12.9	
Bicycles	51	44	70	59.1
share in Total	0.5	0.5	0.7	
Two-wheelers	3,654	3,052	4,111	34.7
Share in Total	34.6	33	40.9	
Auto-Rickshaws	205	114	119	4.4
Share in Total	1.9	1.2	1.2	
Cars, Taxis, Vans & LMVs	2,513	2,180	2,091	-4.1
Share in Total	23.8	23.6	20.8	
Trucks/Lorries	1,120	1,357	1,027	-24.3
Share in Total	10.6	14.7	10.2	
Buses	460	281	253	-10
Share in Total	4.4	3	2.5	
Other Non- Motor Vehicles (including e-rickshaw)	0	1,156	160	-86.2
Share in Total	0	12.5	1.6	21.1
Others (other motor vehicles, animals drawn vehicle, cycle rickshaws,	1,117	0	921	-

Road-user category	Persons killed 2019	Persons killed 2020	Persons killed 2021	% Change 2021 over 2020
hand carts, & other persons)				
Share in Total	10.6	0	9.2	
<b>Total</b>	<b>10,563</b>	<b>9,250</b>	<b>10,043</b>	

**Chart 4.10: Gender wise profile of Persons killed in road accidents in terms of road user categories during 2021 (percentage Share)**



4.19 According to **Table 4.5**, the number of Pedestrians killed by different categories of crime vehicles in 2021 was 1,291 which is 12.9 percent of the total road accident deaths. The leading three crime vehicles in terms of Share of pedestrians killed are Cars, Taxis, Vans & LMV 33.3% (430), Two wheelers 23.1% (298) and Trucks/Lorries 15.41% (199).

**Table 4.5: Persons killed in Accidents Classified by the type of impacting vehicles (Crime Vehicles by Victim vehicles) in 2021**

Crime Vehicle- →	Two- Wheeler	Auto Rickshaws	Cars, Taxis, Vans & LMV	Truck/ Lorries	Buses	Other Non- motorized vehicle (E- Rickshaw etc.)	Others	Total
Victim Vehicle								
Pedestrian	298	27	430	199	53	27	257	1,291
Bicycles	19	1	27	7	2	1	13	70
Two-wheelers	1,588	40	1,144	585	165	54	535	4,111
Cars, Taxis, Vans & LMVs	260	7	989	486	85	23	241	2,091
Trucks/ Lorries	167	8	154	559	53	9	77	1,027



## CHAPTER-5

### ROAD ACCIDENTS IN MILLION-PLUS CITIES

- 5.1 Road accidents tend to be concentrated in urban areas because of dense population and road traffic congestion. In the report published by MoRTH the road accidents statistics for 50 Indian cities with population of one million and above were briefly highlighted. These cities are spread across 17 States and 2 Union Territories. Out of the 50 Indian cities 3 cities namely Jaipur, Jodhpur and Kota belongs to Rajasthan. In this Section, an abstract of road accident statistics for 3 cities of Rajasthan with population of one million and above (one million-plus) are briefly highlighted.
- 5.2 The total number of road accidents recorded in year 2021 were 4,12,432 and the number of road accidents recorded in year 2020 were 3,66,138. The percentage increase in road accidents in year 2021 as compared with number of road accidents which took place in the year 2020 was found to be 12.46%. Similarly the number of road accidents in 50 one million plus cities of the country was 67,301 in year 2021 and it was 58,736 in the year 2020. The percentage growth of road accidents in 50 one million plus cities is 14.60%. It was found that the total number of accidents and number of persons killed in Million Plus Cities registered significant reduction in growth from 2018 onwards to year 2020 due to Covid-19. The incidence of road accident recorded an increase of 14.60 percent in 2021 over 2020, which is above national average of 12.64 percent increase recorded in 2021. Similarly, growth of injury registered an increase of 16.3 percent, which is higher than national average of 10.4 percent increase recorded in 2021. (**Table 5.1**)

**Table 5.1: Million Plus cities in total road accidents, number of persons killed and injured during 2017-2021**

S No.	Description	2017	2018	2019	2020	2021
1	No. of accidents(million plus cities)	82,286	85,318	82,781	58,736	67,301
	% increase/decrease over previous year	-8.40	3.68	-2.97	-29.05	14.60
	All India total road accidents	4,64,910	4,67,044	4,49,002	3,66,138	4,12,432
	Share of Million Plus City in total	17.70	18.27	18.44	16.04	16.30

S No.	Description	2017	2018	2019	2020	2021
2	No. of persons killed (million plus cities)	16,971	17,709	17,798	13,542	15,350
	% increase/decrease over previous year	-4.64	4.35	0.50	-23.91	13.40
	All India total number of persons killed	1,47,913	1,51,417	1,51,113	1,31,714	1,53,972
	Share of Million Plus City in total	11.47	11.70	11.78	10.28	9.90
3	No. of persons injured (million plus cities)	73,945	76,747	74,120	50,515	58,758
	% increase/decrease over previous year	-10.49	3.79	-3.42	-31.85	16.30
	All India total number of persons injured	4,70,975	4,69,418	4,51,361	3,48,279	3,84,448
	Share of Million Plus City in total	15.70	16.35	16.42	14.50	15.30
	<b>Accident severity (million plus cities)</b>	<b>20.60</b>	<b>20.80</b>	<b>21.50</b>	<b>23.10</b>	<b>22.80</b>
	<b>All India - Accident severity</b>	<b>31.80</b>	<b>32.40</b>	<b>33.70</b>	<b>36.0</b>	<b>37.30</b>

## TOP 10 MILLION PLUS CITIES IN ROAD ACCIDENTS DURING 2021

5.3 Top 10 cities listed in **Table 5.2** are selected based on the number of accidents reported by these Cities in the year 2021. Chennai has recorded the highest number of accidents in 2021, followed by Delhi and Jabalpur being at the third place (**Table 5.2**). The top 10 cities comprising Chennai, Delhi, Jabalpur, Indore, Bengaluru, Bhopal, Vizaq, Hyderabad, Mumbai and Jaipur accounted for 47.73 percent of the total road accidents which took place in 50 Million plus cities (**Table 5.2**). It is submitted that Jaipur ranked 10<sup>th</sup> in total number of road accidents caused in 50 Million Plus cities of the country. 2165 road accidents took place in 2021 in Jaipur city.

**Table 5.2: Number of Road Accidents in Top 10 million-plus Cities in India (2017-2021)**

S. No.	Million Plus Cities	2017	2018	2019	2020	2021
1	Chennai	7,257	7,580	6,871	4,389	5,034
		8.74	8.79	8.21	7.31	7.48
2	Delhi	6,673	6,515	5,610	4,178	4,720
		8.04	7.56	6.70	6.96	7.01
3	Jabalpur	3,303	3,419	3,397	3,226	3,855

S. No.	Million Plus Cities	2017	2018	2019	2020	2021
		3.98	3.97	4.06	5.37	5.73
4	Indore	4,513	3,434	3,383	3,036	3,676
		5.44	3.98	4.04	5.06	5.46
5	Bengaluru	2,297	4,611	4,684	3,233	3,213
		2.77	5.35	5.59	5.38	4.77
6	Bhopal	3,393	3,508	3,287	2,295	2,616
		4.09	4.07	3.93	3.82	3.89
7	Vizag	1,667	1,838	1,706	1,765	2,339
		2.01	2.13	2.04	2.94	3.48
8	Hyderabad	2,834	2,846	2,900	2,064	2,273
		3.41	3.30	3.46	3.44	3.38
9	Mumbai	3,160	3,162	2,872	1,812	2,230
		3.81	3.67	3.43	3.02	3.31
10	Jaipur	2,983	2,781	4,271	1,940	2,165
		3.59	3.23	5.10	3.23	3.22
<b>Total top 10</b>		<b>38,080</b>	<b>39,694</b>	<b>38,981</b>	<b>27,938</b>	<b>32,121</b>
<b>% Share in Total 50 Million plus cities</b>		<b>45.88</b>	<b>46.05</b>	<b>46.55</b>	<b>46.53</b>	<b>47.73</b>
<b>All 50 Million plus Cities Total</b>		<b>82,286</b>	<b>85,318</b>	<b>82,781</b>	<b>58,736</b>	<b>67,301</b>

5.4 During the last five years from 2017 to 2021, Top 10 million-plus cities have been sharing more than 47.73 percent of total road accidents in India (**Table 5.2**). Micro analysis of Top 10 million-plus Cities listed in above table, shows general decline in the incidence of accidents in most of the Top-10 cities from 2018 onwards and then increase in 2021. All top ten million plus cities recorded significant increase in number of accidents in 2021 compared to 2020, which may be due to the impact of Covid-19 induced nationwide lockdown in 2020.

## **TOP 10 MILLION-PLUS CITIES IN TERMS OF NUMBER OF FATALITIES IN 2021**

5.5 Top 10 Cities are selected based on the number of fatalities reported in the year 2021. In respect of number of fatalities, Delhi recorded the highest number of deaths in 2021, followed by Chennai, Bangalore and then Jaipur. The Top10 cities together

accounted for 43.13 per cent of road accident deaths in the 50 million-Plus Cities in 2021. It is submitted that Jaipur ranked 4<sup>th</sup> in total number of fatalities caused in 50 Million Plus cities of the country. 625 persons were killed in road accidents in 2021 in Jaipur city. (**Table 5.3**)

**Table 5.3: Number of Road Accidents Fatalities in Top 10 million-plus Cities in India in 2021**

S. No.	Million Plus Cities	2017	2018	2019	2020	2021
1	Delhi	1,584 9.33	1,690 9.54	1,463 8.22	1,196 8.83	1,239 8.07
2	Chennai	1,299 7.65	1,260 7.12	1,252 7.03	872 6.44	998 6.5
3	Bengaluru	653 3.85	686 3.87	768 4.32	646 4.77	654 4.26
4	Jaipur	813 4.79	692 3.91	1283 7.21	606 4.47	625 4.07
5	Kanpur	682 4.02	698 3.94	692 3.89	563 4.16	598 3.9
6	Agra	555 3.27	623 3.52	616 3.46	514 3.8	549 3.58
7	Allahabad (Prayagraj)	472 2.78	614 3.47	599 3.37	517 3.82	535 3.49
8	Indore	391 2.3	322 1.82	328 1.84	459 3.39	484 3.15
9	Raipur	420 2.47	427 2.41	458 2.57	482 3.56	472 3.07
10	Jabalpur	409 2.41	374 2.11	406 2.28	422 3.12	467 3.04
<b>Total top 10</b>		7,278 42.88	7,386 41.71	7,865 44.19	6,277 46.35	6,621 43.13
<b>All Cities Total</b>		<b>16,971</b>	<b>17,709</b>	<b>17,798</b>	<b>13,542</b>	<b>15,350</b>

5.6 During the last five years from 2017 to 2021, top 10 million plus cities have been sharing more than 43.13 percent of total road accidents fatalities in India (**Table 5.3**). Micro analysis of Top 10 million plus cities listed in the above table, show a decline in the incidence of accident fatalities from 2018 onwards in cities like Delhi, Chennai, Kanpur, Allahabad, and Agra. In respect of Raipur city, total number of fatalities has been showing slightly increasing trend during 2017 to 2021.

## MILLION-PLUS CITIES OF RAJASTHAN ROAD ACCIDENTS AND PERCENTAGE CHANGE

5.7 Three cities of Rajasthan namely Jaipur, Jodhpur and Kota fell in top 50 million plus cities of the country in road accidents, fatalities and injuries. Overall, all the 3 cities of million-plus population in Rajasthan recorded a rise in number of accidents in 2021 as compared to 2020 as shown in the **Table 5.4**.

**Table 5.4: Road Accidents, Fatalities and Injuries in 3 million Plus cities of Rajasthan from 2015 to 2021**

Years	Jaipur			Jodhpur			Kota		
	Accidents	Deaths	Injuries	Accidents	Deaths	Injuries	Accidents	Deaths	Injuries
2015	1894	476	1661	678	297	700	745	108	713
2016	3004	890	2625	270	100	239	590	102	569
2017	2983	813	2550	282	104	262	481	93	471
2018	2781	692	2265	549	245	434	466	89	478
2019	4271	1283	3581	1117	589	834	784	225	813
2020	1940	606	1568	292	142	207	353	60	362
2021	2165	625	1791	593	237	422	368	75	367
<b>Rajasthan</b>	<b>20,951</b>	<b>10,043</b>	<b>19,344</b>	-	-	-	-	-	-

5.8 The number of total road accidents, fatalities and injuries taken together for the 3 million plus cities and the corresponding figure of accidents, fatalities and injuries which have taken place in the state from the year 2015 to 2021 has been depicted in the following **Table 5.5**.

**Table 5.5: Combined Road accidents, fatalities and Injuries in all 3 million plus cities from 2015 to 2021 and Rajasthan from 2015 to 2021**

Years	Top-3 Million Plus Cities			Rajasthan		
	Accidents	Deaths	Injuries	Accidents	Deaths	Injuries
2015	3317	881	3074	24,072	10,510	26,153
2016	3864	1092	3433	23,066	10,465	24,103
2017	3746	1010	3283	22,112	10,444	22,071
2018	3796	1026	3177	21,743	10,320	21,547
2019	6172	2097	5228	23,480	10,563	22,979
2020	2585	808	2137	19,114	9,250	16,769
2021	3126	937	2580	20,951	10,043	19,344

- 5.9 The percentage share of total road accidents, fatalities, and injuries of the 3 million plus cities as compared with the total road accidents, fatalities and injuries of the state has been depicted in the following **Table 5.5** and **Table 5.6**.

