

# A Case Study of Black Spot at Nanthoor Junction, Mangalore and Proposal of Mitigation Measures

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**Abstract-** An accident black spot is a term used in road safety management to denote a place where road traffic accidents have historically been concentrated. It has been estimated that over 30,000 persons die and over 10 to 15 million persons are injured every single year in road accidents throughout the world. Nowadays the accidents are very serious issue for the nation, it causes damage for human life's and also property damage. The present work deals with the study of NANTHOOR junction (accident prone location) in Mangalore city by collecting past Five-year First Investigation Reports from Mangalore City Police station and analysed to find the major causes for accidents.

**The various parameter which causes for accidents are studied and the engineering mitigating measures are proposed to resolve accident prone location or Block Spot**

**Indexed Terms-** BLACK SPOT, ENGINEERING, ENFORCING, EDUCATING, NANTHOOR JUNCTION MITIGATION MEASURE

## I. INTRODUCTION

### • ACCIDENT SCENARIO IN MANGLORE

Central Road Research Institute (CRRI) Study report, (2008) reveals that the accident record of the country is once been rapid. Mangalore has grown exponentially in the past two decades. The Booming Software, Biotech and manufacturing industries have magnified the requirements of basic and service employments, which generated and magnified urban sprawl into problematic proportions. Improvement in the quality of life along with substandard public transportation has resulted in spiralling growth of private automobiles. The resultant offshoot among the worst in the world. Road accidents have registered a

sharp increase recently following rapid growth in vehicle ownership. The comparative data with regard to the Place of Occurrence of road accidents which is reported from three Traffic Police Stations of Mangalore city reveals that more than 41 percent of the road accidents were reported in eleven places in and around Mangalore city.

### • BLACKSPOT

There is no universal definition of accident locations on roads, commonly termed Black spots, which means that the definition of Black spot is open to much speculation. The traditional definition considered that the Black spot as a place where a high number of accidents are found or the locations where the accidents are occurring more frequently had to be identified and were marked as the Black spots. It may have occurred for a variety of reasons, such as a sharp drop or corner in a straight road, so oncoming traffic is concealed, a hidden junction on a fast road, poor or concealed warning signs at cross-roads.

### • FACTORS INFLUENCING ROAD ACCIDENTS

These can be grouped into following.

1. Vehicle related factors: this may be due to inherent design limitations or defects to lack of maintenance, failure of components like brakes, tires and lighting. Visibility, speed and vehicle lighting are also important.
2. Road related factors: this includes pavement design and conditions, horizontal curves, insufficient lane and shoulder width, vertical curves.
3. Road user related factors: psychological factors of the users, alertness and intelligence, patience of driver, drivers experience and age

4. Environmental related factors: rain, reduced visibility, bad weather etc. heavy fog and mist and heavy rain also plays important role.

- MITIGATION OF ACCIDENTS BY THREE E'S

1. Engineering
2. Enforcement
3. Education or educating the people

Accidents not only depend upon vehicular or environmental conditions but also depend on engineering infrastructural facilities provided. From the accident data, it has been witnessed that 48% of the accidents were occurring at day time and 52% of accidents are occurring at night time.

- ENGINEERING FACILITIES INCLUDE:

1. Road design: the geometric design features of the road such as sight distance, width of the pavement, horizontal and vertical alignment design details and intersection design elements are checked and corrected if necessary. The pavement surface characteristics including the skid resistance values are checked and suitable maintenance steps are taken to bring them up to the design standards.
2. Preventive maintenance of vehicles: the braking system, steering and lighting arrangements of vehicles plying on the roads may be checked at suitable intervals and heavy penalties levied on defective vehicles.
3. Before and after studies: the record of accidents and their patterns for different locations are maintained by means of collision and condition diagrams. After making the necessary improvements in design and enforcing regulation, it is again necessary to collect and maintain the record of accidents "before and after" the introduction of preventive measures to study their efficiency.
4. Road lighting: proper road lighting can decrease the rate of accidents during night, due to poor visibility. Lighting is particularly desirable at intersections, bridge sites and at places where there are restrictions to traffic movements.

- Education

Road safety knowledge and awareness will be created amongst the population through Education, training

and publicity campaigns. Road safety education will also focus on school Children and college going students, while road safety publicity campaigns will be used to propagate good road safety practices among the community. The Government should encourage all professionals associated with road design, road construction, road network management, traffic management and law enforcement to attain adequate knowledge of road safety issues.

