International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET2293118

"Preparation of Action plan for elimination of Accident at black spot "(A Case Study)

Ajit Bhadade[*1], Dr. Ishfaq Rashid Shaikh[2], Dr. P. L. Naktode[3]

[*1] P.G. Student, MTech Transportation Engineering and Planning, Sandip University, Nashik, Maharashtra, India

[2] Assistant Professor, Civil Engineering Department, Sandip University, Nashik, Maharashtra, India

[3] H.O.D., Civil Engineering Department, Sandip University, Nashik, Maharashtra, India

Article Info
Volume 9, Issue 3

Page Number : 319-330

Publication Issue :
May-June-2022

Article History
Accepted : 15 May 2022
Published: 30 May 2022

ABSTRACT

The number of traffic accidents globally is increasing as the world's population expands and cars become more widespread. Improved geometric design, congestion management tactics, and greater driver education and enforcement are all traditional ways to prevent collisions. While these procedures are often beneficial, they are frequently impractical or prohibitively expensive to put in place. Many factors play a role in traffic accidents, and some of them have a significant impact on one another, making it impossible for transportation safety engineers to use just one parameter to adequately explain the severity of traffic accidents. The number of traffic crashes can be reduced by studying parameters involved in traffic crashes utilizing combined contemporary models that include the interplay of input and output variables. Road and traffic accidents are a leading source of death and disability around the world. A collision between a conveyance and another conveyance, a person, or other items is referred to as a road contingency.

In rapidly developing metropolitan agglomerations, road traffic accidents are a big concern. There is a substantial body of research literature that sheds light on the scope of the problem and the remedies that are required. Road traffic accidents are the third leading cause of unnatural death among all deaths. Transportation engineers and academics have attempted to construct safe roads that adhere to suitable design standards, yet traffic accidents are inescapable. If an accident occurs, the reasons that caused it must be identified, and suitable corrective measures must be established and implemented as soon as possible. The goal of this study is to gain a better knowledge of the problem of road traffic accidents and identification of black spot-on BG Road in Sivasagar City and ends at Sapekhati and the factors that may contribute to the high accident rates.

Keywords: Road Safety, Data Collection, Road Inventory, Action Plan, Accident Black Spots

I. INTRODUCTION

Every year, more than 28000 people are killed on Iranian roadways, resulting in severe economic and social effects. The demographic or behavioural characteristics of the driver (vehicle speed, driver's age and gender, seat belt use), environmental factors and roadway conditions at the time of the crash (crash time, weather conditions, road surface, crash type, collision type, traffic flow), and technical characteristics of the vehicle itself (vehicle type and safety) all have a significant impact on traffic accident severity.
A road accident not only causes physical damage, but it can also cause partial or complete incapacitation, and in some cases, death. The rising number of traffic accidents is not a healthy indicator for vehicle safety. The only solution is to analyse traffic congestion data in order to discover various causes of road accidents and take preventative actions. One of the most important tools for analysing the relationship between crash incidence and risk factors associated with various traffic entities is the crash prediction model (also known as the safety performance function). People's lifestyles have improved as a result of the rapid development in urbanisation. However, these developments have placed a burden on roadways by expanding vehicle ownership, causing traffic problems to worsen at an alarming rate.

Significant effort and money have been expended in recent years to improve road and highway safety. A continuing problem for transportation engineers is to build and operate the transportation system in such a way that it serves a variety of social goals such as shortening travel time and increasing safety. There has been an increase in due to an exceptional surge in road transportation and automotive traffic in India as a result of and the economy's and consumers' consumption habits have grown at an exponential rate, resulting in dangerous conditions. Circumstances on our Indian roads, including highways and expressways. The number of people killed or injured in traffic accidents on these roads is increasing year after year. The path Accidents, deaths, and injuries are global events, but the issue is more severe in mixed communities.

The traffic situation on Indian multi-lane motorways; the true situation is likely to be far worse due to underreporting of incidents to make the road worse. Furthermore, there is a culture of poor car upkeep, poor driving practice, and a lack of enforcing the law, and the casual attitude of road users Road safety has become a major concern for the general population, and highway safety in particular.