**Table 5.6: Percentage share of Road accidents, fatalities and Injuries in 3 million plus cities with respect to the state of Rajasthan from 2015 to 2021**

Years	Jaipur			Jodhpur			Kota		
	Accidents	Deaths	Injuries	Accidents	Deaths	Injuries	Accidents	Deaths	Injuries
2015	7.87	4.53	6.35	2.82	2.83	2.68	3.09	1.03	2.73
2016	13.02	8.5	10.89	1.17	0.96	0.99	2.56	0.97	2.36
2017	13.49	7.78	11.55	1.28	1	1.19	2.18	0.89	2.13
2018	12.79	6.71	10.51	2.52	2.37	2.01	2.14	0.86	2.22
2019	18.19	12.15	15.58	4.76	5.58	3.63	3.34	2.13	3.54
2020	10.15	6.55	9.35	1.53	1.54	1.23	1.85	0.65	2.16
2021	10.33	6.22	9.26	2.83	2.36	2.18	1.76	0.75	1.9

The percentage share of accidents, deaths and injuries in Jaipur and Jodhpur has gone up in 2021 as compared with 2020. However, in Kota the percentage share of accidents and injuries has gone down during the same period. It was observed in all 3 cities that there was a gradual increase in rate of accidents, deaths and injuries from the year 2015 to 2019, followed by a significant drop in the year 2020 due to the COVID-19 pandemic. After 2019 there is a slight increase on all the three road accident parameters in the year 2021 but the significant feature is that the increase in year 2021 in road accidents, fatalities and injuries was still less than the year 2019.

- 5.10 An effort has been made to compile the data of road accidents, fatalities and injuries which have taken place in the state, 3 million plus cities of Rajasthan, percentage change in above three parameters in the 3 million plus cities and the percentage share of the parameters of 3 million plus cities with reference to the state (**Table 5.7**) from the year 2017 to 2021. In addition to the above accident severity for the 3 million cities and that of the state has also been computed in **Table 5.7**.
- 5.11 From the **Table 5.7** it is clear that 14.92 percent of accidents, 9.33 percent fatalities and 13.34 percent of injuries in year 2021 in the state took place in 3 million plus cities of Rajasthan namely Jaipur, Jodhpur and Kota. The accident severity in million plus cities have been less than the accident severity of the state since 2017 to 2021. However, the accident severity for the 3 million cities was 31.3 in year 2020 which

came down to 30 in the year 2021. Similarly, the accident severity for the state also came down from 48.4 in the year 2020 to 47.9 in the year 2021.

**Table 5.7: Total road accidents, number of persons killed and injured in Million-plus cities during 2017-2021 in Rajasthan along with percentage share etc.**

S No.	Description	2017	2018	2019	2020	2021
1	No. of accidents(million plus cities)	3746	3796	6172	2585	3126
	% increase/decrease over previous year	-	1.33	62.59	-58.12	20.93
	Total road accidents In Rajasthan	22,112	21,743	23,480	19,114	20,951
	Share of Million Plus City in total	16.94	17.46	26.29	13.52	14.92
2	No. of persons killed (million plus cities)	1010	1026	2097	808	937
	% increase/decrease over previous year	-	1.58	104.39	-61.47	15.97
	Total persons killed In Rajasthan	10,444	10,320	10,563	9,250	10,043
	Share of Million Plus City in total	9.67	9.94	19.85	8.74	9.33
3	No. of persons injured (million plus cities)	3283	3177	5228	2137	2580
	% increase/decrease over previous year	-	-3.23	64.56	-59.12	20.73
	Total persons injured In Rajasthan	22,071	21,547	22,979	16,769	19,344
	Share of Million Plus City in total	14.87	14.74	22.75	12.74	13.34
	Accident severity (million plus cities)	27	27	34	31.3	30
	Accident severity- Rajasthan	47.2	47.5	44.9	48.4	47.9

## CAUSES OF ACCIDENTS IN MILLION PLUS CITIES

5.12 The analysis of causes of accidents in million plus cities of the state is based on type of impacting vehicles, traffic rules violations, road features, road junctions & traffic merging points, type of traffic control and weather conditions.

### Road Accidents, Fatalities, and Injuries by Type of Impacting Vehicles in million plus cities of Rajasthan

5.13 The data in **Table 5.8** and **Chart 5.1** reveals two wheelers accounted for the highest share of road accidents 40.34 percent (1,261), fatalities 43.33 percent (406) and injuries 51.94 percent (1,340) in 2021 in million plus cities of Rajasthan (million plus cities: Jaipur, Jodhpur & Kota). The percentage share of road accidents by Cars,

Taxis, Vans & LMVs accounts for 24.28 percent which is the second highest followed by percentage share of Pedestrians which accounts for 16.6 percent of road accidents in million plus cities of Rajasthan. The percentage share of persons killed by Pedestrians accounts for 21.34 percent, which is the second highest followed by Cars, Taxis, Vans & LMVs with a percentage share of 16.01 percent in million plus cities of Rajasthan. However, in case of persons injured Cars, Taxis, Vans & LMVs accounted for 18.10 percent followed by Pedestrians accounting for 14.84 percent of persons injured in million plus cities of Rajasthan. It was observed that 3 major category of impacting vehicles which are Two-wheelers, Cars, Taxis, Vans & LMVs and Pedestrians accounted for maximum number of road accidents (81.22%), fatalities (80.68%) and injuries (84.88%) in million plus cities of Rajasthan.

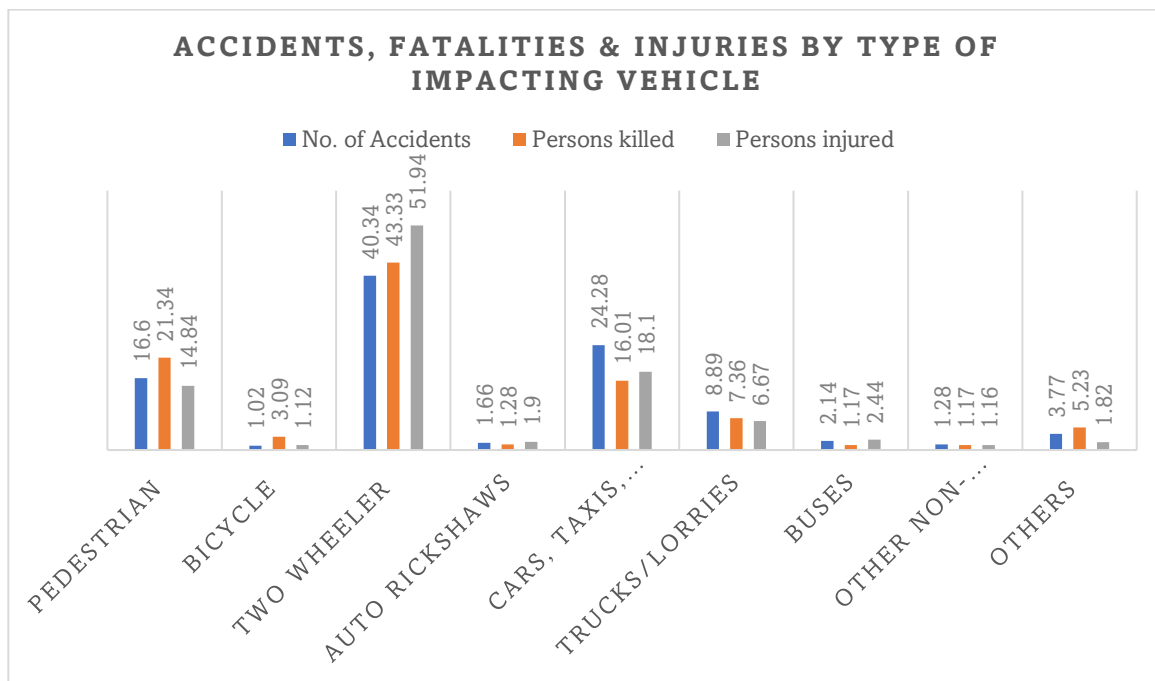
**Table 5.8: Road Accidents, Fatalities, and Injuries by Type of Impacting Vehicles i.e., Crime Vehicle in Million Plus Cities of Rajasthan during 2021**

Vehicle type	No. of Accidents	Persons killed	Persons injured
<b>Pedestrian</b>	519	200	383
<b>% Share in total</b>	16.6	21.34	14.84
<b>Bicycle</b>	32	29	29
<b>% Share in total</b>	1.02	3.09	1.12
<b>Two-Wheeler</b>	1,261	406	1,340
<b>% Share in total</b>	40.34	43.33	51.94
<b>Auto Rickshaws</b>	52	12	49
<b>% Share in total</b>	1.66	1.28	1.90
<b>Cars, Taxis, Vans, &amp; LMV</b>	759	150	467
<b>% Share in total</b>	24.28	16.01	18.10
<b>Trucks/Lorries</b>	278	69	172
<b>% Share in total</b>	8.89	7.36	6.67
<b>Buses</b>	67	11	63
<b>% Share in total</b>	2.14	1.17	2.44
<b>Other Non-motorized vehicle (E-rickshaw etc.)</b>	40	11	30
<b>% Share in total</b>	1.28	1.17	1.16
<b>Others</b>	118	49	47
<b>% Share in total</b>	3.77	5.23	1.82



Vehicle type	No. of Accidents	Persons killed	Persons injured
<b>Total</b>	<b>3126</b>	<b>937</b>	<b>2580</b>

**Chart 5.1: Road Accidents and Fatalities by Type of Impacting Vehicles i.e., Crime Vehicle in Million Plus Cities of Rajasthan during 2021**



### Road Accidents, Fatalities, and Injuries by type of Traffic Rules Violations in million plus cities of Rajasthan

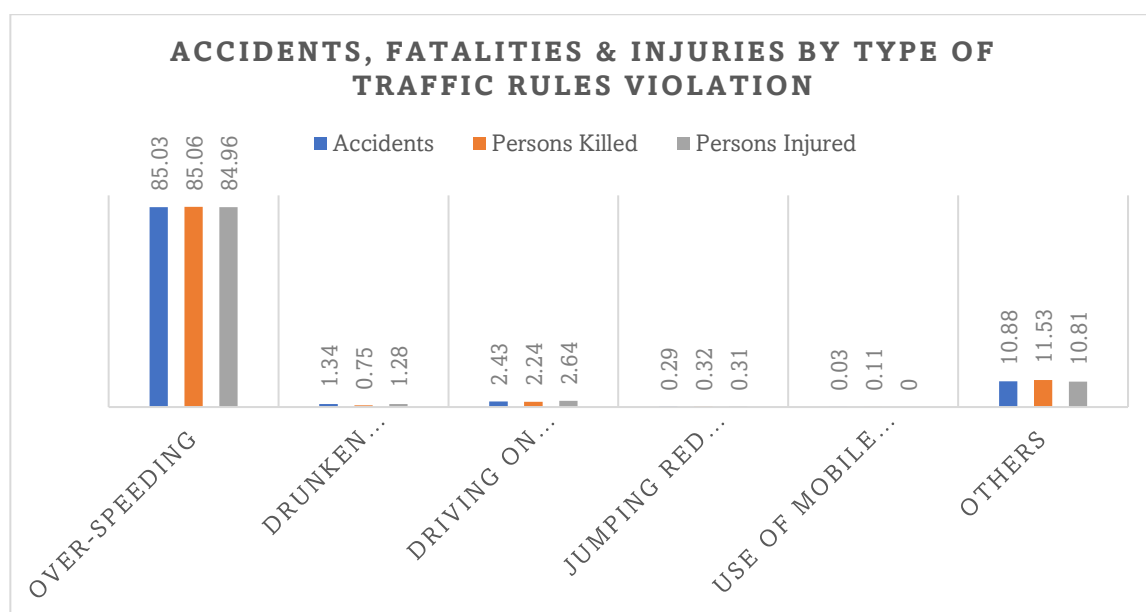
5.14 In the year 2021, 'Over speeding' like at all India level, is the main traffic violation associated with accidents, accident-related deaths, and injuries in the 3 million plus cities of Rajasthan (**Table 5.9**). Over speeding in the 3 million plus cities in Rajasthan accounts for 85.03 percent (2,658) of the road accidents, 85.06 percent (797) of road accident deaths and 84.96 percent of (2,192) of total injuries (**Chart 5.2 & Table 5.9**).

