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ROAD SAFETY AUDIT OF NAVALE BRIDGE

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Abstract: *A road safety audit is a systematic process used to evaluate the likelihood of accidents and safety performance when developing new road plans, renovating and improving existing routes, and maintaining existing roads. An auditor's job is to offer unbiased counsel in the form of formal recommendations. After giving the suggestions some thought, the designer or customer formally decides whether or not to implement each of the suggested safety changes. The main responsibility of an audit team is to find any potential issues with a highway project by visiting the site and gathering information from different authorities. The study's goals are to identify accident-prone parts of the road from the Federal Insurance Report (FIR), investigate the impact of traffic patterns and road geometry on the affected stretch of road, and establish statistical relationships between accident rates and various accident-causing elements. The goal of the study is to lower the number of accidents on the road network, as well as their severity and the necessity for expensive repair work. Bannerghatta Road, a 12-kilometer stretch, was chosen as the research road. Four years' worth of data are used for the accident study.*

I.INTRODUCTION

In this paper India has the second-largest road network in the world, with a total length of about 54,72,144 kilometres as of March 31, 2015. In India, road traffic crashes resulted in 1,41,526 fatalities and 4,77,731 injuries in 2014, according to official figures (NCRB, 2015). Due to the fact thatnot all injuries are reported to the police, this figure is likely an underestimate. Road traffic injuries have increased over the past 20 years in India as the situation gets worse. This may bepartially attributed to the rise in the number of automobiles on the road, but it is primarily caused by the lack of a coordinated, evidence-based strategy to address the issue. In India, accidents are the leading cause of death. The Navale Bridge, located in Pune's Narhe – a busy bridge on the Katraj Dehu Road bypass of the Mumbai-Bengaluru Highway, has been identified as an accident-prone area due to several incidents of road accidents occurring in its vicinity.

The purpose of this project report is to evaluate the safety procedures that are already in place, investigate the elements that led to these incidents and their causes, and make recommendations for improving safety and lowering accident rates in the region. Road and traffic accidents are unpredictable and involve uncertainty. Numerous factors, including giving pedestrians less priority than vehicles, allowing people to cross the street without permission, bicycle riders' negligence, driving at a speed that is too fast for the conditions on the road, driver error involving animal traction vehicles, and more, are to blame for these accidents. One could argue that a variety of more nuanced factors, some known and others unknown, determine road and traffic accidents.

This statement is supported by statistics: over 3000 people from all over the world decease daily because of road traffic [4]. These road accidents cause a series of global economic losses estimated in road traffic damage costs of $518 billion a year. These huge economic losses contribute to the country's economic imbalance. In developing countries, the cost of road accidents is estimated to be $100 billion [4]. Besides these economic effects, road accidents also influence the demographics of each country. In this context, identifying strategies to counteract these effects is an important direction for each country.

The Safe System represents a major change to past approaches. It overturns the fatalistic view that road traffic injury is the price to be paid for achieving mobility. It sets a goal of eliminating road crash fatalities and serious injuries in the long-term, with interim targets to be set in the years towards road death and serious injury elimination. This elimination is feasible. It requires system reconfiguration and recognition that the network must eventually be forgiving of routine human (road user) errors. It is important to recognise the fundamental change that road safety agencies, including road authorities, will face in embracing and implementing this Safe System aspiration and in implementing Safe System treatments across their networks (See Responsibilities and Policy for road authority impacts).

II.LITERATURE SURVEY

Gopala Raju SSSV et al. (June 2012),
Identification of Blackspot and junction improvements in Vishakhapatnam city, By analysing data they found out the blackspots at that respected area or road and finding the blackspots theygive the preventive measure or improvement in the various junction. Apparao. G et al (Feb- 2013), "Identification of accident black spot for national highway using GIS". The data were collectedfrom police station and survey of topographical map has been studied after that the ground control point with the help of global position system has been found out and then the blackspothas been identified by using critical crash rare factor method.

A.N Dehury et al. (M/ J 2013),
"Black Spot Analysis on National Highways," A case study was taken on NH-55 of Angul district in Orissa state. They collected data from FIR index from police department during period 2002-2011. They analysed deficiencies to improve black spot by using accident frequency method.