Professionals in particular, because road accidents are a major cause of death; Furthermore, the economic losses as a result of property damage or lost working days as a result of injuries the annual cost of fatalities is estimated to exceed billions of dollars. Road safety is both a health and a safety concern and development issue of significance given its magnitude and gravity, as well as the as a result, negative effects on the economy, public health, and general well-being individuals, particularly those with modest means.

II. OBJECTIVE OF STUDY

The objectives of this study are:

- Necessity of identification, rectification to avoid human life and vehicle costs and traffic conjections.
- To provide solution to reduce, neglect an accident.
- Provide engineering measures to avoid accident black spots with zero percent accident rates.

The necessity of identification of accident black spot is to avoid the damage to Human & property & vehicles, traffic congestion which will directly impact on saving time & fuel.

The major cause of forming accident black spots is encroachment of either side of the roads where the road width is narrowed due to encroachment, the less sight distance which will directly affecting the high-speed vehicles control at an accident-causing situation. To avoid such situations, it is mandatory to reduce the chances of accidents by providing various measures.

The rectification of accident black spot can be done by collecting various traffic data, accidents data from police department, severity of accidents, time and season of the accident occurred,

The solutions to reduce or neglect the accidents can be done by providing various improvements such as engineering designs or geometric designs, such as improving the horizontal & vertical geometry of road, Improvement of junctions with traffic calming measures, signalized junction Providing adequate sight distance etc.

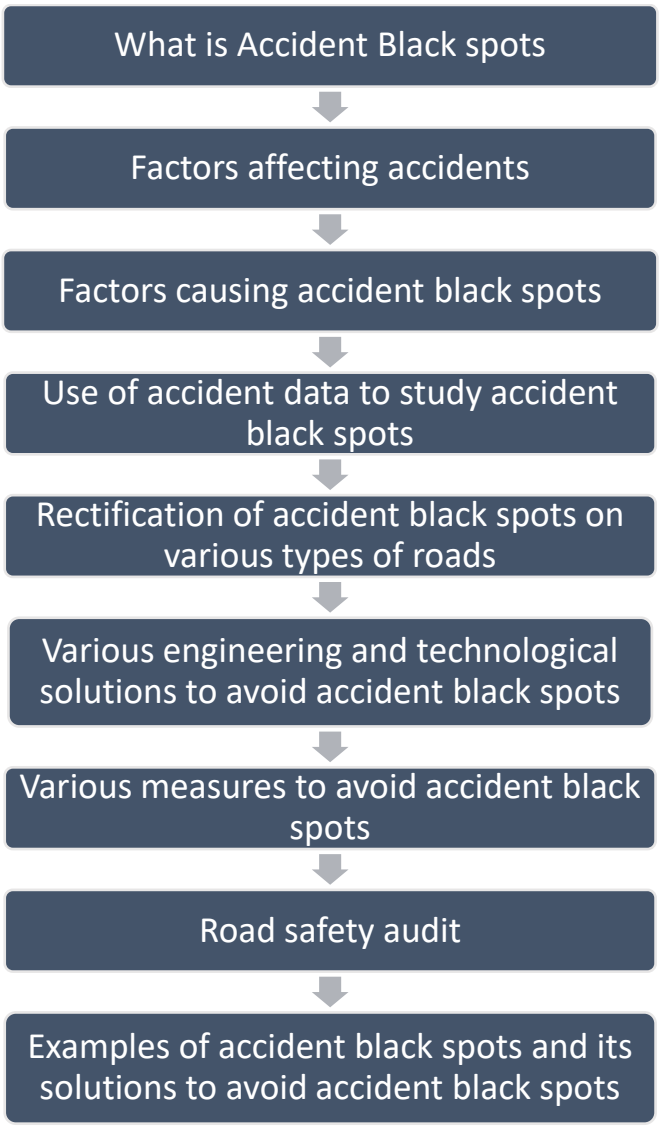
III. PROJECT SCOPE

The scope of the project is as follows:

- Reconnaissance Survey for the intersection and intersecting arms.
- Road inventory Survey.
- Conduct necessary traffic survey and analysis of the data
- Introduction of Black Spots and multiple attributes involved like Geometric Design of Road, Human Behaviour, Weather Conditions, Land Constraints, Type of Terrain etc.
- Need for rectification of Black Spots (Accidents) causing Loss of Life, Property Damage & Financial Losses incurred.
- Discussion on Different Methods & Techniques for Identification and Analysis of Black Spots in Literature Review section.
- Reviewing all factors causing accident and elaborating individual factors weightage in same.
- Possible measures to improve the existing condition & providing mitigation measures for the same.

IV. METHODOLGY

There are lots of parameters to be considered in order to carry out the research in the field of planning, designing or improvement of accident black spot or to avoid accident. So, the set of parameters and methodologies of this research is expressed in the form of flowchart as shown below:



V. ROAD ACCIDENT TREND IN INDIA

There have been numerous types of vehicles on the road in India due to the development of road networks, such as cars, buses, motorcycles, trucks, vans, and others that have been used as a base to move from one place to another. According to the statistics from the Road Transportation Department website in 2019, as shown in Figure, the registered public vehicles in India are increasing every year, indicating that road safety is an important aspect because it involves the majority of the people in this country who are primarily transported by road.

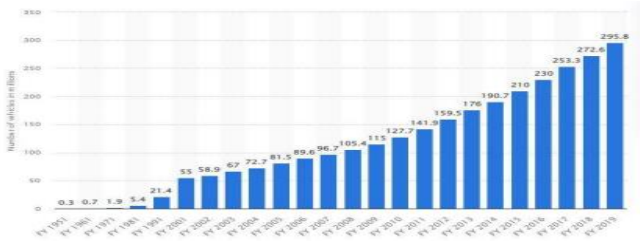


Figure 1: Total cumulative of registered public vehicles in India up to year 2019 (MoRTH website)

It is quite concerned based on the development of the complete situation about motor vehicles for that period. This is due to the fact that, as the diversity of motor vehicles on the road has increased, so has the number of accidents that have happened in India. This scenario must be investigated, and study must be conducted to determine the root reasons of the accident. It is also critical to ensure that India's present transportation infrastructure is in perfect working order in serving all types of vehicle users in this country.

Definition of Black spot (MoRTH): According to Ministry of Road Transport & Highways (MoRTH), Government of India, road accident black spot-on National Highways is a road stretch of about 500m in length in which either 5 road accidents (involving fatalities/grievous injuries) took place during last three calendar years or 10 fatalities took place during last three calendar years.

VI. STUDY AREA

The project road Sivasagar to Sapekhati via Simalguri lies in the district of Sivasagar in Assam. This district is bounded by district of Dibrugarh on its north & east and on the west & southwest by the district of Jorhat and by Nagaland in South.

The project road originates near Thanuram Gogoi Memorial High Secondary School on BG Road in Sivasagar City and ends at Sapekhati. The entire road stretch transverse in the north-east direction. The Dikhow river which is a tributary of Brahmaputra River flows alongside the project road from its originating point at Sivasagar till Simalguri city. The alignment experiences moderate agricultural activities and also crosses forest areas. A map showing the project road is presented in Figure below:

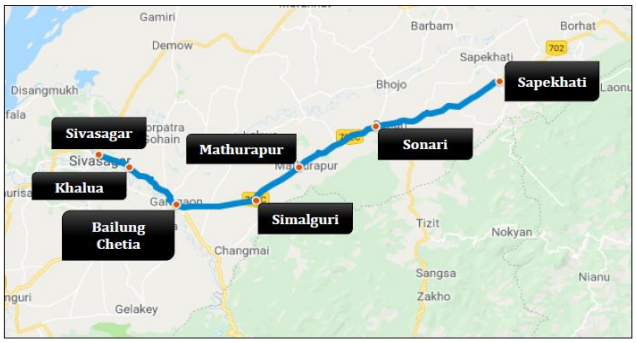


Figure 2: Map showing Sivasagar to Sapekhati road

Data Collection: Data collected includes summary of road inventory and pavement condition, traffic details, speed data and accident information then accident data is analyzed for concluding the type of predominantly vehicles involving in accidents and its percentage in comparation to total accidents. Also, the other details like information and list of junctions, sensitive locations like build up and schools, water bodies, drains, bridges, signs and markings etc. are included in audit observations.