**Table 5.9: Road Accidents, Fatalities and Injuries in Million Plus Cities of Rajasthan by type of Traffic Rules Violation during 2021**

Traffic Rules Violation	Accidents	Persons Killed	Persons Injured
<b>Over-speeding</b>	2,658	797	2,192
<b>% Share in total</b>	85.03	85.06	84.96

Traffic Rules Violation	Accidents	Persons Killed	Persons Injured
<b>Drunken driving/consumption of alcohol &amp; drug</b>	42	7	33
<b>% Share in total</b>	1.34	0.75	1.28
<b>Driving on wrong side/Lane indiscipline</b>	76	21	68
<b>% Share in total</b>	2.43	2.24	2.64
<b>Jumping red light</b>	9	3	8
<b>% Share in total</b>	0.29	0.32	0.31
<b>Use of mobile phone</b>	1	1	0
<b>% Share in total</b>	0.03	0.11	0
<b>Others</b>	340	108	279
<b>% Share in total</b>	10.88	11.53	10.81
<b>Total</b>	<b>3,126</b>	<b>937</b>	<b>2,580</b>

**Chart 5.2: Road Accidents and Fatalities by type of Traffic Rule Violation in Million Plus Cities of Rajasthan during 2021 (Percent Share)**



### Road Accidents, Fatalities, and Injuries by Road Features in million plus cities of Rajasthan

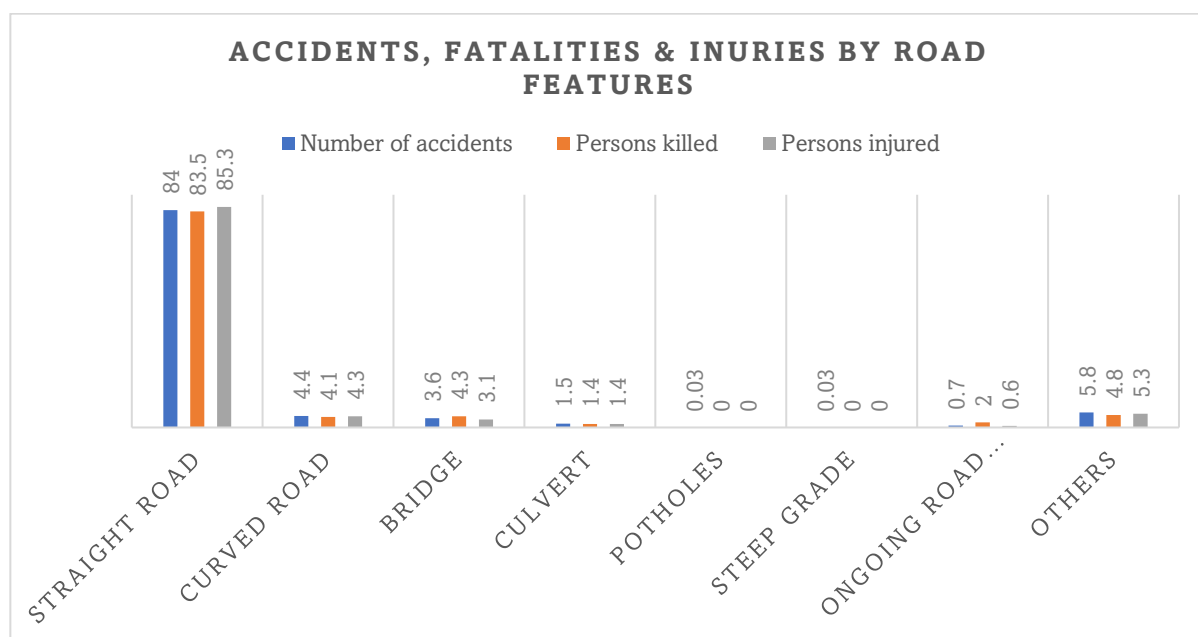
5.15 'Straight roads' accounted for 84 percent of road accidents, 83.5 percent of road accident deaths and 85.3 percent of injuries in the Million Plus Cities during 2021 (Table 5.10 & Chart 5.3). The other road type, which accounted for the second

highest share is 'curved roads' with a share of more than 4.4 percent of road accidents, 4.1 percent of deaths and 4.3 percent of injuries. Various road features which lead to more road accidents include presence of potholes and also irregular situation led by ongoing construction works. In the 3 Million Plus Cities of Rajasthan, ongoing road works/roads under construction and Bridges together account for 0.7 percent of road accidents, 2 percent of deaths and 0.6 percent of injuries. Potholes account for nearly 0.03 percent road accidents, 0 percent of road accident deaths and 0 percent of injuries.

**Table 5.10: Accidents, Persons Killed and Injuries by Road Feature in Million Plus Cities of Rajasthan during 2021**

Road feature	Number of accidents	Persons killed	Persons injured
<b>Straight Road</b>	2625	782	2200
<b>% Share in total</b>	84.0	83.5	85.3
<b>Curved Road</b>	137	38	110
<b>% Share in total</b>	4.4	4.1	4.3
<b>Bridge</b>	113	40	80
<b>% Share in total</b>	3.6	4.3	3.1
<b>Culvert</b>	46	13	37
<b>% Share in total</b>	1.5	1.4	1.4
<b>Potholes</b>	1	0	0
<b>% Share in total</b>	0.03	0	0
<b>Steep Grade</b>	1	0	0
<b>% Share in total</b>	0.03	0	0
<b>Ongoing Road Works/ Under Construction</b>	21	19	16
<b>% Share in total</b>	0.7	2.0	0.6
<b>Others</b>	182	45	137
<b>% Share in total</b>	5.8	4.8	5.3
<b>Total</b>	<b>3126</b>	<b>937</b>	<b>2580</b>

**Chart 5.3: Road Accidents and Fatalities by Road Features in Million Plus Cities of Rajasthan during 2021**



**Road Accidents, Fatalities, and Injuries by Road junctions in million plus cities of Rajasthan**

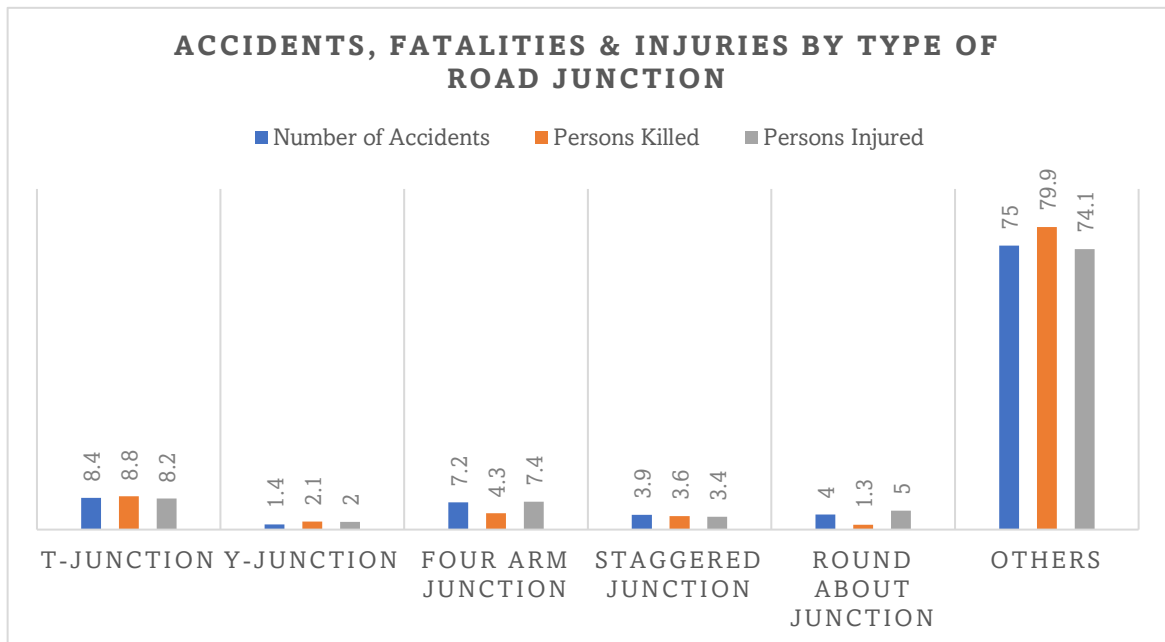
5.16 Road junctions are traffic merging points and hence are prone to accidents. The data of 3 Million-Plus Cities of Rajasthan reveals 25% of the accidents, 20.01% of death and 25.9% of injuries in 2021 took place at various types of junctions defined in the table 5.11, while the “others” category accounted for the remaining 75% of accidents, 79.9% of death and 74.1% of injuries (**Chart 5.4**). Within the Junctions Category, T-junction accounts for the largest share of accidents (8.4%), persons killed (8.8%) and injuries (8.2%).

**Table 5.11: Accidents by type of Road Junction in the Million Plus Cities of Rajasthan during 2021**

Junction Type	Number of Accidents	Persons Killed	Persons Injured
T-Junction	263	82	211
% Share in total	8.4	8.8	8.2
Y-Junction	45	20	51
% Share in total	1.4	2.1	2.0
Four arm Junction	225	40	191

Junction Type	Number of Accidents	Persons Killed	Persons Injured
% Share in total	7.2	4.3	7.4
Staggered Junction	122	34	87
% Share in total	3.9	3.6	3.4
Round about Junction	126	12	128
% Share in total	4.0	1.3	5.0
Others	2345	749	1912
% Share in total	75.0	79.9	74.1
<b>Total</b>	<b>3126</b>	<b>937</b>	<b>2580</b>

**Chart 5.4: Road Accidents and Fatalities by type of Road Junction in Million Plus Cities of Rajasthan during 2021**



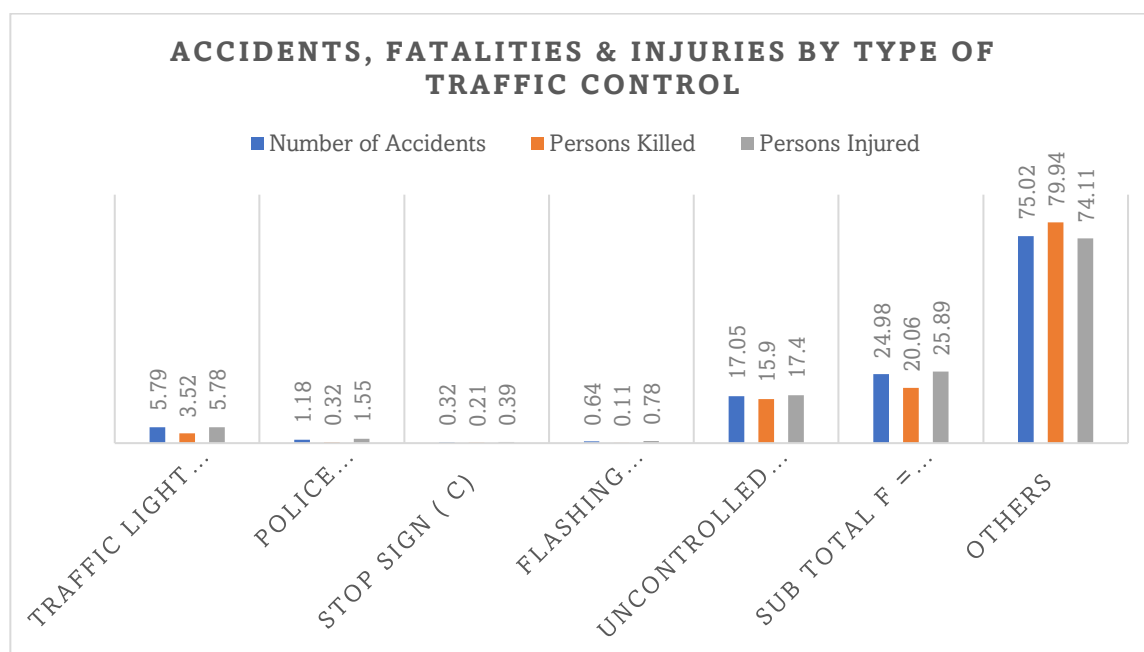
**Road Accidents, Fatalities, and Injuries by type of Traffic Control in million plus cities of Rajasthan**

5.17 The **Table 5.12** reveals the largest number of accidents, persons killed and injures in the 3 Million-Plus Cities took place on uncontrolled crossings, which accounted for 17.05% of the total accidents, 15.9% of the people killed and 17.4% of the people injured during 2021. “Others” category shared 75.02 percent of accidents, 79.94 percent of death and 74.11 percent of injuries (**Chart 5.5**).

**Table 5.12: Accidents, Persons Killed and Injured by type of Traffic Control in Million-Plus cities of Rajasthan during 2021**

Traffic control	Number of Accidents	Persons Killed	Persons Injured
Traffic Light Signal (a)	181	33	149
Share in Total	5.79	3.52	5.78
Police Controlled (b)	37	3	40
Share in Total	1.18	0.32	1.55
Stop Sign ( c)	10	2	10
Share in Total	0.32	0.21	0.39
Flashing Signal/Blinker (d)	20	1	20
Share in Total	0.64	0.11	0.78
Uncontrolled (e)	533	149	449
Share in Total	17.05	15.9	17.4
Sub Total f = (a+b+c+d+e)	781	188	668
Share of subtotal in Total	24.98	20.06	25.89
Others	2345	749	1912
Share in Total	75.02	79.94	74.11
Total	3126	937	2580

**Chart 5.5: Road Accidents and Fatalities by type of Traffic Control in Million Plus Cities of Rajasthan during 2021 (Percent Share)**



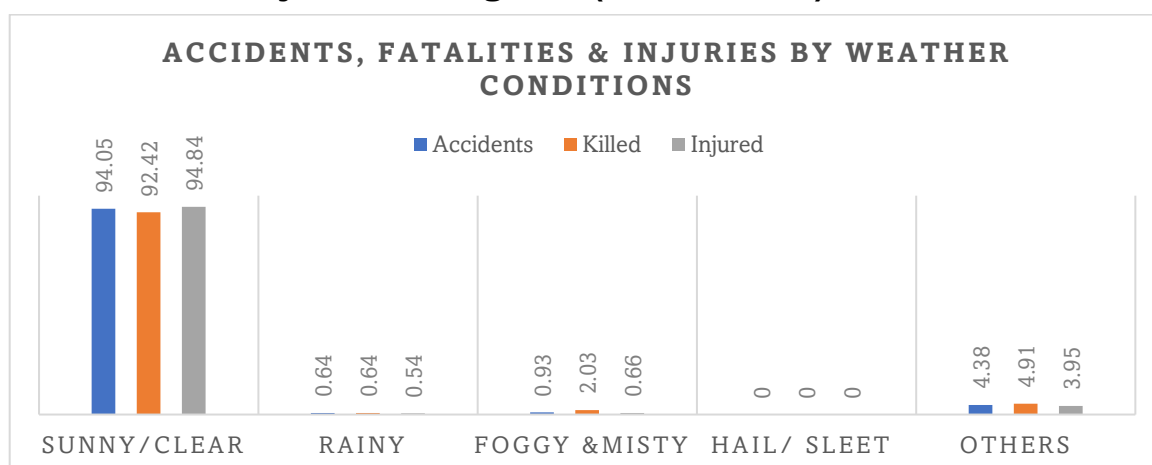
## Road Accidents, Fatalities, and Injuries by Weather Condition in million plus cities of Rajasthan

5.18 Weather condition affects road surface condition and the visibility of the motorist, thereby increasing the chances of mishaps. Data of road accidents for 2021, shows that almost 94.05 percent of the accidents took place under sunny/clear weather condition (**Table 5.13**). Accidents under adverse weather conditions such as rainy, foggy and hail/sleet and others accounted for only 5.95 per cent of total road accidents during 2021.