With a view to spread Road safety awareness among the general public, the Government has been undertaking various Publicity measures in the form of telecast/broadcast of T.V. spots/Radio jingles, organizing Road Safety Week, seminars, exhibitions, all India essay competition on road safety, printing of calendars, Children activity books, book on signage and sign, posters, etc., containing road safety messages for various segments of road users viz. Pedestrians, cyclists, school children, heavy vehicle drivers, etc.

All the people in our country are not educated enough to understand the requirement of road safety. Hence the measures taken should reach every common man. It can be fulfilled by organising various awareness programs such as street plays regarding the road safety or traffic rules.

- Enforcement

Enforcement of the traffic rules and regulations on the road users and maintaining the facilities provided plays an important role in the mitigation of accidents. The measure includes:

1. Speed control: to enable drivers of buses to develop correct speed habits tachometers may be fitted so as to give the record of speeds.

Traffic control devices: signals may be re-designed or signal system be introduced if necessary. Similarly, proper traffic control devices like signs, markings or channelizing islands may be installed wherever found necessary

- OBJECTIVES

- 1) To study the causes of accidents and to suggest corrective treatment at potential location.
- 2) To evaluate existing designs.
- 3) To carry out before and after studies and to demonstrate the improvement in the problem.

- 4) To make computations of financial loss.
- 5) To give economic justification for the improvements suggested.

## II. RESEARCH METHODOLOGY

### • THE METHODOLOGY ADOPTED FOR THE STUDY IS AS FOLLOWS:

1. To collect accident data of past 5 years in Mangalore city from police department to identify severity of black spot.
2. The data which are collected are called as secondary data.
3. Incorporation of data to MS Excel.
4. Visual survey is determined at the black spot to identify the causes for the accident.
5. To find out different methods to prioritize hazardous locations.
6. Pavement condition survey is performed to determine actual road condition.
7. Traffic volume survey is done at the identified black spot in order to know the number of vehicles crossing a section of road per unit time at any selected period.
8. The analysis of black spot is done to check the severity in future.
9. After analysing the black spot suitable remedial measures may be proposed.
10. The proposed measures may prove to be effective if they are implemented

## III. ANALYSIS OF COLLECTED DATA

### • BLACK SPOT OF NANTHOOR JUNCTION

Nantoor junction is a very large circle in the Mangalore city where huge no. of traffic meet at this point due to which there is a lot of traffic congestion which consumes lot of time and energy. Major accidents are taking place in this junction because of meeting of two national highways NH-66 and NH-13. It is observed from the study that there have been no proper traffic signals, improper pedestrian crossing. Due to the congestion at the roundabout it is confusing for the road users regarding the moving direction of the adjacent vehicles. The radius of roundabout is very less which causes traffic problems and lead to the accidents. Insufficient setback distance at the junction has been again a reason for traffic congestion. Even the road condition is also not as good as it contains pot

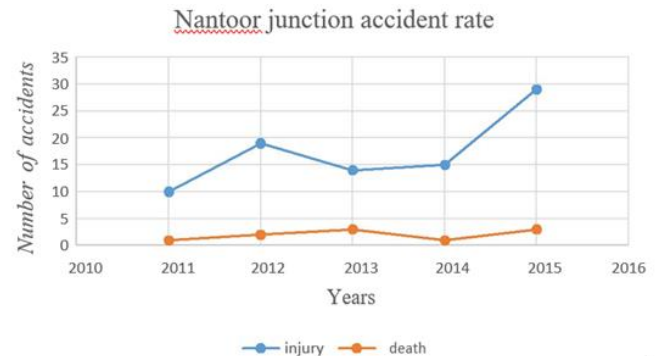
holes, rutting, cracking, etc. the top view of Nantoor circle is shown in below.

### • SCENERIO OF NANTHOOR JUNCTION



### • ACCIDENT DATA

To identify the Black spot accident data is collected. The past five year data of Nantoor junction is collected from Kadri police station. The analysis of these data is useful to find the severity of Nantoor junction and it is also useful in prediction of future accidents. The collected accident data of Nantoor junction authorized from respective police station.

