Review Paper on Identification, Analysis and Suggestions Upgrade of Accident-Related Black Spots on NH-934 NHAI-PIU Sagar, Madhya Pradesh

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Abstract — National Highway 934 (NH-934) serves as a critical arterial route in Madhya Pradesh, connecting major towns and facilitating the movement of goods and people. However, the highway is plagued with accident-prone zones, commonly referred to as "black spots." These black spots are locations where road traffic accidents occur frequently, leading to severe consequences in terms of loss of life, injuries, and economic costs. This paper reviews the existing literature and accident data regarding NH-934, specifically in the Sagar district of Madhya Pradesh, and presents an analysis of the causes, identification, and suggestions for the upgrade of these accident hotspots.

Keywords: National Highway 934 (NH-934), Black Spots, Road Safety, Accident Analysis, Traffic Accidents, Highway Upgradation, Accident-Prone Zones, Transport Infrastructure

I. Introduction

Accident black spots, often identified through the collection of accident data, represent areas on highways where accidents occur disproportionately more than in other segments. The NHAI-PIU (National Highways Authority of India - Project Implementation Unit) Sagar in Madhya Pradesh faces numerous challenges in managing road safety, especially on NH-934, a key route traversing the region. Identifying and upgrading black spots is critical in improving road safety, reducing fatalities, and enhancing the efficiency of road transport.

Identification of Black Spots: The first step in addressing the safety concerns on NH-934 involves the identification of accident-prone areas, or black spots. These areas can be determined through accident records, with frequent occurrences of fatalities and injuries. The following are key locations identified on NH-934:

1) Near Major Intersections: High traffic volume at junctions and unregulated intersections, where vehicles from different directions converge, contributes to accidents. Poor signage and inadequate traffic control systems increase the risk.
2) Sharp Curves and Slopes: Certain sections of NH-934 near hilly terrain and curves lack proper guardrails or road signs indicating sharp turns, leading to accidents, especially in adverse weather conditions.
3) Construction Zones: Ongoing road construction or poorly managed construction zones have been identified as dangerous locations. Narrow lanes, uneven road surfaces, and lack of clear signage contribute to accidents in these areas.
4) Pedestrian Crossings: Areas where pedestrian crossings are not well-marked or lack proper facilities pose a risk to both pedestrians and motorists.

II. Literature Survey & Background

Identification of accidental Black sports on N.H.

A. General:

Numerous studies have recently focused on accident analysis and the recognition of accidental black spots in the country. This chapter includes several significant studies.

B. Definition:

Definition of road accident Black spot on N.H. can be define as Road accident Black sport is a stretch of N.H. of about 500 meter in length, in which either 5 road accident (in all three years put together involving (at alitiesl grievous injuries) took place during the last 03 calendar year or 10 fatalities

In the identification process of Black spots three main methods can be used

1) Screening methods
2) Clustering methods
3) Crash prediction methods.

Many literates and case studies has been written describing each method pros or cons.

C. Abstract:

The Identification of road sections characterized by high-risk accidents in the first step for any successful road safety management process, considering the limited available sources, although researcher started to study Blacked decade ago, there one mainly un clarified question in this field.

These literatures concentrate mostly on one type of road each time, although road characteristics (i.e., speed, ADT) can highly affect the success and precision of the applied method. Therefore, the most important question to be answered is which methods for far which road? This question can be answered by comparing different applied method for different road types. However, the comparison of different methods is still not adequate explored areas. This article aims to compare different methods used in identifying black spot.

The sliding window and the spatial autocorrelation for 2 types of roads differ in their average speed, where speed in one of the important road characteristics which in still not adequately explored. The result shows a preference to us the sliding window for identifying Black spots in high-speed road and the lock of preference to use it in low-speed road, and vice versa for spatial auto correlation method, following accidents distribution pattern and result of weakness in applying Empirical Bayesian in high-speed road in also included.

D. Statically Analysis of Occurrence and severity of crashes involving vulnerable road users:

Cites have been often organised in terms of Planning with special attention to motor vehicle and not well prepared for pedestrians and cyclist. In order to privilege active mode, there is in need to ensure the safety of these vulnerable road users.

The main objective of this paper is to implement a statically analysis to assess the occurrence and severity of road crashes involving vulnerable road users. This research is focused on analysing the trends and causes of road crashes involving cyclists and pedestrians and what are main difficulties that people using active modes do face in their journeys. In order to reach these objectives, a database of crashes registration involving motor vehicle and vulnerable road users need to be created.