For conducting safety audit on existing roadway sections, the field studies such as Road Inventory, Classified Volume counts, Speed Survey and Collection of First Information Report from police stations.

1. Collection of First information reports from police stations.

Apart from the site inspection activity, the past accident data is also collected from the police station for Project Road, the police station contacted for the data collection are mentioned as below,

- Sivasagar Police Station, (Dist.: Charaideo, Sivasagar)
- Simaluguri Police Station, (Dist.: Charaideo, Sivasagar)
- Mathurapur Police Station (Sapekathi), (Dist.: Charaideo, Sivasagar)
- Sonari Police Station, (Dist.: Charaideo, Sivasagar)

The data regarding the accident severity involved are collected from the above-mentioned police stations. The detailed summary of the collected data is presented as under in Table,

Table 1: Detailed Summary of accident data collected

A20: Sivasagar to Sapekhati Road								
Year	Severity of Accident	Two-Wheeler	Car/Jeep/Taxi	Auto	Truck	Bus	Tractor	Unknown
2017	F	10	3	1	4	3	0	4
	I	19	13	0	9	1	1	2
2018	F	11	8	1	3	3	0	1
	I	14	11	1	8	1	3	4
2019	F	14	6	0	3	2	0	3
	I	7	11	0	5	1	0	2

2. Analysis of Accidental Data

The police station data of consecutive year from 2017-2019 is collected from mentioned police stations and analyzed considering the accident severity and modal split of traffic. The detailed collected data is elaborated in ANNEXURE-1 (Police Station Data). Considering the vehicles involved in the accidents the vehicles percentage wise as well as the Year wise analysis is carried out as follows.

Table 2: Vehicle wise Summarized Accidental Data

Year	2017		2018		2019	
Vehicle Type	F	I	F	I	F	I
Two-Wheeler	10	19	11	14	14	7
Car/Jeep/Taxi	3	13	8	11	6	11
Auto	1	0	1	1	0	0
Truck	4	9	3	8	3	5
Bus	3	1	3	1	2	1
Tractor	0	1	0	3	0	0
Unknown	4	2	1	4	3	2

The vehicle percentage wise distribution of the accidental data is presented as below in

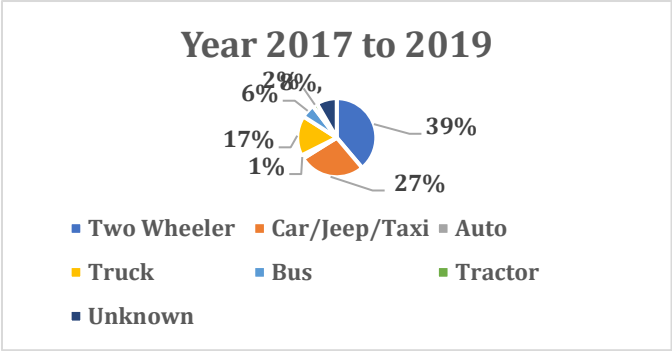


Figure 3: Vehicle Percentage Wise Distribution

The above figure shows that the majority of vehicle involved in the accident was Two-wheeler i.e., 39%, secondly Car/Jeep/Taxi i.e., 27% and the third major vehicle to cause the accidents is found as Trucks i.e., 17% of total accidents from 2017 to 2019 on project stretch.