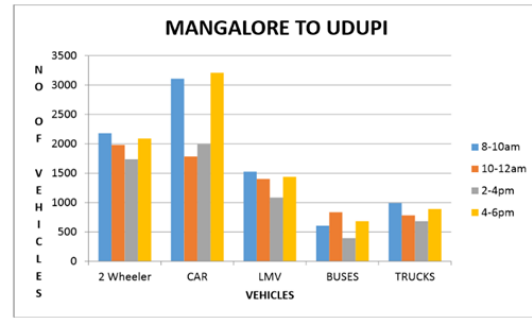


### • INCORPORATION OF FIR DATA TO EXCEL SHEET

The collected accident data is incorporated into MS Excel sheet in order to find the impact in 2030 at Nantoor junction by forecasting method. And also the various graphs are formed to check the number of vehicles passing through that junction. Rate of accidents at day and night is calculated using those graphs and the incremental of accidents as per year wise is shown in chart.

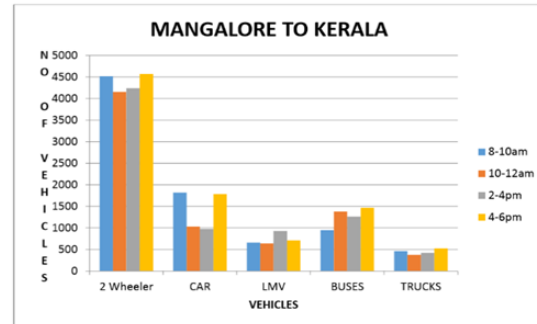
• VISUAL SURVEY

Parameter	Yes	No	Comments
1. SIGNNALED	YES	----	Not Always Working
2. SIGN POSTS	----	NO	No Regulatory or Informative posts
3. ROAD HUMPS	----	NO	----
4. SPEED BREAKER	----	NO	----
5. BARRICADES	----	NO	----
6. FREE LEFT	YES	----	Partial
7. ROUND ABOUT	YES	----	----
8. STREET LIGHTS	YES	----	Less
9. ZEBRA CROSSING	YES	----	Present only in two roads
10. FOOT PATHS	----	NO	----

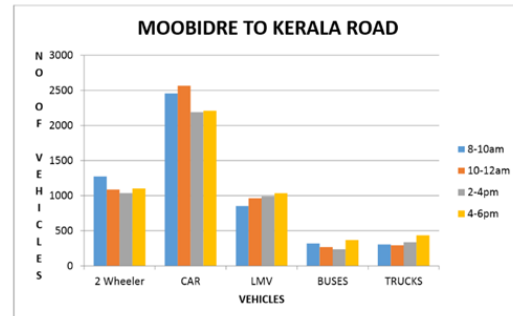
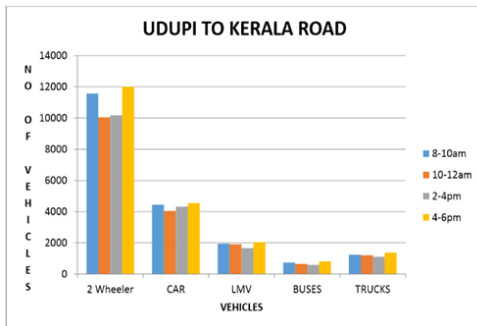
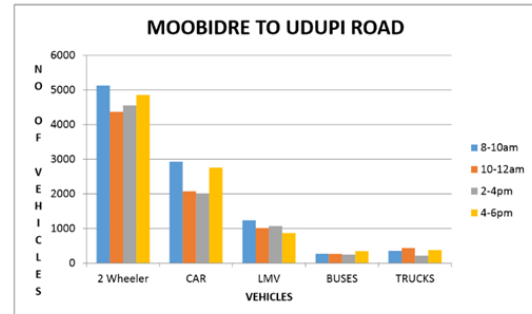
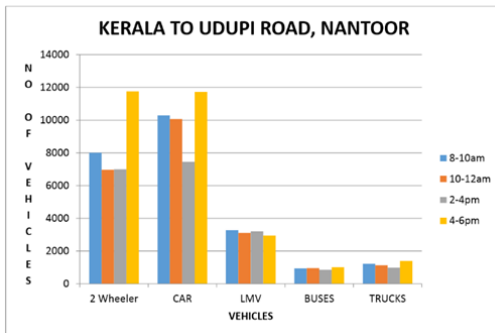