**Table 5.13: Accidents, persons killed and injured by Weather Condition in Million-Plus cities of Rajasthan in 2021**

Weather condition	Accidents	Killed	Injured
<b>Sunny/clear</b>	2940	866	2447
<b>% Share</b>	94.05	92.42	94.84
<b>Rainy</b>	20	6	14
<b>% Share</b>	0.64	0.64	0.54
<b>Foggy &amp; misty</b>	29	19	17
<b>% Share</b>	0.93	2.03	0.66
<b>Hail/ sleet</b>	0	0	0
<b>% Share</b>	0.0	0.0	0.0
<b>Others</b>	137	46	102
<b>% Share</b>	4.38	4.91	3.95
<b>Total</b>	3126	937	2580

**Chart 5.6: Road Accidents and Fatalities by Weather Condition in Million Plus Cities in Rajasthan during 2021 (Percent Share)**



## CHAPTER-6

# SPATIAL AND INTER-TEMPORAL DISTRIBUTION OF ROAD ACCIDENTS

6.1 As per 2011 census, 75.1 percent of Rajasthan’s population lives in rural area while 24.9 per cent lives in urban areas. Urban areas have higher population density and more vehicular traffic and therefore more incidences of road accidents as compared to rural areas. Social and economic activities and travel during a year and in a day have some seasonality and pattern, which affects road traffic volume and, perhaps, incidences of accidents as well. This section presents a summary of the related data for 2021 in Rajasthan state.

### ROAD ACCIDENTS IN URBAN AND RURAL AREAS

6.2 During 2021, 6,565 (31.34%) road accidents were reported in urban areas and 14,386 (68.66%) in rural areas. In urban area accidents killed 2,455 (24.44%) persons whereas in rural areas the number reported was 7,588 (75.56%). As compared to 2020, the share of urban areas and rural areas in accidents, fatalities and injuries have gone up in 2021 (**Table 6.1**). About 31.03 percent of injured were in the urban area whereas 68.97 percent of injury took place in the rural area. The higher share of rural areas in total fatalities reveals comparatively inadequate trauma care facilities in rural areas as compared to urban area. (**Chart 6.1**)

**Table 6.1: Number of road accidents, persons killed and injured in Rural and Urban areas in Rajasthan vis-à-vis All India from 2015 to 2021**

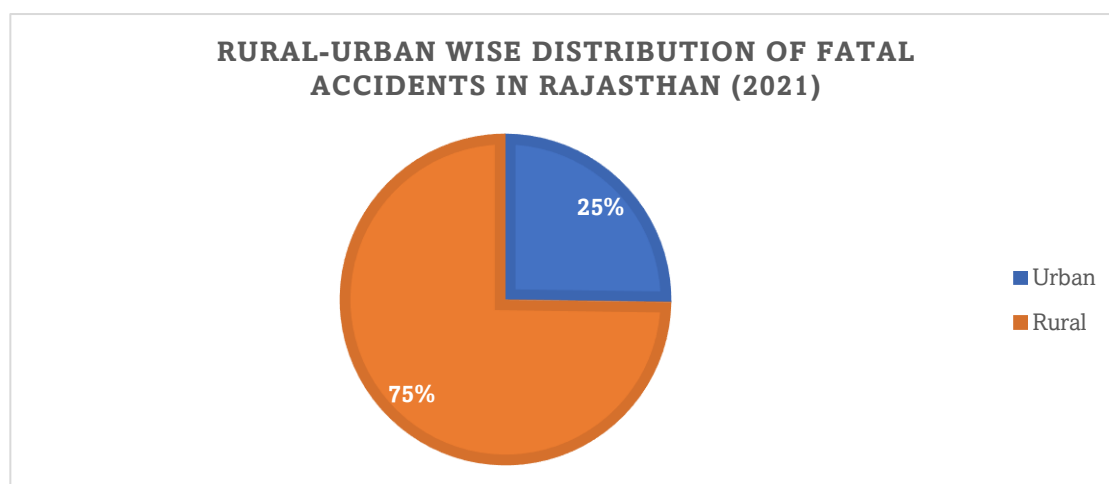
Year	Urban Area			Rural Area			Rajasthan		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
<b>2015</b>	8648	2975	8704	15424	7535	17449	24072	10510	26153
<b>%Share</b>	35.93	28.31	33.28	64.07	71.69	66.72	-	-	-
<b>2016</b>	7781	2803	7,829	15285	7662	16,274	23066	10465	24,103
<b>%Share</b>	33.73	26.78	32.48	66.27	73.22	67.52	-	-	-
<b>2017</b>	7338	2536	7,119	14774	7908	14,952	22112	10444	22,071
<b>%Share</b>	33.19	24.28	32.25	66.81	75.72	67.75	-	-	-
<b>2018</b>	6,850	2,259	6,169	14,893	8,061	15,378	21,743	10,320	21,547
<b>%Share</b>	31.5	21.89	28.63	68.5	78.11	71.37	-	-	-
<b>2019</b>	7,283	2,401	6,673	16,197	8,162	16,306	23,480	10,563	22,979



Year	Urban Area			Rural Area			Rajasthan		
	Accidents	Killed	Injured	Accidents	Killed	Injured	Accidents	Killed	Injured
%Share	31.02	22.73	29.04	68.98	77.27	70.96	-	-	-
2020	5,865	2,188	5,010	13,249	7,062	11,759	19,114	9,250	16,769
%Share	30.68	23.65	29.88	69.32	76.35	70.12	-	-	-
2021	6,565	2,455	6,003	14,386	7,588	13,341	20,951	10,043	19,344
%Share	31.34	24.44	31.03	68.66	75.56	68.97	-	-	-

6.3 The share of Urban Areas in number of accidents has declined as compared to Rural Areas, whose share has increased over the period 2016 to 2021(**Table 6.1**). Whereas, the share of persons killed in Urban areas had declined from year 2016 till 2018 and thereafter it has gone up from 21.89 in year 2018 to 24.44 percent in year 2021 while in rural areas the percentage share of persons killed has increased from year 2016 till 2018 and thereafter it has gone down from 78.11 percent in year 2018 to 75.56 percent in year 2021.

**Chart 6.1: Rural-Urban wise distribution of fatal accidents in Rajasthan during 2021**



## MONTH-WISE DISTRIBUTION OF ROAD ACCIDENTS

6.4 The month wise data on road accidents presented in **Table 6.2** reveals during the last five years (2017 to 2021), the months which recorded maximum number of accidents have no defined pattern or certainty. However, the maximum number of accidents occurred in the month on May from year 2017 till year 2019 and then in the month of February in year 2020 and in month of January in year 2021.

**Table 6.2: Trends of month wise distribution of Road Accidents and Persons Killed during 2017-2021**

Year	2017		2018		2019		2020		2021	
Month	Accident	Killed	Accident	Killed	Accident	Killed	Accident	Killed	Accident	Killed
<b>JAN</b>	1947	829	2,070	886	2,189	922	1,944	837	2,141	899
<b>FEB</b>	1813	818	1,725	784	1,818	774	2,044	915	1,914	838
<b>MAR</b>	1947	917	1,927	863	2,049	949	1,647	768	1,982	919
<b>APR</b>	1909	905	1,981	948	1,961	930	372	220	1,673	840
<b>MAY</b>	2116	1038	2,055	934	2,338	1,043	941	543	991	564
<b>JUNE</b>	1877	889	1,725	874	2,253	999	1,460	725	1,410	695
<b>JULY</b>	1677	755	1,666	804	1,997	797	1,647	779	1,686	818
<b>AUG</b>	1728	869	1,636	807	1,743	743	1,641	749	1,784	879
<b>SEPT</b>	1724	758	1,756	802	1,664	725	1,671	797	1,701	775
<b>OCT</b>	1861	934	1,804	831	1,838	837	1,853	903	1872	866
<b>NOV</b>	1927	893	1,863	931	1,962	986	1,982	1,003	2,019	1,007
<b>DEC</b>	1586	839	1,535	856	1,668	858	1,912	1,011	1,778	943
<b>Total</b>	<b>22112</b>	<b>10444</b>	<b>21,743</b>	<b>10,320</b>	<b>23,480</b>	<b>10,563</b>	<b>19,114</b>	<b>9,250</b>	<b>20,951</b>	<b>10,043</b>

## TIME INTERVAL-WISE DISTRIBUTION OF ROAD ACCIDENTS

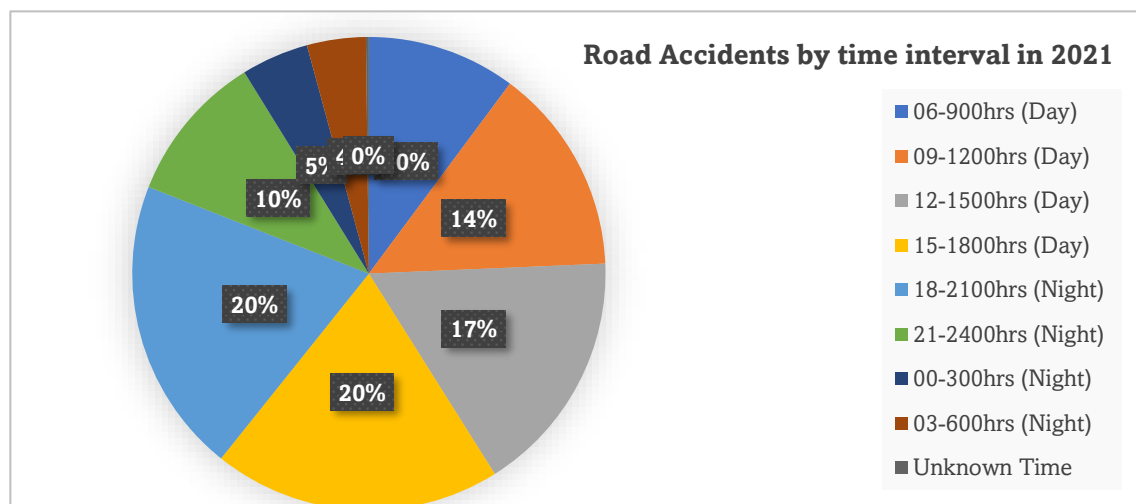
6.5 In 2021, the time interval between 18:00-21:00hrs (Night) recorded maximum number of road accidents, accounting for 20.23 percent of the total accidents in the state and this is in line with the pattern seen over the past five years (**Table 6.3**). The second highest time interval of a day was between 15:00-18:00 hrs (Day) constituting for 19.67 percent of road accidents in 2021. As per the data, afternoon and evening times are the most dangerous times to be on the road. The time interval of 3:00 AM to 6:00 AM has the least number of accidents (**Table 6.3 & Chart 6.4**).

**Table 6.3: Number of Road Accidents by time interval of day during 2017-2021**

Time	2017		2018		2019		2020		2021	
	Number of Accidents	Share in total accidents	Number of Accidents	Share in total accidents	Number of Accidents	Share in total accidents	Number of Accidents	Share in total accidents	Number of Accidents	Share in total accidents
06-900hrs (Day)	2237	10.12	2,369	10.9	2,485	10.58	1,770	9.26	2,130	10.17
09-1200hrs (Day)	3452	15.61	3,308	15.21	3,388	14.43	2,715	14.2	2,967	14.16

Time	2017		2018		2019		2020		2021	
	Number of Accidents	% Share in total accidents	Number of Accidents	% Share in total accidents	Number of Accidents	% Share in total accidents	Number of Accidents	% Share in total accidents	Number of Accidents	% Share in total accidents
12-1500hrs (Day)	3852	17.42	3,523	16.2	3,814	16.24	3,253	17.02	3,507	16.74
15-1800hrs (Day)	4366	19.74	4,343	19.97	4,841	20.62	3,860	20.19	4,121	19.67
18-2100hrs (Night)	4257	19.25	4,392	20.2	4,567	19.45	3,879	20.29	4,238	20.23
21-2400hrs (Night)	2108	9.53	2,022	9.3	2,170	9.24	1,876	9.81	2,141	10.22
00-300hrs (Night)	903	4.08	895	4.12	1,062	4.52	889	4.65	963	4.6
03-600hrs (Night)	937	4.24	827	3.8	1,153	4.91	721	3.77	843	4.02
Unknown Time	NA	NA	64	0.29	0	0	151	0.79	41	0.2
<b>Total</b>	22112		21,743		23,480		19,114		20,951	

**Chart 6.4: Road Accidents by time interval of day during 2021 (percentage share)**



## CHAPTER-7

# ROAD ACCIDENT MITIGATION MEASURES TAKEN BY STAKEHOLDER DEPARTMENTS

- 7.1 India is committed to bring down fatalities from road accidents as it is one of the signatories of the Global High Level Conference on road safety held in Brazil. This declaration aimed at reduction in number of global deaths and injuries from road traffic accidents. It also intended that the countries should form transport policies in order to favour more sustainable modes of transport such as walking, cycling and using public transport. It highlights strategies to ensure the safety of all road users by improving laws and enforcement, making roads safer through infrastructural modifications, ensuring that vehicles are equipped with life saving technologies and enhancing emergency trauma care system. Looking into the large number of deaths United Nations also declared 2010-2020 as the decade of action for road safety.
- 7.2 Recognising the importance of road safety the decade 2011-20 was declared by UN as Decade of Action on Road Safety 2011-20, promoting the safe system and vision zero approach to road safety. In September 2020 the UN General Assembly adopted resolution “improving global road safety” proclaiming the Decade of Action for Road Safety 2021-2030 with ambitious target of preventing at least 50% of road traffic deaths and injuries by 2030. WHO and the UN regional commissions, in cooperation with other partners in the UN Road Safety Collaboration, have developed a Global Plan for the Decade of Action, which was released in October 2021. The Global Plan aligns with the Stockholm Declaration by emphasizing the importance of a holistic approach to road safety, and calling on continued improvements in the design of roads and vehicles, enhancement of laws and law enforcement and provision of timely life saving emergency care for the injured.
- 7.3 Progress made during the previous Decade of Action for Road Safety 2011-2020 has laid the foundation for accelerated action in the years ahead. Among achievements are inclusion of road safety on the global health and development agenda, broad dissemination of scientific guidance on what works, strengthening of partnerships and networks, and mobilization of resources. This new Decade of

Action provides an opportunity for harnessing the successes and lessons of previous years and building upon them to save more lives.