Snehal U Bobade et al (February 2015),
"Identification of accident black spot on National Highways and Expressways", this deals withstudy and identification of accidental black spot on pune solapur national highway (NH9) andMumbai Pune expressway by method on ranking.

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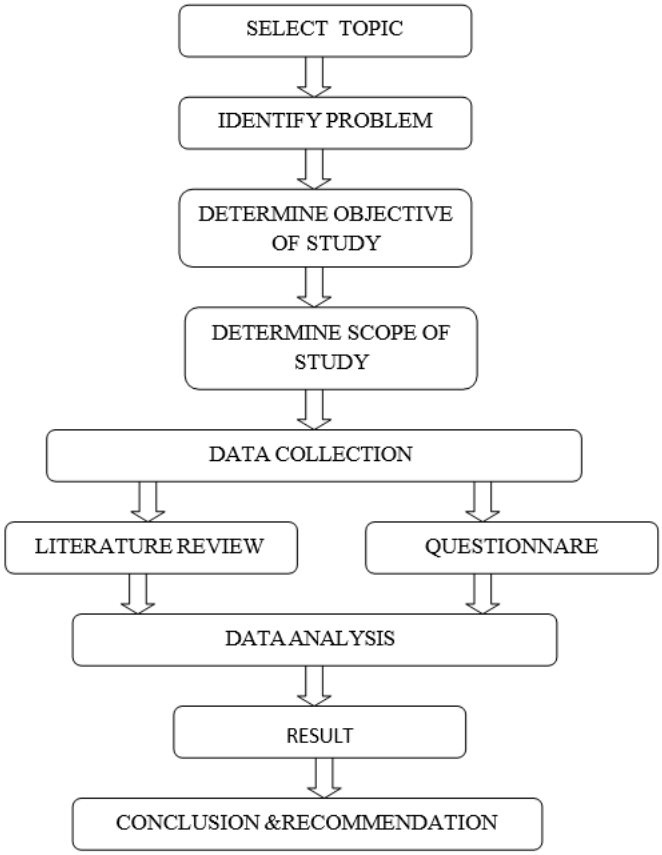
III.METHODOLOGY

3.1 Methodology Of Project:



The **5 E**'s - Education, Encouragement, Enforcement, Evaluation, and Engineering. The cornerstone of SRTS is the acknowledgement that safer walking and biking routes can best be accomplished through a combination of infrastructure and non-infrastructure projects and programs.

Education: Teach students and community members about walking and biking safely. Education can happen through in-school curriculum, bike/ped safety assemblies, newsletter blurbs, tips sheets,and send-home flyers.

Encouragement: Get students and parents excited about walking and biking by hosting special events, walking school buses and bike trains, holding schoolwide competitions, or celebrating walking and biking with student art or other projects.

Enforcement: Reduce negative behavior such as speeding, double parking, or disobeying traffic signals by working with local law enforcement. Officers can attend walking events to monitor speeding activity or to build relationships with school children and neighbors.

Evaluation: Check to see if your strategies are working! Schools and local governments can recordwalking and biking rates, parent concerns, and traffic data to evaluate the success of a SRTS program. Evaluation activities can help set goals and establish baseline data for planning projects.

Engineering: Improve the physical walking and biking environment. Schools can work with localgovernment agencies to determine if infrastructure improvements are needed to encourage studentsto walk or bike to school safely.

3.2 Present Investigation:

- **General:**
  The objective of the study is to establish a quantifiable relationship between accident rate and some. factors influencing accidents. To develop such relationship, it is necessary to collect the accident data and details about the factors affecting the accident rate, such as roadway geometric traffic condition etc. The accident data for four years have been collected and used for the analysis. Surveys were conducted to collect the details like road geometrics, traffic volume, speed and delay etc. at selectedlocations.

- **Location**
  The Mumbai-Bangalore highway was selected for analysis. The analysis is done for 5km stretch from Mico layout (Katraj chowk to Navale bridge). The present study is limited to analysis of accidents during the years 2012 to 2023

- **Road Inventory Data**
  Selected road stretch was divided into number of sub stretches measuring approximately 1000 meters. At each sub-stretch details of following road geometrics were also collected

- **Traffic Studies**
  8 hours volume count was conducted at 2 locations of the stretch on a weekday covering both peak and off peak hours of a day. floating car method survey was conducted to find the speed at every kilo meter of the stretch.