The analysis of the year wise accidental data is as under in Table

Table 3: Summarized year wise Accidental Data

Year	F	I	Total
2017	25	45	70
2018	27	42	69
2019	28	26	54

(F=Fatal, A=Accident, I=Injured)

The year wise distribution of accidental data is elaborated as below in

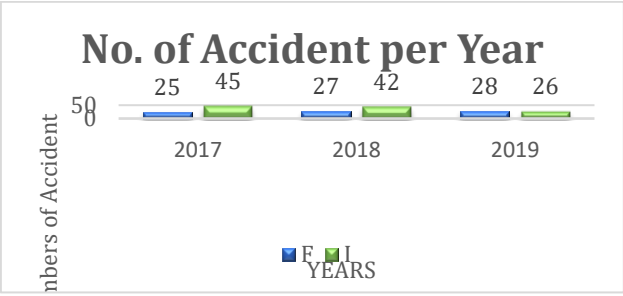


Figure 4: Year Wise Distribution

The collected data shows that there is not an established black spot is located along the project stretch, whereas based on the local enquiry and analyzed accident data, frequent accident locations hereinafter named as Accident prone locations are concluded. Same are considered for improvement in the further part of report.

VII. PREPARATION OF ACTION PLAN FOR CASE STUDY TO AVOID ACCIDENT

The audit team conducted road safety audit on the project road based on the audit, recommendations the priorities has been assigned to each aspect. The risk as well as the priority of each observation and recommendation have been elaborated already. The implementing agency shall follow to the priorities from the audit.

The different activities for recommended for improvement of road safety shall be categorized as the short term and long-term measures.

Short term measures are those which can be implemented within 6 months, such as road markings, road signs, rumble strips, speed breakers, surface repairs, minor geometric improvements etc.

Long term measure is those which can be implemented as recommendations proposed for DPR where proposals like, widening and geometric improvements to road, junctions and Horizontal and vertical curves, construction of structures, bypasses, realignments etc. will be involved.

The action plan for the corridor based on road safety audit observations and recommendations are summarized as below.

Table 4: Action Plan of Existing Road Safety Audit

Sr. No.	Activity	Measures	
		Short Term	Long Term
1	**Curves with geometric Deficiency (59 No with radius less than 250m.)**		
1)	Improvement with requisite sight distance, radius of curve, Super elevation, Camber and improvement to pavement by strengthening.		√
2)	Providing extra widening at Non-Visibility sections.		√
3)	Improvement by providing sign boards, marking, cat eyes and speed breakers etc. and protection by providing crash barriers.	√	
4)	The structures located at curves shall be painted, delineated and provided with hazard markers.	√	
2	**Intersections with geometric and Safety Deficiency**		
2.1	**Major Junctions (4 no)**		
1)	Improvement of junctions geometrically (sight distance, turning radius and right turning lane)		√

Sr. No.	Activity	Measures	
		Short Term	Long Term
	and by strengthening of pavement.		
2)	Improvement with pedestrian crossings, Road marking, speed breakers, cat eyes etc. and transverse bar marking.	√	
3)	Improvement by providing footpath with guard rail		√
4)	Provision of Islands, Median with median markers, kerb and drainage facility at junction.		√
2.2	**Minor Junctions (39 no)**		
1)	Providing pedestrian crossings, sign boards, cat eyes, speed breaker with strictly STOP sign on approach road.	√	
2)	Provision of minor improvement to shoulders and potholes and damaged road surface.	√	
3)	Improvement by geometric correction to sight distance, turning radius and matching the grade of connecting road with project road. (Improvement of Y type junctions to T type)		√
2.3	**Railway Level Crossings (2 no)**		
1)	Providing pedestrian crossings, sign boards, cat eyes, speed breaker with strictly STOP sign.	√	
2)	Provision of minor improvement to shoulders and potholes and damaged road surface.	√	
3)	Improvement by geometric correction to sight distance, turning radius and matching the grade of connecting road with project road. (Improvement of Y type junctions to T type) and improvement as per IRC: 39:1986 guidelines.		√
3	**Cross Section and Road Damages (Total length Project Stretch)**		
1)	Minor improvement to road damage by pothole filling, shoulder improvement with murrum etc.	√	
2)	Geometric improvement to road and strengthening of pavement by providing widening, paved shoulders, parking lane, right turning lane, stable side slope etc.		√
4	**Road Side Hazards**		
4.1	**Road Side Trees/ Electric Poles and Transformer etc.**		
1)	Remove the road side hazards and providing clear shoulder.		√