7.4 In this regard it is also submitted that Looking into the road accident scenario in the country Hon'ble Supreme Court expressed its concern for road safety and on 22.04.2014 in Writ Petition (Civil) No. 295/2012 S Rajaseekaran v/s Union of India, directed the Central Government to formulate a committee to monitor and measure implementation of road safety laws in the country. MoRTH on 30.05.2014 under the chairmanship of retired Supreme Court Judge Hon'ble Justice J.S. Radhakrishnan notified formulation of above committee. As a result of the various directions given from time to time, by the above committee most of the States have established institutional arrangements to promote road safety, undertake engineering majors to make roads safe, tighten enforcement together with promoting road safety education and establishing adequate trauma care facilities. At present this committee is being headed by Hon'ble Justice Abhay Manohar Sapre.

7.5 The measures taken by various stakeholder departments which includes Ministry of Road Transport & Highways, Government of India, Transport and Road Safety Department, Police Department and Public Works Department of Government of Rajasthan to improve road safety so as to contain the number of road accidents, fatalities and injuries has been described below.

## **INITIATIVES TAKEN BY MINISTRY OF ROAD TRANSPORT AND HIGHWAYS (MoRTH)**

### **EDUCATION MEASURES**

#### **Publicity and Awareness Campaigns**

7.6 The Ministry of Road Transport & Highways has implemented a scheme, "Grant of Financial Assistance for Administering Road Safety Advocacy and Awards for the Outstanding Work Done in the Field of Road Safety". Under the scheme, financial assistance is provided to various eligible agencies such as NGO/Trust under Indian Trusts Act/ Cooperative Society under Societies Registration Act/ Firm registered under the companies Act, 1956/ 2013 or an Academic Institutions accredited / affiliated to or recognized as a university or Deemed university by

UGC Act (hereinafter referred to as 'Applicant Agency'). As prescribed in the scheme guidelines, programme themes covered under the scheme are Road Safety Audit, Pilot projects, Awareness campaigns (Awareness Building, Safer Vehicles, Safer Road Users) and Capacity Building.

- 7.7 To create effective public awareness about road safety, Ministry undertakes various publicity measures and awareness campaigns on road safety through social media, electronic media, and print media.

## **ENGINEERING MEASURES**

### **Road Engineering Identification and Rectification of Accident Black spots**

- 7.8 High priority has been accorded for identification and rectification of black spots (accidents prone spots) on National Highways. Concerted efforts towards improvement of road safety through engineering measures on National Highways have been made. Ministry of Road Transport & Highways has identified 5,352 black spots on National Highways based on accident and fatality data of year 2015-2018 in 30 states/UTs. Ministry is taking following steps to rectify the black spots.

- (i) The black spots are being rectified by providing immediate short-term measures such as cautionary road signs and markings, transverse bar markings, rumble strips and solar blinkers etc.
- (ii) For long term rectification, measures such as Flyover, Underpasses, Foot over Bridges, Service roads etc. are being provided wherever required.
- (iii) Traffic calming measures such as traffic warning signs, delineators, road studs, bar markings, humps at approach roads, etc. are taken at vulnerable sections of National Highways to reduce road accident fatalities.
- (iv) Emergency/medical facilities for the road accident victims are provided as per the respective contract/concession agreements signed between NHAI and the contractor/concessionaire.

### **Road Safety Audits**

- 7.9 It is mandatory to carry out the Road Safety Audit of all highway projects at all stages i.e. design, construction and operation & maintenance stages. The Road Safety Audit is being carried out as per the applicable standards laid down by the Indian Road Congress (IRC).

## **Pedestrian Facilities**

7.10 Financial power of up to ₹25 crores for construction of Pedestrian Underpasses (PUP) and Pedestrian Subways (PSW) and up to ₹1.25 crore for construction of Foot Over Bridges (FOBs) is delegated to Regional Officers of NHAI to speed up the process. To make roads safer for pedestrians, MoRTH notified AIS 100, which contains the requirements for the protection of pedestrian and other vulnerable road users in the event of a collision with a Motor Vehicle. These norms were applicable from 01st October 2018 for new models and from 1st October 2020 for all models.

## **Vehicle Engineering**

7.11 Crash safety norms: To ensure the safety of the occupants of the vehicles in an event of a crash, following standards have been notified.

- (i) AIS 098: Requirements for the Protection of the Occupants in the event of an Offset Frontal Collision
- (ii) AIS 099: Requirements for the Protection of the Occupants in the event of a Lateral Collision.

The applicability of these standards started from 1<sup>st</sup> October 2017 for new models and from 1<sup>st</sup> October 2019 for all existing models.

## **Mandatory fitment of safety technologies**

7.12 To enhance the safety aspect of the vehicle, from time to time, MoRTH notifies mandatory fitment of various safety technologies in various vehicle categories. Few of the safety technologies mandated by MoRTH are as listed below:

**(a) Airbags:** Fitment of front airbag for driver was mandated from 01st July 2019. From 01st April 2021 for new models and 31st December 2021 for all models, fitment of co-driver airbag was also made mandatory. In his regard, Ministry has notified GSR 148(E) dated 2nd March 2021.

**(b) Anti-lock Braking System (ABS) and Combined Braking System (CBS):** Mandatory fitment of ABS, applicable for 4 wheelers and for 2-wheelers with engine capacity greater than 125 cc, got implemented from 01st April 2018 for

new models and 01st April 2019 for all models. For 2-wheelers with engine capacity less than or equal to 125 cc, ABS or CBS must be fitted.

**(c) Safety Technologies:** Some other safety technologies made mandatory from 01st July 2019 are seat belt reminder for driver and co-driver, over speed warning system, reverse parking sensors, and manual override for central locking door.

**(d) Bharat New Car Assessment Program:** The Ministry of Road Transport and Highways has issued a draft notification dated 24th June 2022, for the introduction of Bharat New Car Assessment Program (BNCAP). Under this program motor vehicles of category M1 [motor vehicles used for carriage of passengers comprising not more than eight seats in addition to the driver's seat] safety technologies in various vehicle categories. Few of the safety technologies mandated by MoRTH are as listed below:

- (i) Gross Vehicle Weight not more than 3.5 tonnes, cars will be tested as per Standard AIS -197, and star rating will be assigned based on its performance in respect of adult occupant protection, child occupant protection and safety assist technology. The customers can refer to this star rating to evaluate the safety aspect of the vehicle before purchasing it. The program is proposed to be implemented from 01st April 2023.
- (ii) The Ministry has mandated that all transport vehicles shall be equipped with speed limiting function/ device, except for two-wheeler, three-wheeler, Quadricycle, fire tenders, ambulances, police vehicles.
- (iii) This Ministry has mandated that the fully built buses (with a seating capacity of 22 passengers or above, excluding driver) manufactured on and after 1st April 2019 by Original Equipment Manufacturers shall comply with the requirements of Fire Detection, Alarm and Suppression system. Further, type III buses of category M3 and school buses, shall also comply with fire alarm and protection system in occupant compartment.
- (iv) This Ministry has prescribed norms related to safety measures for children below four years of age, riding or being carried on a motorcycle. Further, it specifies use of a safety harness, crash helmet and restricts speed to 40kmph.



- (v) MoRTH mandated the application of reflective tapes on the front, rear and side of buses, trucks and trailers to ensure better visibility of these vehicles during night time.

## **TRAINING AND CAPACITY BUILDING**

- 7.13 Accredited Driver Training Centre: Shortage of skilled drivers is one of the major issues in the Indian Roadways Sector. The Ministry of Road Transport and Highways has published a notification on 7th June, 2021, wherein the requirements to be fulfilled by accredited driver training centers have been mandated. The Centre shall be equipped with simulators and dedicated driving test track to provide high quality training to candidates. The candidates who successfully pass the test at these centers will be exempted from the driving test requirement at the time of applying for driving license, which is currently being taken at the RTO. These centres are allowed to provide industry specific specialized training as well.
- 7.14 To ensure good driving skills and knowledge of rules of road regulations among the drivers and to strengthen the system of driver licensing and training to improve the competence and capability of drivers, Ministry is setting up model Institutes of Driving Training and Research (IDTR) Centres, Regional Driving Training Centres (RDTCs) and Driving Training Centres (DTC) in the States/UTs. As on December 2021, a total 31 IDTRs and 6 RDTCs were sanctioned out of 31 IDTRs, 18 IDTRs are functional and remaining are at different stage of completion.
- 7.15 Poor maintenance and use of old vehicles which is not roadworthy (not fit) cause accidents and deaths. To strength the fitness check regime in the country, Ministry of Road Transport and Highways is setting up model Inspection and Certification Centres in States/UTs. As on December 2021, 26 States/UTs have been covered under the scheme.
- 7.16 Ministry of Road Transport and Highways has tied up with Indian Institute of Technology (IIT) Madras to setup a Center of Excellence for Road Safety, to work on development of new products, capacity building, knowledge sharing, collaborations, research and strategic initiatives focused towards improving road safety and reducing road fatalities in the Country. CoERS will assist in creation of an ecosystem for bringing the best practices of road safety to the Country and in establishing leadership at the tri-junction of academia, industry and Government.

## **ENFORCEMENT MEASURES – The Motor Vehicles Act**

7.17 The Motor Vehicles Act, 1988 is the principal instrument through which road transport is regulated in the country. The same has been amended first time in comprehensive way by The Motor Vehicles (Amendment) Act, 2019, passed by the Parliament and published in the Gazette of India on 9th August 2019. The Act is expected to bring reforms in the various segments as elaborated upon in the subsequent paras:

7.18 The Act will bring reforms in the area of Road Safety, bring citizen facilitation, transparency, and reduce corruption with the help of information technology and removing intermediaries. The Act will strengthen public transport, safeguard and protect Good Samaritan and reform the insurance and compensation regime. It will allow innovation and new technologies such as driverless vehicles, to be tested in live environment and increase efficiency in research. The Act will facilitate Divyang by allowing motor vehicles to be converted to adapted vehicles with post-facto approval and facilitating license to drive adapted vehicles.

7.19 **Some of the important Road Safety Provisions and Penalties are as under:**

### **A. Strengthening Enforcement and Road Safety**

- (a) Stricter penalties to improve deterrence effect
- (b) Minimum Penalty of ₹500/- as against present amount of ₹100 for minor offences
- (c) New Section for Juvenile offenders included for the first time with strict penalties
- (d) Drunken driving -Penalty increased to ₹10,000/- from present level of ₹2,000/- and mandatory suspension of license
- (e) Impounding and suspension of License in case of over speeding, dangerous driving, drunk and driving, use of unsafe vehicles, not wearing helmets, use of mobiles, etc.
- (f) Recognizing the use of IT enabled enforcement equipments.
- (g) Recognition of driver refreshing training course as a remedial measure in case of suspension of license.
- (h) Mandatory automated testing for fitness certification.

- (i) Constitution of National Road Safety Board to render advice on Road Safety and Traffic Management.

### **B. Speedy Assistance to Accident Victims**

- (a) Protection of Good Samaritans who help accident victims
- (b) Heavy Penalties on those not giving way to Ambulances
- (c) Cashless treatment during golden hour
- (d) Faster and hassle-free provisions for compensation of ₹2.5 lakhs for grievous hurt and ₹5 lakhs for death.
- (e) Enhanced compensation of ₹2 lakhs in case of death and fifty thousand for grievous hurt for victims of hit and run accidents.
- (f) Simplification of procedures for 3rd Party Insurance and hired Driver brought under the insurance cover.

### **C. Simplification and citizen facilitation**

- (a) Permitting issue of driving license anywhere in the State
- (b) Facilitating grant of online learning license.
- (c) Registration of new vehicles at the dealer's end including grant of registration number before the delivery of the vehicle is given.
- (d) Renewal of transport license after five years as against present provision of three years.
- (e) Documentation permissible in electronic form.
- (f) Provision for recycling of vehicles
- (g) Adapted vehicles for Divyang

### **D. Strengthening Public Transport**

- (a) Aggregators recognized as a legal entity
- (b) Promote Rural Transport
- (c) Promote Public Transport
- (d) Promote last mile connectivity
- (e) National and State Level Transportation plans

- (f) States can formulate Schemes for promotion of public transport waiving the conditions in the Act.

#### **E. Automation and Computerization**

- (a) Promoting use of electronic forms and documents.
- (b) Migration from State registers of driving license and vehicle registration to National level database.