This analysis intent to evaluate the evolution of number of crashes and to create pattern of risk factors such as weather condition, specific location and singularities that might represent additional risk, profile of pedestrian or cyclist involved.

Regarding the analysed variables that characterized crashes participation. The dependent variable considered were metrological condition, location, proximity to a pedestrian's is crosswalk and gender of the VRU.

The probabilities of vulnerable road user being a pedestrian increase by 2.7 times of the crash occurs on urban street segment. 10.6 time of the crash occurs at pedestrians cross walk and 3.5 time of the VRU is female.

Evaluating drivers speed choice with and without route-based warnings on approach to block spots on a rural highway {Elsevier, Vol.65, August-2019}

In 2015, Mr. Bobade and Dr. J.R. Patil tell about that how can identify the accident-prone location by ranking the parameters based on their severity and severity index. The field survey was carried out at a particular location in a select study area. The study area in Mumbai – Pune Expressway and Pune-Sholapur highway and a large number of vehicles move on it. Also, accident rate increases per year than other highways of Maharastra state. The parameters which caused a maximum quantity of accidents were assigned maximum weighted and top rank. The summation of the weighted was calculated to find out the overall severity. The severity index was created by summing the weights assigned to each parameter and dividing the results by the severity of all the allocations.

E. A relative examination of black spot identification approaches and roadways accidents segmentation techniques {Elsevier, Vol.128, July-2019}

Researchers always have a difficult problem when it comes to indicating road safety-related factors throughout the planning and operational phases. The effectiveness of any approach used to pinpoint a hazardous area or black spots (BS) on the pavement would largely shows documents is segmented into distinct homogenous groups. This study is carried out to investigate and evaluate how various Black spot identification (BSID) method approaches perform in the methodological variety of road network segmentation. To achieve this, four widely used BS techniques–spatial assembling, constant length, constant volume of traffic, and the traditional segmentation technique from the Highway Safety Manual–have been compared to four different segmentation methods. The effectiveness of the strategies has been compared using two assessments. The segmentation techniques are initially assessed established based on the precision of the created safety performance function (SPF).

F. Investigation of black spots on NH-3 and its Renovation {MAIJ, Vol.04, June-2019}

This report is based on a thorough investigation of accidental black spots and traffic safety. The most important resolution of this investigation is to recognize comprehensives for the analysis of accidents black spots and their correction. The strategies and procedures utilized for selecting the project study stretch (Where a large number of accidents happened), collecting accident data, dividing the data for better observation, and analysing accidents black spots and accidents black zones are all covered in this study. Additionally, it makes use of some methods for profiling these accident sites as well as before-and-after research to calculate the impact of treatment on the Blacks Spots Zone. This study concludes the methodology of rectification is based on shorts-term measure, long-term measures, mitigation measure, of enhancement of geometric design dependent on the state of the road.

G. Evaluating the black spots intensive strategies for Indian National Highways (Elsevier Vol. 48, September-2020)

One of the top causes of death worldwide is road traffic injuries (RTIs). According to statistics provided by the Indian government, 494, 624 people were injured and 150,785 people died in traffic accident in 2016. With a particular focus on the National Highways (NHs), the Government of Indian recently developed regulations to prevent traffic accidents on Indian Highways. The detection and correction of "black spots" on NHs and State Highways (SHs) are one of these policy objectives. STATES have recognized black spots on their NHs as a result of the Ministry of Roads and Highways (MoRTH) concept and protocol for doing so. The removal of black spots from NHs has received top emphasis. Therefore, temporary solutions like rumble bands, reflective tape at intersections. Signboard/cautionary board installation, signage provision, and speed limitations are also in use. The building of a vehicle underpass, by-pass, flyover, and lane expansion are examples of long-term initiatives that are how being implemented. The purpose of this research in to outline the current state of the National Highways black spot policies.

H. Identifying and enhancing accident-prone areas on Kerala's national highway {2020}

To locate accident-prone areas on National Highways and make improvements there, this study report uses three scientific methodologies. To find the black spots in their study, these three techniques were applied, namely:

1) Weighted Severity Index (WSI) Method.
2) Quantum of Accident Technique.
3) The accident susceptible index method (API).