Sr. No.	Activity	Measures	
		Short Term	Long Term
2)	Provision of hazard markers, reflector markers and shielded with protection devices.	√	
4.2	**Water Bodies 11 No)**		
1)	Improvement with widening of road with retaining/ toe wall at pond or water bodies location.		√
2)	Temporary guarding with locally available materials and alerting the road users by hazard sign boards.	√	
5	**Road side protection work/furniture**		
5.1	**Structures (Bridge 2 No and Many Culverts locations)**		
1)	The narrow structures shall be protected by metal beam crash barriers, road marking, Object hazard markers, sign boards, delineation, marking, cat eyes and painting on railing of structures.	√	
2)	Improvement by widening and reconstruction by correcting sharp bend and steep gradients at approaches of structures with all safety provisions.		√

Sr. No.	Activity	Measures	
		Short Term	Long Term
6	**Drainage and Cross Drainage Work**		
1)	Improvement with providing built-up drains in built-up areas and surface / open drain/ earthen drain in rural or open areas.		√
7	**Signs, pavement markings and delineation**		
1)	The pavement marking, signs and delineation work on total project stretch.	√	
8	**Vulnerable road users (pedestrians, bicyclists, two wheelers and three wheelers, and animal drawn carts)**		
8.1	**Built-up and Village Locations (52 no. of Major & Minor Villages)**		
1)	Provision of facilities for vulnerable road users, raised pedestrian crossings (Special treatment), rumble strips making, pavement marking, speed restriction and sign boards.	√	
2)	Provision of Bus shelter with ramps, bus bays, truck lay bay, built-up drains and pedestrian marking (special treatment), speed hump.		√
8.2	**School/Colleges, Hospital, Govt. Offices and Temple**		

Sr. No.	Activity	Measures	
		Short Term	Long Term
	Locations (39 No. of School & 2 no. of Hospitals)		
1)	Provisions of sign boards (speed restriction sign, information sign and warning sign), pedestrian marking (special treatment at vulnerable reach), guard rail.	√	
2)	Improvement by widening of road with paved shoulder, speed hum, raised pedestrian marking and speed restriction sign boards, marking and guard rail.		√
9	**Access to property and developments (Many locations along total project stretch)**		
1)	Improvement to eliminate the too many direct accesses by providing common access by connecting it to nearby minor or major junctions.		√
2)	Alerting the road users by providing road marking, sign boards, speed humps etc.	√	
10	**Lighting and night time issues**		
1)	Providing lighting facility for vulnerable road users at major junctions, built-up area, bus shelter and pedestrian crossing for vulnerable users.		√
11	**General road safety considerations**		
1)	Provision of road marking and No parking sign boards.	√	
2)	Improvement of road by widening with provision of parking lane and strengthening of pavement.		√

The project stretch consists geometrical part as horizontal alignment and sharp blind curves, major bridges, minor bridges and at grade intersections. It can be concluded that the safety concerns of the project can be resolved at detailed design stages by following the provisions as per Indian Road Congress standards. The key conclusions are mentioned as below,

The major and minor junctions need to be improved geometrically by providing suggested recommendations in this report with appropriate marking and sign boards as per IRC guidelines.

The sharp curve horizontal with geometric deficiencies need to be improved by improving the sharp horizontal curves.

The marking and sign boards at narrow structures, road side hazards and at water bodies need to be provided by considering the individual recommendations from this report.

The project stretch does not contain any established black spot location but, the Project Road have blind curves which can be treated as black spot location and that need to be rectified by improving it geometrically and as an immediate measures sign boards with pavement marking are recommended.