- **collection of accident data**
  The accident particular pertaining to the study stretch was collection from respective police station. The study stretch of 5 kms (from micro layout Katraj chowk to Navale bridge) fell under the administration of micro layout police station limit. Accident data related to past four year was collected for necessary information such as date, time, location, whether the accident was fatal vehicle damage and injured.

- **Analysis of Data**
  The data regarding the road accident in Bangalore road have been collected for a period of four year i.e 2012 to 2023 from the traffic police station .The date ,time ,approximate place, type of vehicle involved etc are entered in the first information report (F.I.R)AND details are recorded in case diaries In order to analyse accident data ,it was found that the details were not recorded in standard format and police FIR lacked the important engineering aspect like nature of accident(Head on ,rear end etc)type of location are most affected ,curve ,bridge etc).therefore ,micro level analysis is not possible .the pedestrians are most affected by accident in this road .The pedestrian safety is very low. Accidents which occurred during the study period. i.e 2012 to2023, are arranged year-wise month -wise and hour -wise. It is observed that more number of accdent , which will help to identify the accident prone stretch of the road network .Kilo meter-wise distribution accident.

3.3 Joint Influence of Road Conditions on Traffic Safety:
require careful design and take longer time to implement. The most important element of the roadway which affects safety is cross-sectional elements, sight distance considerations, horizontal curve radius, grade and pavement surface characteristics.Every road consists of a combination of separate sections differing in these factors. The relative probability of a road accident on any section can be appraised by a summary accident rate calculated as the product of the separate relative accident rates characterizing the worsening of traffic conditions in comparison with a two-lane road having a roadway width of 7.5m, paved (or stabilized) shoulders and a non-skid pavement due to their influence of separate elements of the horizontal alignment, profile, cross-section and roadside strip

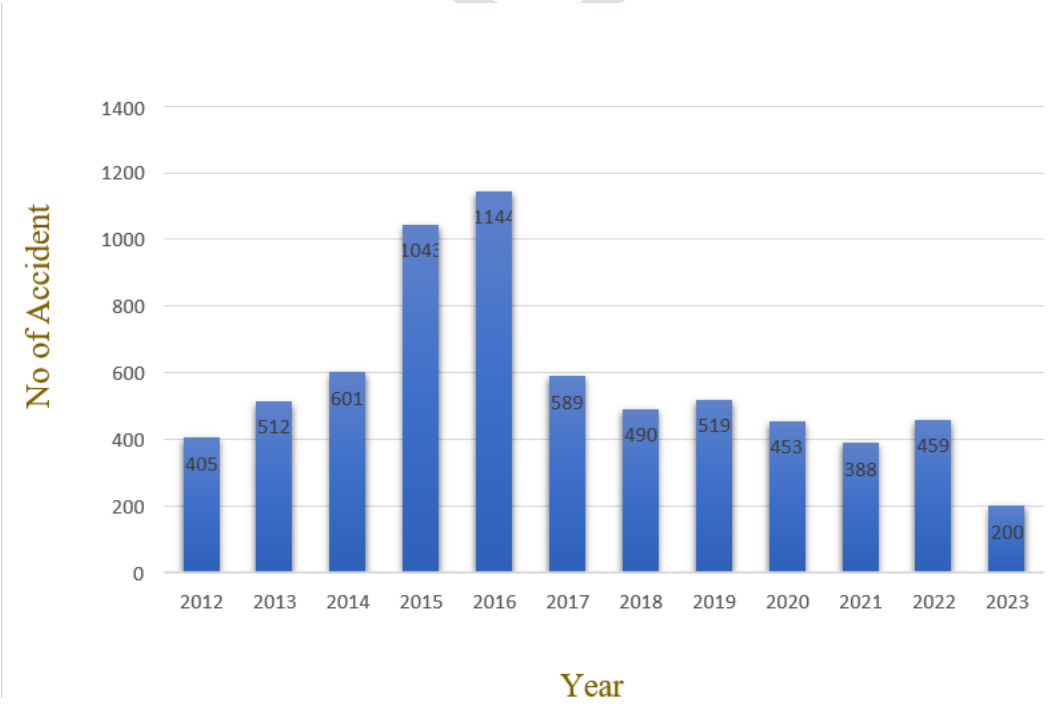


Figure: Yearly Graphical representation data

YEAR	ACCIDENT
2012	405
2013	512
2014	601
2015	1043
2016	1144
2017	589
2018	490
2019	519
2020	453
2021	388
2022	459
2023	200