#### **F. Empowerment of States**

- (a) Compound offenses at amounts equal to the penalty or higher amounts
- (b) Impose a multiplier up to 10 to any penalty
- (c) Exempt the requirement of Stage Carriage in interest of rural transport
- (d) Exempt the requirements for promoting the last mile connectivity
- (e) Can authorize any other person to exercise the powers
- (f) Regulating pedestrians' movements and non-motorized traffic

#### **Enhancing Road Safety of Citizens Protection of Good Samaritan**

7.20 The Motor Vehicles (Amendment) Act, 2019 inserted a new section 134A, viz., "Protection of Good Samaritans". This section provides that no police officer or any other person, shall compel a Good Samaritan to disclose the name, identity, address or any such other personal details: provided that the Good Samaritan may voluntarily choose to disclose his/her name.

7.21 MoRTH initiated a scheme, "Scheme for grant of Award to the Good Samaritan who has saved life of a victim of a fatal accident involving a motor vehicle by administering immediate assistance and rushing to Hospital/Trauma Care Centre within the Golden Hour of the accident to provide medical treatment". Under this scheme, Good Samaritans are incentivized, so that Good Samaritan acts are encouraged.

## **OTHER INITIATIVES**

### **Electronic Monitoring and Enforcement**

7.22 For provision of electronic monitoring and enforcement of Road Safety (through speed cameras, CCTVs, speed guns, dash cams, body wearable cameras etc.), rules have been notified through G.S.R. 575(E) dated 11th August 2021.

### **Incident Management System & Incident Management Services**

7.23 The services like ambulances, patrol vehicles, cranes to be deployed at every toll plaza.

### **National Road Safety Board (NRSB)**

7.24 National Road Safety Board and its Rules have been notified on 3rd September 2021.

### **Supreme Court Committee on Road Safety**

7.25 Regular review meetings are being conducted by Supreme Court Committee on Road Safety, State Road Safety Committee and District Road Safety Committee. The Ministry, in coordination with field offices, ensures compliance of directions of the Supreme Court Committee on Road safety.

### **Integrated Road Accident Database (iRAD)**

7.26 Integrated Road Accident Database (iRAD) system is a central repository for reporting, management, claim processing and analysis of road accidents data to enhance road safety in the Country. The application is being developed and implemented by NIC/NICSI and the required analytics on the data is being carried out by Indian Institute of Technology (IIT) Madras under the aegis of Ministry of Road Transport and Highways (MoRTH). It is being integrated with national databases such as CCTNS, VAAHAN, SAARTHI etc. Till now, the application has been rolled out in 34 States for live data entry of road accidents.

## **INITIATIVES TAKEN BY TRANSPORT & ROAD SAFETY DEPARTMENT OF GOVERNMENT OF RAJASTHAN**

7.27 Some of the measures which have been taken by the Transport department of the State to improve road safety so as to decrease the number of road accidents and fatalities in road accidents are as follows:-

- (i) Transport department declared as nodal department for road safety.
- (ii) Name of the department changed to Transport and Road Safety Department from previous name of Transport Department w.e.f. 01.10.2021.
- (iii) Following State level Road Safety Committees constituted: -
  - a. High Powered Committee under the Chairmanship of Hon'ble Chief Minister of the State constituted on 12.03.2020
  - b. State Road Safety Council under the Chairmanship of Transport Minister of the State constituted on 03.07.2009
  - c. Traffic Management Committee under the Chairmanship of Chief Secretary of the State constituted on 10.04.2007
  - d. Special Task Force chaired by Principle Secretary Home/Transport and Road Safety constituted on 17.06.2022

7.28 Besides, above in each district a District Road Safety Committee under the Chairmanship of District Collector has been constituted on 15.07.2022

- (i) Road Safety Policy for the State notified on 21.03.2017
- (ii) Dedicated non-lapsable Road Safety Fund created, 25% of revenue collected from traffic violation challans in the State goes to this fund.
- (iii) Road Safety War Room for immediate support of accident victims made operational.
- (iv) Integrated Road Accident Database (iRAD) created.
- (v) Road safety audit of roads by the joint teams at State and District Level are carried out.
- (vi) Joint inspection of major road accidents by the officer of Transport, Police and Public Works Department of the State.

- (vii) Scheme for investigation of road accident cases and wayside amnesties/traffic aid posts/truck parking complexes along highways of Rajasthan notified on 03.09.2021 under section 135 of Motor Vehicles Act, 1988.
- (viii) Awareness activities through IEC, FM, TV, Social media, RSRTC buses etc. organized from time to time.
- (ix) Financial Assistance to Police department from Road Safety Fund for regular awareness activities, reflective tape installation, establishing traffic aid post, carrying out rescue operations, minor road repairs, establishing counselling centres for the drivers found violating traffic rules and purchase of equipments.
- (x) Automated driving testing track planned for 37 transport districts and have been made operational in 13 transport districts.
- (xi) Procurement of portable weighing machines/e-challan for enforcement staff
- (xii) Steps taken for correcting Black spot
- (xiii) Mukhyamantri Chiranjeevi Jeevan Raksha Yojana-2022 made operational which provide for granting reward of ₹5000/- and issuance of appreciation certificate for persons who carry accident victims to hospital for medical treatment.
- (xiv) Mukhyamantri Chiranjeevi Sadak Suraksha Yojana-2022 made operational for free treatment of road accident victims for a period of 72 hours from the time of accident.
- (xv) Mukhyamantri Chiranjeevi Durghatna Bima Yojana-2022 provides for compensation of ₹5 lakhs to the person who dies in road accident and ₹1.5 lakhs to ₹3 lakhs for disability caused to the victim of road accident.
- (xvi) Balvahini scheme for safe transportation of school children, establishing road safety clubs
- (xvii) Carrying out capacity building programmes for stakeholders such as school going children, para-medical staff, teachers etc.
- (xviii) Carrying out road safety auditors training by the engineers.

## **INITIATIVES TAKEN BY POLICE DEPARTMENT OF GOVERNMENT OF RAJASTHAN**

7.29 Some of the measures which have been taken in the year 2022 by the Police department of the State to improve road safety so as to decrease the number of road accidents and fatalities in road accidents are as follows:-

- (i) Constitution of Road Safety Audit Teams in each district of the State for auditing National Highways and State Highways. So far road safety audit of 1985 Kms has been completed.
- (ii) To ensure transparency in challan system of vehicles a system of e-Challan with a facility of digital payment has been started. So far this system has been established in 16 districts of the State and 10,23,052 challans have been made in the year 2022 through e-Challan system.
- (iii) Intelligent Traffic Management System (ITMS) has been integrated with e-Challan server of NIC for the offences relating to Motor Vehicles Act, 1988 in the Police Commissioner Office, Jaipur. The above system enables the offenders to open the link given in the message for depositing the composition money.
- (iv) To ensure uniformity in road accident data a MIS software has been developed in the department.
- (v) 5,47,713 reflected tapes were affixed on motor vehicles, stray animals etc. in the year 2022.
- (vi) 25 interceptor vehicles with latest technology have been allotted to different districts of the State and the e-Challan against the drivers violating the provision of the Motor Vehicles Act, 1988 are generated by using ITMS.
- (vii) 40 police stations where the death rate on account of road accidents is 20 or more were monitored every day through video conferencing in year 2022. 178 such police stations shall be monitored in year 2023 under the above scheme.
- (viii) A policy to promote use of BIS approved helmets was initiated. Special campaign was initiated to check the sale/storage of non ISI marked helmets.



- (ix) Basic life saving training programme was initiated in 100 police stations located on National Public State Highways with help of NGOs in year 2022.
- (x) Awareness programmes on traffic rules and road safety were initiated in each month by Highway Mobile Teams in at least five villages located on National Highways, so far these programmes have been conducted in 2023 villages in the year 2022.
- (xi) 21 new traffic aid check posts were established on various national highways of the State.
- (xii) Scientific investigation of the accident sites by joint teams are being carried out in those cases where the number of death(s) on account of road accidents in 4 or more.
- (xiii) 424 officers/sub-ordinate police officials were accorded training to investigate on Road Safety Management and road accident by the Rajasthan Police Academy, Jaipur in the year 2022.

7.30 The above measures have strengthened creation of an effective policy making mechanism for improving road safety, creating a robust infrastructure in terms of capacity building of stakeholders and post accidental measures which mainly relate to providing expeditious medical/financial aid to the victims of road accidents.

## CHAPTER-8

# PREVENTIVE MEASURES

- 8.1 The road accidents are multi-causal which requires multi-pronged measures to mitigate the problems through concerted efforts of all agencies of both Central Government and State Governments. Transport and Road Safety Department in coordination with other related departments have formulated a multi-pronged strategy to address the issue of road safety based on Education, Engineering, Enforcement and Emergency Care.
- 8.2 It is also submitted that on account of the continuous monitoring of the Hon'ble Supreme Court the necessary institutional setup has been created in almost all the States of country including Rajasthan. In state of Rajasthan following activities/schemes have been framed and notified:
- (i) Formulation of State Road Safety Policy
  - (ii) Setting up of State Road Safety Council and holding of meetings at least twice in a year
  - (iii) Setting up of a Lead Agency with adequate dedicated and professional staff to deal exclusively with Road Safety issues
  - (iv) Establishing a non-lapsable Dedicated Road Safety Fund by appropriating 25 percent of fines collected from traffic violators in each year
  - (v) Preparing a Road Safety Action Plan with annual targets for reducing road accidents and deaths
  - (vi) Constitution of District Road Safety Committees under the chairmanship of District Collectors.
- 8.3 In spite of the creation of institutional setup still there is much scope for further improving road safety measures, so as to ensure reduction in number of road accidents, fatalities and injuries in the State. It seems that there is a necessity to draw an action plan at the level of State Government wherein simultaneous action is required to be taken on the following four issues given below:
- (i) Intensive publicity for awareness of general public on traffic rules and penalties thereon payable for their violations

- (ii) Strengthening of enforcement activities by extensive use of electronic monitoring for violation of traffic rules
- (iii) Improvement of Road conditions by adhering to the standards specified for road engineering by Indian Road Congress
- (iv) Strengthening emergency response and medical care systems

8.4 Road accidents are multi-causal and are the result of an interplay of various factors. The major causes of road accidents are lack of awareness/knowledge of traffic rules in general public, defective road engineering, use of defective vehicles and gross violation of traffic rules. Presently the system of enforcing road/traffic discipline is mostly manual and the individuals who are violating the traffic rules are aware of the fact that in the absence of any effective enforcement mechanism they are free to violate the traffic rules. Hence, there is a necessity to create a deterrent effect in the minds of such traffic rule violators by promoting extensive use of electronic monitoring of traffic offenders. State Directorate of Revenue Intelligence (SDRI) suggests that the State Government should work on all the above 4 issues simultaneously so that the road safety maybe improved in the State. The above four issues along with suggestions are as follows:

### **INTENSIVE PUBLICITY AND AWARENESS DRIVE THROUGH ELECTRONIC, DIGITAL AND PRINT MEDIA**

8.5 The purpose of providing stringent penalties in law serves a dual purpose. On the one hand, the offender is punished for the offence committed by him and on the other hand, such penalties create a deterrent effect in the minds of persons not abiding laws. In 2019 the Motor Vehicles (Amendment) Act was enacted wherein besides other amendments the penalties for violation of traffic laws were made stringent in the Motor Vehicles Act, 1988. The Statement of Objects and reasons of the amending act clearly states that with rapidly increasing motorisation, India is facing an increasing burden of road traffic injuries and fatalities. The emotional and social trauma caused to the family which loses its bread winner, cannot be quantified. India being signatory to the Brasilia Declaration is committed to reduce the number of road accident fatality by 50 percent by the year 2030. Looking into the above objects the fines and penalties for the violation of provisions of the Act were increased multiple fold. It is also submitted that some new sections relating

to Good Samaritans, Golden Hour, Driver refreshing training course, offences by juveniles, framing of schemes for the transportation of goods and passengers for the promotion of development and efficiency in transportation were also enacted through the above amending Act.

8.6 The general public is not fully aware of the new provisions including the penalties payable on such violations, the impact of such violation on the driving license of the offenders, the mandatory suspension of driving license provided for committing certain offences like jumping a red light, violating a stop sign, use of handheld communication devices while driving, passing or overtaking other vehicles in a manner contrary to law, driving against the authorised flow of traffic, the responsibility of the guardian of a motor vehicle for allowing a juvenile person to drive a vehicle, etc. are not much known to the general public. In case the above provisions are widely publicised by using social media, electronic media, and print media they will certainly create a positive effect in the minds of citizens to follow traffic rules. Many enlightened citizens may take precautions and would like to ensure that the traffic laws are followed diligently after becoming aware of the consequences of traffic violations in terms of payment of fine, disqualification for holding a driving license and the necessity to undertake driver refresher training course for becoming eligible for driving.

8.7 The provisions which require wide publicity are being listed below:

- (i) Section 206(4) provides for seizing of driving license by a police officer and forwarding it to the licensing authority for disqualification or revocation proceedings under Section 19 if he has a reason to believe that an offence has been committed by a person under Sections 183, 184, 185, 189, 190, 194-C, 194-D or 194-E.
- (ii) Section 183 is a penal section for driving at excessive speed in case a second or subsequent offence under this section is committed then the driving license of such person can be impounded under Section 206(4) of the Act. The minimum fine under this offence is Rs. 1000 extending up to Rs. 4000 depending on the nature of the vehicle used.
- (iii) Section 184 provides for penalty for dangerous driving which includes jumping a red light, violating a stop sign, use of handheld communication

devices while driving, passing or overtaking other vehicles in a manner contrary to law, and driving against the authorised flow of traffic. The minimum fine under this offence is Rs. 1000 which may extend upto Rs. 5000 and a minimum imprisonment of 6 months which may extend to one year. On committing a second or subsequent offence the fine amounts to Rs. 10000 and with imprisonment for a term which may extend to two years or both.