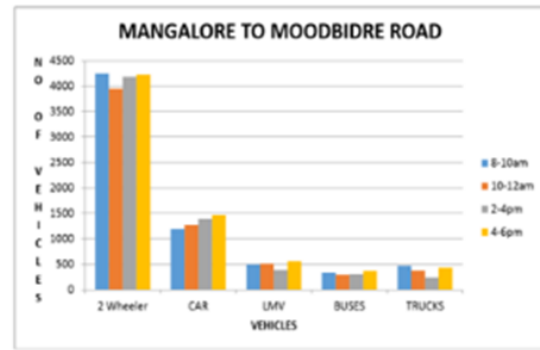
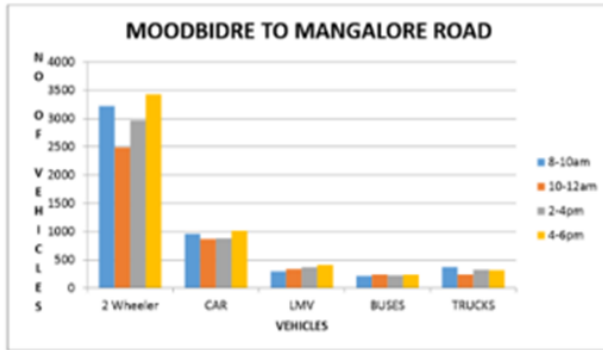
• Physical Parameter Survey

PARAMETER	DESCRIPTION	EXPLANATION
1. TYPE OF ROAD	Flexible pavement, Rigid pavement	NH-66 and NH-13 Intersecting in this junction
2. TYPE OF INTERSECTION	Cross Channelized	
3. TYPE OF DISTRESS	Minor cracks are present in all the roads	Map , rutting, shear failure and lack of binding
4. WIDTH OF THE ROAD	7m	Two lane divided carriage way
5. SET BACK DISTANCE	In sufficient	No space for parking. Less shoulder width



• TRAFFIC VOLUME SURVEY





• PAVEMENT DISTRESS SURVEY

The purpose of the distress surveys is to identify and quantify the amount and severity of the surface distress in a given segment of pavement. The survey is done at Nantoor junction and it is observed that the road experiences the rutting, pot holes, shear failure and lack of binding which can be seen in all road of Nantoor junction. The road accidents might cause due to skidding of bikes because of improper roads conditions. So if the proper measures are taken to treat the roads the accidents can be minimized considerably. The road condition of Nantoor junction is as shown in figure below



• MITIGATION MEASURES ENGINEERING SOLUTION

• Provision of underpass

An underpass is an important infrastructure asset that allows the passage of stock beneath a road, while allowing movement above. Underpass provides major benefits by reducing safety risks, travel delay and inconvenience for the road user. The underpass proposed in the present study is of height of 5.5m and

the slope is of 1 in 35 while approaching from Udupi side but the longitudinal section of the highway pavement remains horizontal from underpass towards kerala. The vehicles coming from Udupi moving towards the Kerala route will be using the underpass whereas the vehicles coming from Moodbidri towards the Mangalore city will be using the normal road. The underpass includes the service road for easy access of the traffic. The service road provided will be two-way road and there won't be any grade separation.

• Benefits of underpass:

1. The underpass is very economical when compared to the flyover and the time consumed to construct the underpass is very less which will be convenient for the flow of traffic during the construction.
2. Provision of underpass at this junction reduces traffic congestion, as a result, a lot of time and fuel is saved. Also air pollution at this junction is minimized.
3. The provision of underpass will result in the reduction of fuel cost nearly up to 58%.