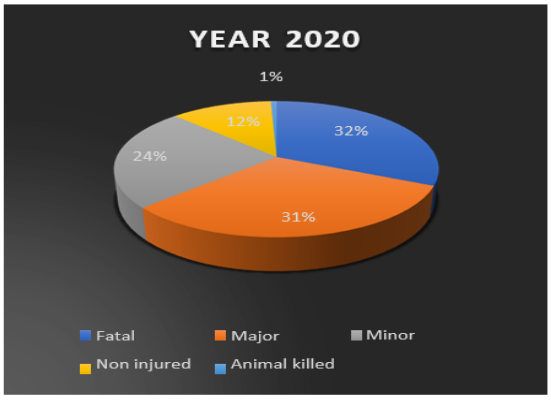
Fatal :
"fatal" means something that causes death or is capable of causing death. Itrefers to situations, events, or conditions that can lead to a person's demise or end their life.For example, a fatal accident is one that results in severe injuries or death.

Major:
"major accident" refers to a significant and often serious incident or event that can result in substantial harm, damage, or consequences. This term is commonlyused in various contexts, including industrial settings, transportation, and everyday life. Major accidents can involve large-scale injuries, significant property damage, or have widespread effects on the environment.

Minor:
"minor accident" refers to a small and not very serious incident or eventthat usually causes minimal harm, damage, or injury. It's a situation where the consequencesare relatively minor, and there is usually no significant or long-lasting impact.

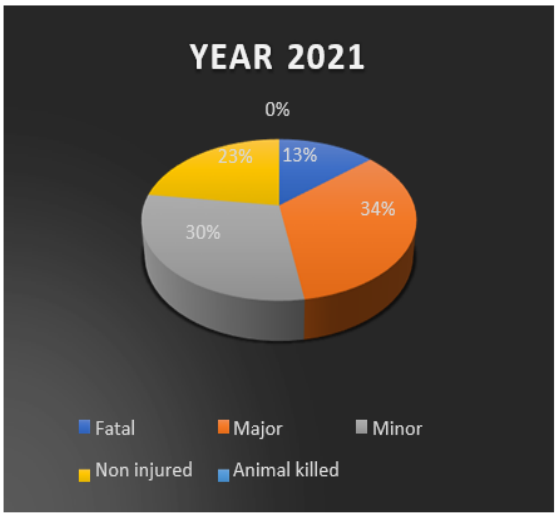
Non-Injured:
A "non-injured accident" refers to a situation in which an accidentoccurs, but no one involved sustains any injuries. In other words, despite the occurrence ofan accident, there is no physical harm or damage to the individuals or parties involved.\

Animal Killed:
"Animal killed accident" refers to a situation in which an animalhas been involved in an accident and has died as a result. This can occur in various contexts,such as traffic accidents involving animals on roads, collisions with wildlife, or accidents inwhich animals are inadvertently harmed.



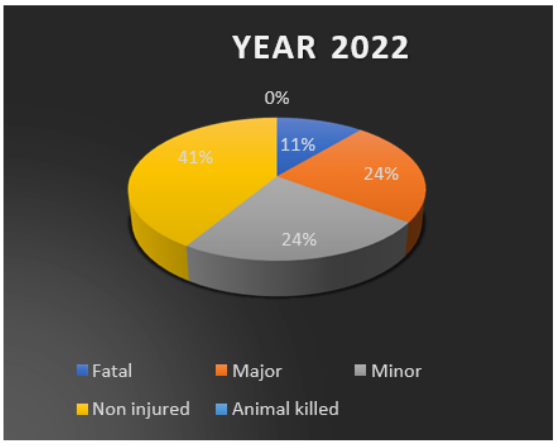
YEAR	TYPE	NO ACCIDENT
2020	Fatal	140
	Major	139
	Minor	107
	Non injured	53
	Animal killed	3