- (iv) Section 185 provides for fine for driving of vehicle by a drunken person or by a person under the influence of drugs. The minimum fine for the first offence is Rs. 10000 and with imprisonment for a term which may extend to 6 months or both. On subsequent offence the amount of fine is Rs. 15000 with imprisonment for a term which may extend to two years or both.
- (v) Section 189 provides for the offence of racing and trials of speed and the minimum fine for the first offence is Rs. 5000 and with imprisonment for a term which may extend to 3 months or both. On subsequent offence the amount of fine is Rs. 10000 with imprisonment for a term which may extend to one year or both.
- (vi) Section 190 provides for the offence of using a vehicle in unsafe condition and which has resulted in an accident then the minimum fine for the first offence is Rs. 5000 and with imprisonment for a term which may extend to 3 months or both. On subsequent offence the amount of fine is Rs. 10000 with imprisonment for a term which may extend to 6 months or both.
- (vii) Section 194-C provides for penalty for violation of safety measures for motorcycle drivers and pillion riders which is punishable with a fine of Rs. 1000 and such person shall be **disqualified for holding license for the period of 3 months.**
- (viii) Section 194-D provides for penalty for not wearing protective head gear with a fine of Rs. 1000 and such person shall be **disqualified for holding license for the period of 3 months.**
- (ix) Section 194-E provides for failure to allow free passage to emergency vehicles is punishable with a fine of Rs. 10000 and imprisonment for a term, which may extend to 6 months or both.
- (x) Section 181 provides for driving a vehicle in contravention of Section 3 or Section 4 of the Act i.e., driving a vehicle without a driving license of driving a vehicle by a person who is of an age less than the prescribed age is

punishable with a fine of Rs. 5000 and with imprisonment for a term which may extend to 3 months or with both.

(xi) Section 194-B provides for use of safety belts and the seating of children in the vehicle.

(1) Whoever drives a motor vehicle without wearing a safety belt or carries passengers not wearing seat belts shall be punishable with a fine of one thousand rupees:

*Provided that the State Government, may by notification in the Official Gazette, exclude the application of this sub-section to transport vehicles to carry standing passengers or other specified classes of transport vehicles.*

(2) Whoever drives a motor vehicle or causes or allows a motor vehicle to be driven **with a child who, not having attained the age of fourteen years**, is not secured by a safety belt or a child restraint system shall be punishable with a fine of one thousand rupees.

(xii) Section 199-A provides for offences by juveniles. It provides that any offence under the Motor vehicles Act,1988 if committed by a juvenile then the guardians of the juvenile or the owner of the motor vehicle shall be deemed to be guilty of the contravention. The punishment prescribed for the violation of above provision is Rs. 25000 as fine and imprisonment for a term which may extend to 3 years. The registration of the motor vehicle used in the commission of the offence shall be cancelled for a period of 12 months and the juvenile shall not be entitled for obtaining a learner's license unless he attains the age of 25 years.

(xiii) The provision for undertaking driver refresher training course for the revocation of disqualification of the person from holding a license. (Section 19)

**It is suggested that the above provisions should be widely published by using social media, electronic media, print media and other media platforms so that general public may become aware of the traffic rules and the consequences of violating traffic rules in terms of**

**imprisonment, payment of fines and disqualification from holding a driving license for violation of certain offences mentioned above.**

## **STRENGTHENING OF ENFORCEMENT ACTIVITIES BY EXTENSIVE USE OF ELECTRONIC MONITORING**

- 8.8 Presently most of the enforcement activities carried out by the officials of police department or transport department are manual. Gradually transformation from manual process to electronic process is under progress. In this regard it is submitted that a new section 136-A was inserted in the Motor Vehicles Act, 1988 by enacting the Motor Vehicles (Amendment) Act, 2019. This new section provides for electronic monitoring and enforcement of road safety.
- 8.9 It is also submitted that Rule 167A has also been inserted in the Central Motor Vehicles Rule, 1989 subsequent to the enactment of Section 136-A in the Act. The rule 167-A has come into operation with effect from 1/10/2020. This rule provides for use of electronic enforcement devices which includes speed camera, close circuit television camera, speed gun, body wearable camera, dashboard camera, Automatic Number Plate Recognition (ANPR), weigh in machine (WIM) and any other technology specified by the State Government. Besides this the above rule provides for placing of electronic enforcement devices at places of high risk and high-density corridors on National Highways and State Highways, and at critical junctions at least in major cities with more than one million population (as per data available based on million plus urban agglomerations or cities: Census of India 2011 or as per the latest census) including the 132 cities of the country given in the table of subrule (2) of Rule 167A. This table contains five cities of Rajasthan namely Alwar, Jaipur, Jodhpur, Kota and Udaipur.
- 8.10 Rule 167 which also came into operation with effect from 1/10/2020 provides for procedure for issuance and payment of challans, auto-generation of challan through electronic monitoring and enforcement system by any police officer or a designated agency. This rule also provides for disposal of challan within a period of 90 days and provides for service of notice for payment of fine through electronic means or communication authorised by the Central/State Government or by way of call to the registered mobile number of a person who violates the provisions of the Act. The rule also provides that in case the challan is due beyond the time

period of 90 days(except in case of offences instituted for prosecution by a court) the services of the license of offender or registration of motor vehicle as the case may be shall not be processed by the licensing authority or registering authority as the case may be, except applications relating to permit, fitness and tax of motor vehicles.

8.11 The above amendments made in the Motor Vehicles Act, 1988 and the Central Motor Vehicle Rules, 1989 are made for strengthening the enforcement activities which otherwise is not possible with the rise in population and rise in registration of motor vehicles. From the analysis made by SDRI in chapter 3 of this report, the various reasons which were responsible for road accidents in the State are as follows:

- (i) On account of traffic rule violations
  - (a) Over speeding
  - (b) Driving without driving license
  - (c) Non-use of safety devices like helmets and seat belts
  - (d) Drunken driving
  - (e) Use of Mobile phone while driving
  - (f) Overloading by vehicles
- (ii) Road condition/environment
  - (a) Accidents happening in open areas, residential areas and institutional areas
  - (b) Accidents on straight roads, curved roads
  - (c) Accidents on T-junctions
  - (d) Accidents at uncontrolled traffic junctions
- (iii) Road accidents on account of Weather conditions
- (iv) Accidents based on Vehicle conditions

8.12 It is suggested that all the offences provided in subrule 3 of Rule 167-A of Central motor Vehicles Rule, 1989 may be detected by using electronic enforcement devices. The following offences can be detected by this system.

- (i) Not driving within the prescribed speed limit (section 112 and 183)
- (ii) Stopping or parking vehicle at an unauthorised location (section 122)



- (iii) Not undertaking Safety measures for drivers and pillion riders (section 128)
- (iv) Not wearing protective headgear or helmet (section 129)
- (v) Jumping a red light, violating a stop sign, using of handheld communications devices while driving, passing or overtaking other vehicles in a manner contrary to law, driving against the authorised flow of traffic, driving in any manner that falls far below what would be expected of a competent and careful driver and where it would be obvious to a competent and careful driver that driving in that manner would be dangerous (section 184)
- (vi) Driving vehicle exceeding permissible weight (sub-section (1) of section 194)
- (vii) Driving without safety belt (section 194B)
- (viii) Contravention of rule 6 (pertaining of lane driving) of the Motor Vehicles (Driving) Regulations, 2017 (section 177A)
- (ix) Goods carriage carrying passengers (section 66)
- (x) Contravention of rule 36 (pertaining of Registration plates) of the Motor Vehicles (Driving) Regulations, 2017 (section 177A)
- (xi) Driving vehicle with load that extends beyond the sides of body or to the front or to the rear or in height beyond the permissible limit (sub-section (1A) of section 194)
- (xii) Failure to provide free passage to emergency vehicle (section 194E)

Hence, electronic monitoring system should be used to identify traffic rule violations such as over speeding, non use of safety devices like helmets and seat belts, use of mobile phones while driving, overloading by vehicles, jumping of red light, violating a stop sign, driving against the authorised flow of traffic, etc. by using the electronic enforcement devices mentioned at paragraph 8.9 of this report. It is also submitted that **Transport department has already started generating e-challans on Vahan portal** and even the challans made by police department have been integrated with Vahan portal. Development of Intelligent Transport Management System (ITMS) is also being developed by the Transport Department and the vehicles violating speed limitations are being challenged under this system.

## **IMPROVEMENT OF ROAD CONDITIONS BY ADHERING TO THE STANDARDS SPECIFIED FOR ROAD ENGINEERING BY INDIAN ROAD CONGRESS**

- 8.13 A new section 198-A was inserted in the Motor Vehicles Act, 1988 with the enactment of Motor vehicles (Amendment) Act, 2019. This section provides that the designated authority, contractor, consultant or concessioner responsible for the design or construction or maintenance of the safety standards of the road shall follow such design, construction and maintenance standards as may be prescribed by the Central Government from time to time. It also provides that where the above persons failed to comply with the standards for road design, construction and maintenance and such failure results in death or disability such persons shall be punishable with a fine amounting to Rs. 1 Lakh and the same shall be paid to the fund constituted under section 164-B of the Act.
- 8.14 Rule 166 has also been enacted in the Central Motor Vehicles Rule, 1989 with effect from 1/10/2020 which relates to road design, construction and maintenance standards in accordance with the standards and specifications of the Indian Road Congress as may be applicable or any other instructions or guidelines issued by the Central Government from time to time.
- 8.15 Since over speeding is the leading cause of road accidents hence the department/agency which is responsible for maintenance of roads should display variable messages or other fixed mandatory signs relating to speed limits at regular intervals on the road and road marking using Thermoplastic Road Marking Paint due to it's hard-wearing and reflective property. Appropriate road signs such as one way, no entry, prohibition of U-turn, no parking, etc. should also be displayed on the roads so that the persons using the roads are fully aware of the road conditions and other mandatory directions to be followed by them. This will facilitate the road users while using the roads.
- 8.16 Auditing of roads to ensure that they are properly maintained, the road signage are being properly displayed and identification of road defects such as unauthorized construction of speed breakers, illegal encroachment on roads, illegal barricading, etc. by specialized teams.

## STRENGTHENING EMERGENCY RESPONSE AND MEDICAL CARE SYSTEMS

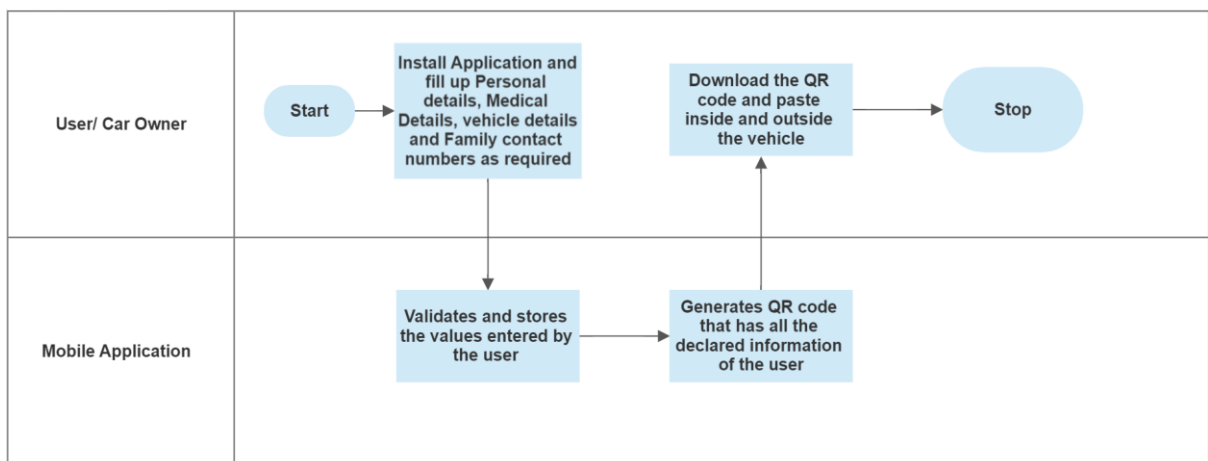
- 8.17 The possibility of road accidents can be minimized by adoption of various precautionary measures, even then the road accidents are bound to happen. Once the accident takes place a quick response system will ensure timely treatment of the victims that helps to minimise the fatalities on account of road accidents. In the year 2021, 9,055 fatal accidents took place in which 10,043 persons lost their lives. Majority of the deaths take place on account of delay in adequate response within the **Golden Hour** by way of providing first aid to the victims and rushing them to a Trauma Centre/hospital in the **very first hour** of the accident.
- 8.18 To cater to such requirement, a robust network of ambulances and hospital/trauma centres equipped with trained medical professionals would be required on different types of roads/highways. At present 73 trauma centres are operational, sanction of 3 trauma centres at Tonk, Bharatpur and Sikkar are under progress. More availability of trauma centres and ambulances equipped with robust information system would ensure reduction in response time. Digital initiatives in terms of software applications can be adapted for different type of users such as victim/public, ambulances, hospital/trauma centres and command and control centres.
- 8.19 SDRI proposes one such application system that can help in quick information sharing to concerned entities thorough digital channels. The objective is to report any accident to the nearest ambulances and hospitals/Trauma centres easily with minimal steps by an informer. An informer of accident can either be accident victims or general public who intends to report it. The proposed set-up involves and ecosystem of 4 level of users having different application interface depending on their role whose details are given as under-

### Applications Users-

Sn	User	Intention	Channel
i.	Public	To initiate the accident reporting	Mobile based app working over internet
ii.	Ambulance	To receive request and respond to the request	Mix set-up with internet enabled

			Tablet and alarm systems (sound & light)
iii.	Hospital/ Trauma Centre	To receive request and respond to the request	Mix set-up with internet enabled Tablet/ Computer systems and alarm systems (sound & light)
iv.	Command & Control Centre	To manage the entire accident reporting system	Mix set-up with computer systems, Large screens, telephones, fast internet, alarm systems (sound & light)

The envisioned accident reporting system starts in two ways namely (i) QR code based manual reporting and (ii) sensor-based auto reporting. In QR code based manual reporting, an individual would be required to install accident reporting application in his phone and register himself by providing his personal, medical and emergency contact numbers. Individual who also happens to be a vehicle owner would also provide his vehicle details while registration. Once the registration is done, a vehicle owner would generate a QR code that would be pasted inside and outside the vehicle. Individuals who do not declare vehicle details would not be able to generate QR code but will be able to report the accident cases.