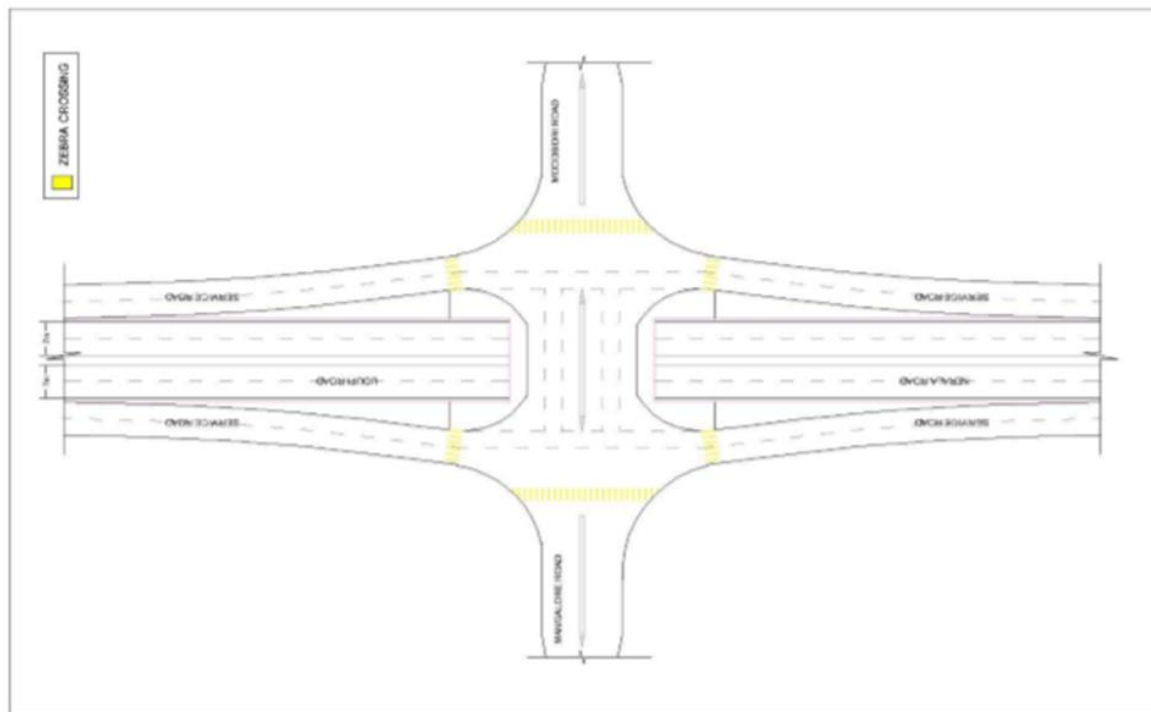
Total cost of fuel required/hr to cross the junction at present

Type of Vehicle	Total Traffic volume count / hr	Mileage	Speed	Fuel consumed litre/ hr	Time required to cross the junction (min)	Fuel required to cross the junction (lit)	Cost/ litre	Total cost
Motor cycle	4216	20	22	1.1	2	0.03667	65	10049.05
Passenger car	3145	8	20	2.5	3	0.125	65	25553.13
Light motor vehicle	1979	10	15	1.5	3	0.075	48	7124.4
Buses	387	1	10	10	3	0.5	48	9288
Trucks	511	1	10	10	3	0.5	48	12264
Total								Rs. 64278

Total cost of fuel required/hr to cross the junction after the implementation of underpass

Type of Vehicle	Total Traffic volume count / hr	Mileage	Speed	Fuel consumed litre/ hr	Time required to cross the junction (min)	Fuel required to cross the junction (lit)	Cost/ litre	Total cost
Motor cycle	4216	50	60	1.2	1	0.02	65	5480.8
Passenger car	3145	20	60	3	1	0.05	65	10221.25
Light motor vehicle	1979	22	50	2.27272	1	0.037878788	48	3598.182
Buses	387	6	60	10	1	0.16667	48	3096
Trucks	511	6	60	10	1	0.1667	48	4088
Total								Rs. 26485

• IMPROVED DESIGN OF NANTHOOR JUNCTION



IV. RESULTS, DISCUSSION AND CONCLUSION

• RESULTS AND DISCUSSION

The severity of accidents studied based on the data collected from the Police Department. Traffic surveys, road inventory data collection, alignment surveys and local enquiries were carried out to identify the major causes of accidents.

A few short-term measures include providing adequate road furniture, speed breakers, lane markings, pedestrian crossings and good pavement

maintenance are proposed as a mitigation measure.

The long-term measures involve widening of the pavement and shoulders, provision of road humps and the underpass are proposed as a mitigation measure.

In addition, restrict the illegal parking at intersection. Once the proposed measures are implemented, the future studies may be carried out to assess the improvised impact at the NANTHOOR junction by proposed mitigation measures.

• CONCLUSION

Traffic accident injuries and fatalities are a serious problem all over the world. In India, the incidence has become a very disturbing phenomenon as the country is presently ranked among countries with the highest traffic injuries and fatalities in the world.

Road traffic accidents are complicated to analyse as they cross the boundaries of engineering, geography, and human behaviour. Road safety requires taking into account the general problem posed by the heterogeneity of the traffic mix different categories of vehicles. "Health of the nation is more important than the wealth of the nation". Road safety is a major public health concern, so attention must be given to road safety measures. Strict implementation of road safety measures reduces the road accidents injuries and fatality.

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