VIII. CONCLUSION

Within the consider carried on Distinguishing proof, Arrangement & brief term and long-term Measures of Mischance Dark Spot, distinctive angles included in area to be named as Mishap Dark Spot were examined. Affect due to mishaps like Misfortune of Lives and Gigantic Temperate Misfortunes Brought about Actually & Socially are laid out within the report. For the way better understanding of the subject a case thinks about for extend of 62 Kilometers in State of Assam was embraced. Utilizing Mischance information collected from Police Divisions, Street stock, Asphalt Stock, Activity Development think about, Conceivable components causing mischances along the extend were recorded out and relief measures were given for the same. Recommended improvement measures were given in accordance with MoRTH Intersection Design Guideline Manual IRC SP: 55 – 2014, IRC 35 -2015, IRC 67 – 2012 and NHAI Policy Circular No 12.25/2022 dated 12/04/2022. Listed below are recommended measures for improvement:

- Geometric Design Improvement of Road stretch and Intersection.
- Junction Improvement along the stretch in compliance with IRC.
- Provision of proper Traffic Signs and Road Markings.
- Provision of crash barrier and railing
- Possibility of using Traffic calming measures.
- Inclusion of Road Safety measures like crash barriers etc.
- Signalising of Intersection, Provision of Channelising Island & Roundabouts

IX. REFERENCES

[1]. Identification and prioritization of "black spots" without using accident information. Modelling and Simulation in Engineering, 2017.

[2]. Bobade, S. U., Patil, J. R., & Sorate, R. R. (2015, February). Identification of Accidental Black spots on National Highways and Expressways. In National Conference "ACGT (Vol. 2015, pp. 13-14).

[3]. Ravi Prasad Chief Engineer (Road Safety) Ministry of Road Transport & Highways Road Safety –Engineering interventions & Black spot rectification, Government of India, 08-07-2017 Kolkata.

[4]. Reddy, B. S., Reddy, L. V. V., and Reddy, G. S. (2017). Statistical Analysis and Treatment of Accident Black Spots: A Case Study of Nandyal Mandal.

[5]. Oppe, S. (1982). Detection and analysis of black spots with even small accident figures. Institute for Road Safety Research SWOV, the Netherlands.

[6]. Premaratne, B. A. R. (2004). Identification and prioratization of accident black spots in Nittambuwa Police Division.

[7]. Apparao, G., Mallikarjunareddy, P., & Raju, S. G. (2013). Identification of accident black spots for national highway using GIS. International Journal of Scientific & Technology Research, 2(2), 154-157.

[8]. Sorate, R. R., Kulkarni, R. P., Bobade, S. U., Patil, M. S., Talathi, A. M., Sayyad, I. Y., & Apte, S. V. (2015). Identification of accident black spots on national highway 4 (New Katraj tunnel to Chandani chowk). IOSR J Mech Civil Eng, 12, 61-67.

[9]. Ministry of road transport and highways, identification of accident prone NHs, 2019.

[10]. Yuan, T., Zeng, X., & Shi, T. (2020). Identifying Urban Road Black Spots with a Novel Method Based on the Firefly Clustering Algorithm and a Geographic Information System. Sustainability, 12(5), 2091.

[11]. Reddy, B. S., Reddy, L. V. V., & Reddy, G. S. (2017). Statistical Analysis and Treatment of Accident Black Spots: A Case Study of Nandyal Mandal.

[12]. Rakesh, K., & Ajay, K. (2015). Identification and Improvement of Accident Black Spots on NH-3, Distt. Una (Himachal Pradesh)-A Case Study (Doctoral dissertation, Lovely Professional University).

[13]. Saran, M. S. (2017). Evaluation of accident black spots on roads using geoinformatics tools in Kozhikode district, Kerala. Journal of Geomatics, 11(2).

Cite this article as :

Ajit Bhadade, Dr. Ishfaq Rashid Shaikh, Dr. P. L. Naktode, "Preparation of Action plan for elimination of Accident at black spot (A Case Study) ", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 9 Issue 3, pp. 319-330, May-June 2022. Available at doi : https://doi.org/10.32628/IJSRSET2293118
Journal URL : https://ijsrset.com/IJSRSET2293118