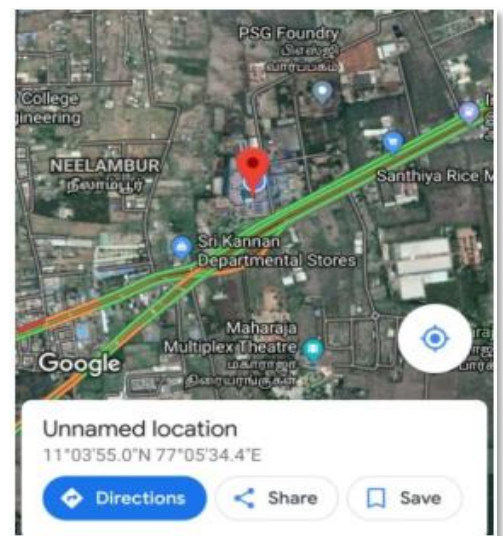
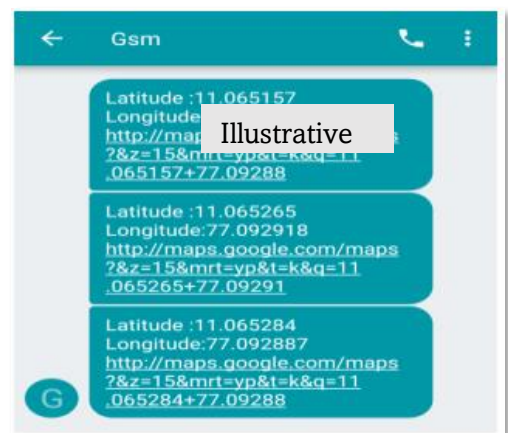
Process steps of the end-to-end accident reporting system using QR code is given below-

**Pre-requisites:**

- (i) QR codes are pasted inside and outside the vehicles.
- (ii) Personal details such as medical history, blood group, etc. are updated in the app
- (iii) Emergency contact numbers are updated in the app.

**Process Flow:**

- (i) Accident happens/occurs.
- (ii) Individual (either a victim or other person) scans QR code using mobile camera.
- (iii) Scanned QR will prompt to open application.
- (iv) Application captures Geo-coordinates of the location.
- (v) The application sends SOS messages to the relatives contact number including coordinates and personalised message along with contact number of the person who scanned the QR code to share the information (reporter).
- (vi) The application identifies nearest 3 Ambulances and 3 Hospitals/ Trauma Centres in the accident periphery and sends alerts to them including the coordinates of the accident site and appropriate message along with contact number of the reporter.
- (vii) Upon getting the alert message, systems of the ambulances (all three) start alerting through sound and lights to inform the respondents.
- (viii) The respondents of the ambulances have appropriate time (say 5 minutes) to accept the call. The one who accepts first is booked to go to the accident site.
- (ix) In case none accepts the call, the application system again looks for other 3 ambulances in the periphery to send alerts.
- (x) Once accepted, the status of movement of the ambulance is displayed on the mobile



- screen of the reporter (through application interface).
- (xi) The ambulance rushes to the accident site with necessary equipment.
  - (xii) Parallely, upon getting the alert message, Hospitals/Trauma Centre Systems alerts through alarms and lights to inform staffs about the accident
  - (xiii) The hospital/ Trauma centres have option to accept the call depending on availability in that hospital/ Trauma centre for a given period of time (say 5 minutes)
  - (xiv) If during the given time period, any of the hospital/trauma centre accepts the call, the system will display details of the accident, accident site on map, details of victim with their personal details and medical history.
  - (xv) Once the hospital / trauma centre accepts the case, the location of the hospital will be displayed in the ambulance meaning that the ambulance is expected to reach to that hospital.
  - (xvi) Once the mapping of ambulance and hospital is done, the hospital systems will display the location of ambulance on geo map along with expected time of arrival of the ambulance. It carries the ambulance ID in the information.
  - (xvii) The interface of the hospital application shows the location of ambulance on geo-map.
  - (xviii) The hospital in the meantime prepares for patient admission.
  - (xix) Patient(s) are brought to the hospital for treatment.

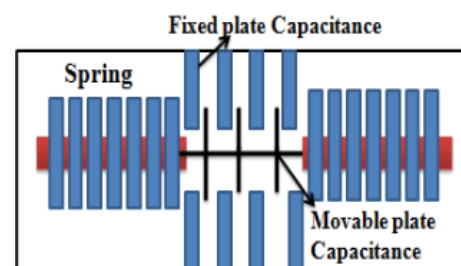
**Automated accident Sensor based:**

**Pre-requisites:**

Sensor based device is installed in the vehicle

**Process steps:**

- (i) Accident happens/occurs.
- (ii) Sensors of the vehicles senses the accident based on impact and triggers the inbuilt application to send SOS and alert to the nearest ambulance and hospital/trauma centre including coordinates and messages.

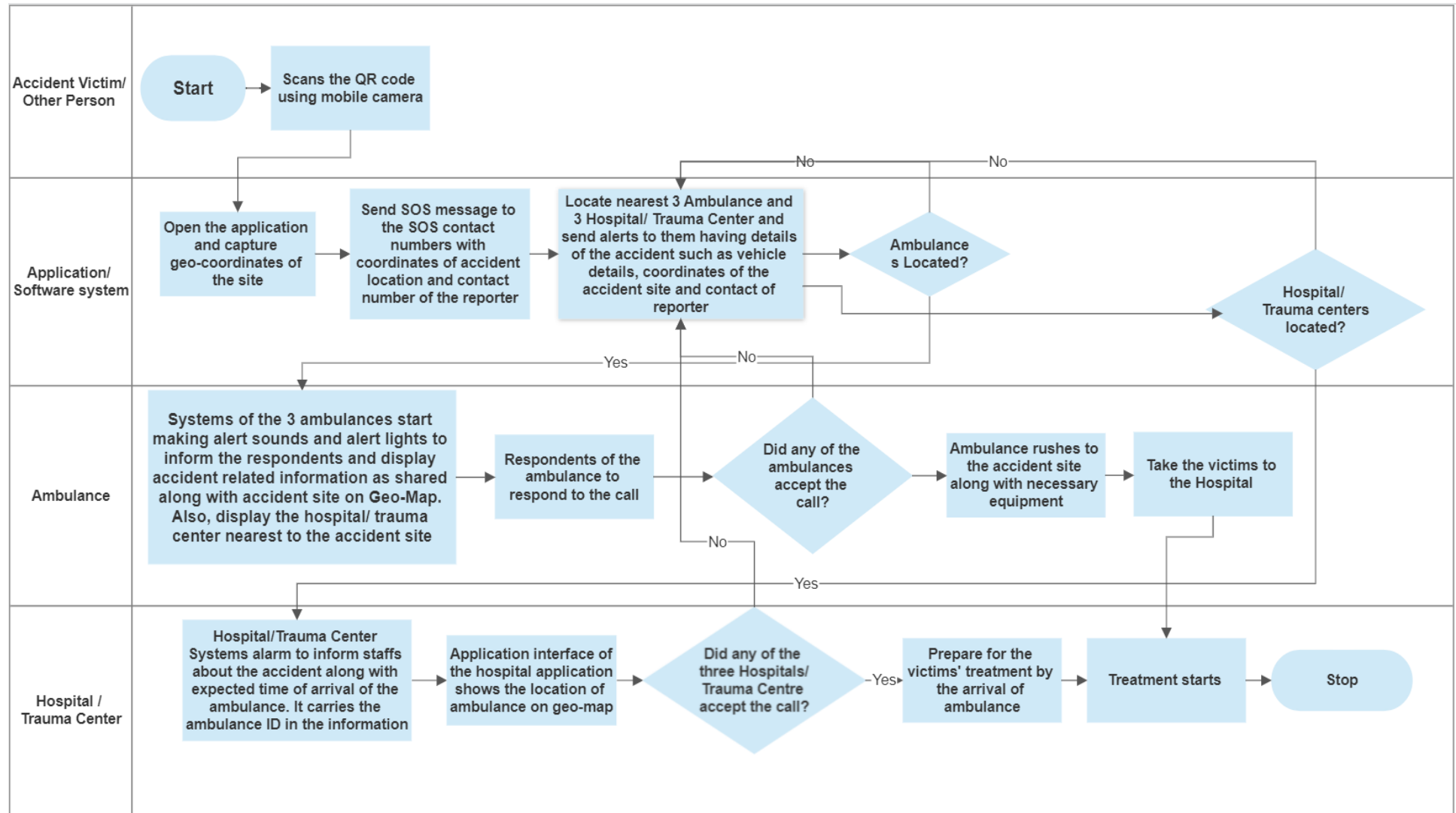


*Illustrative*

- (iii) Rest of the reporting process remains same from point no 4 of the Process flow. The only difference here would be that there would not be any contact no of reporter as the accident is reported automatically (sensor based)

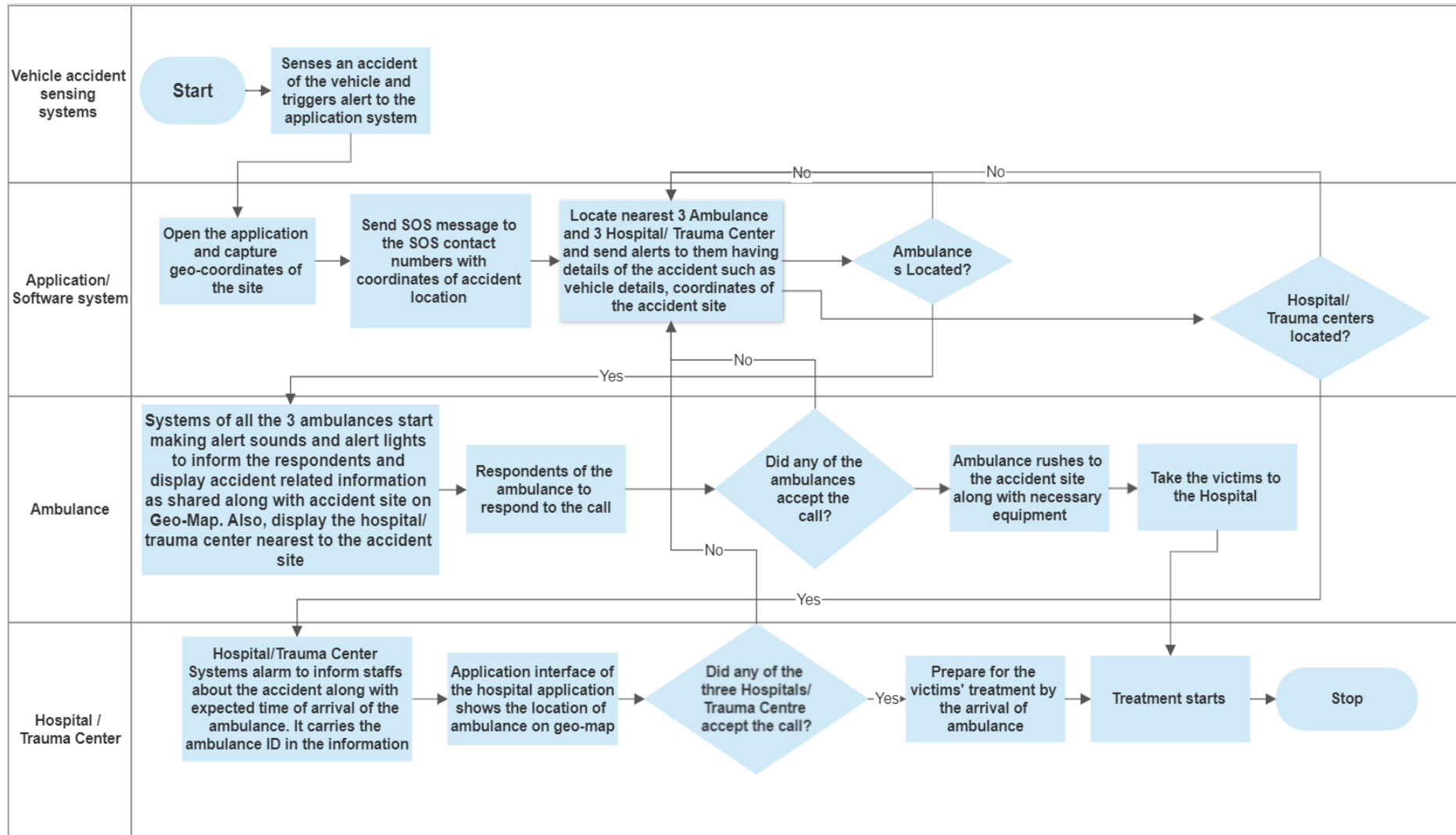
Alternatively, an informer can also call the command & control centre through telephone/ mobile to inform about an accident providing all required details of the accident. A respondents of Command & Control centre can register the accident in the system post which automatic information dissemination will happen to the ambulances and Hospitals/ Trauma Centres.

### Process Flow: Accident Reporting Process- QR Code Based





## Process Flow: Accident Reporting System- Sensor Based





**Education**



**Engineering**



**Enforcement**



**Emergency Care**



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