Fig. 2020 Accident in %



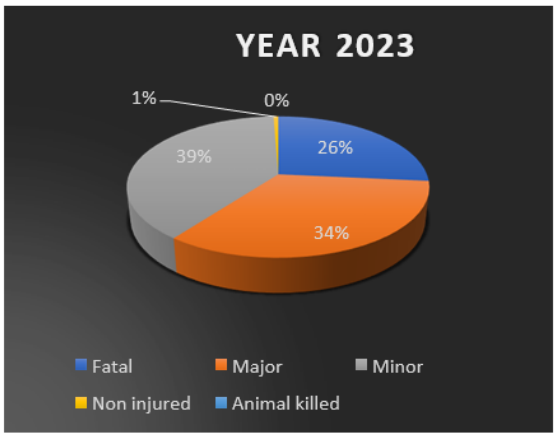
YEAR	TYPE	NO ACCIDENT
2021	Fatal	55
	Major	137
	Minor	120
	Non injured	92
	Animal killed	0

Fig. 2021 Accident in %



YEAR	TYPE	NO ACCIDENT
2022	Fatal	63
	Major	134
	Minor	132
	Non injured	231
	Animal killed	0

Fig. 2022 Accident in %



YEAR	TYPE	NO ACCIDENT
2023	Fatal	44
	Major	56
	Minor	65
	Non injured	1
	Animal killed	0

Fig. 2023 Accident in %

Causes of road Accident:

1. Th two wheeler was crossing the road PUP when it was hit by a truck coming from serviceroads
2. Overturing of bus
3. Road user are not maintain their speed on the road
4. Has presumable turned off its motor while descending a bridge which caused by collision

5. Overturing of minimum tempo due to control loss
6. Driver are intoxicated, tired, over speeding, breaking the law and not understanding sign
7. A pedestrian crosses the carriageway careless and move it to the wrong spot
8. Avid using your phone while driving
9. Never drive in the wrong lane
10. Don't drive at fast pace when you can cross the road slowely.
11. A wounded person should not drive
12. An over speeding two wheeler diver last control of his vehicle rammed the retaining the retaining wall of CUP such was impact the driver was thrown from the wall of CUP and felldown into the service road
13. Drivers disregard traffic law& sign bord.

Prevent Road accident:

1. Avoid drinking &drive
2. Put on your seatbelt &helmet
3. Keep your speed within the posted limits
4. Never wear earphone or mobile phone while driving
5. Know and follow all the traffic rules and safety rule
6. Take breaks while driving for long hour at a stretch
7. Sign board are being managed correctly
8. Distract driving laws
9. Keep it slow and safe for starters
10. Speed can maintain for the night time

IV. CONCLUSION

To keep everyone safe and secure and to lower the number of traffic accidents and injury cases, roadsafety is crucial for individuals of all ages.

We can reduce the probability of traffic accidents in the following ways based onthe aforementioned study.

- There are safety notice boards at the side of the road.
- We are able to offer people safety measures.
- A set top speed limit for automobiles.

We are able to determine the causes of accidents.

- Excessive speeding
- Out-of-control vehicle
- Sharp bend
- Steep climb
- a staggered intersection
- Strong wind

We can gather the accidental data from the previous 12 years and determine theaccident rate.

- Fatal- 12.17%
- Major- 35.55%
- Minor- 30.83%
- Non -injured – 22.97%

YEAR	ACCIDENT	PERCENTAGE
2012	405	5.95%
2013	512	7.52%
2014	601	8.83%
2015	1043	15.33%
2016	1144	16.81%
2017	589	8.65%
2018	490	7.20%
2019	519	7.62%
2020	453	6.65%

2021	388	5.70%
2022	459	6.74%
2023	200	2.92%

We draw the conclusion that the number of accidents is declining annually as a result of the implementation of additional safety measures, such as multilingual sign boards, AI-generated tools,high-definition cameras, and on-road rumblers.

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