The investigation concluded that the WSI-based strategy worked best for locating black spots.

Srinivasan et al. (1987): Formulated a technique for identifying and enhancing accident-prone sites on national

highways (NHs) in Kerala. The techniques used to detect black spots are: i) Accident Prone Index (API) approach ii) WSI method. The research determined that the WSI approach is the most effective for detecting hazardous areas on highways.

Srinivas Rao, B et al. (2005): Executed an accident analysis on NH-5 from Anakapalli to Visakhapatnam in the year 2003. The road where the investigation was conducted traverses both urban and non-urban regions. Data on accidents over the last five years were gathered from the relevant police station and then analysed. Traffic analyses conducted on the roadway include road inventory, signage inventory, signal assessment, traffic volume counting, speed measurement, and delay evaluation. This accident study was undertaken to enhance improvement methods.

Dr. K. Krishnamurthy et al. (2010) performed accident research on three portions of National Highways covering a total of 165 km in Kerala. The first segment was National Highway-17, extending 75 km from Ramanattukara to Thrikkanapuram. The second segment was NH-212, spanning 53 km from Nadakkavu to Churam View Point. The third segment covered a distance of 34 km from Ramanattukara to Malappuram along NH-213.

Nagarajan et al. (2012): Employed remote sensing (RS) and GIS for the identification of hazardous locations and accident analysis along a specific segment of NH-45, extending from Tambaram to Chengalpet. They identify the eleven accident sites using high-resolution satellite imagery (IKONS) informed by non-spatial data gathered from the police department and field surveys. During the field survey, data on traffic volume, vehicle spot speed, and the mapping of the study segment are collected using ArcGIS software.

Pavan, R. Vyas et al. (2014) conducted a research on the SH-85 road segment to identify accident areas using the WSI approach. The many elements influencing road accidents are given weights on a scale of 1 to 10, with those increasing the likelihood of accidents receiving lower weights. The aggregate weights are computed with a programmed Excel spreadsheet. Various variables are examined for the prioritisation of potential black spots, and appropriate weights are assigned to each element. These include roadway-related elements such as road geometry and visibility conditions that contribute to accidents. For the investigation, the following parameters are selected: 1. Quantity of lanes per direction 4. Indicators & Communications 2. Road Width 5. Categories of vehicles.

R.R. Sorate, R.P. Kulkarni, S.U. Bobade, M.S. Patil, A.M. Talathi, I.Y. Sayyad, S. Apate (2015): This project, titled "Identification of Accident Black Spots on National Highway 4 (New Katraj Tunnel to Chandani Chowk)," aimed to identify accident black spots along a 14.5 km stretch of National Highway-4, from New Katraj Tunnel to Chandani Chowk. In technique, the researchers choose several parameters such as current data gathering, experimental investigation, and analysis of existing data. Selects the Ranking and Severity Index approach and ultimately provides output, future prospects, and corrective actions. This project focusses on infrastructure faults and their interplay with other kinds.

Snehal U. Bobade, Jalindar R. Patil, Raviraj R. Sorate (2015): This project, titled "Identification of Accidental Black Spots on National Highways and Expressways," focusses on the Mumbai-Pune Motorway (The Yeshwantrao Chavan Motorway) for research purposes, as it has experienced a significant number of accidents. According to a daily DNA report dated April 3, 2012, there were 11,057 accidents recorded within its ten years of operation. This research employs a ranking methodology to investigate and identify hazardous black spots on the Pune-Solapur National Highway (NH9) and the Mumbai-Pune Motorway.

Liyamol Isen, Shibu A, Saran M.S (2013): The project named "Identification and Analysis of Accident Blackspots Using Geographical Information System" aimed to identify the most susceptible accident blackspots in the Alappuzha and Ernakulam districts via the use of Geographic Information System technology. The researchers included three years of secondary data and prioritised it with the Weighted Severity Index technique. They find six black spot areas in Alappuzha district and ten in Ernakulam district with the program ARCGIS 10.1.

III. Conclusion

Upgrading the black spots on NH-934 in the Sagar district requires a multifaceted approach involving road design improvements, better signage, traffic management, and enhanced public awareness. Addressing these issues will not only reduce the frequency of accidents but also improve the overall safety and efficiency of the highway. Implementing the suggestions outlined in this paper can help pave the way for a safer and more sustainable NH-934, benefitting both motorists and pedestrians.

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