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Analysis of Road Accidents and Noise pollution Estimation at Urban Intersection

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Abstract - *Urban situations confront various challenges related to traffic administration, counting traffic mishaps and intemperate noise levels. This study points to investigate the potential of inventive traffic designing procedures to address these issues and improve the urban environment. The records of road accidents from 2012 to 2021 are reviewed, and several methods that might help control road accidents in the future are suggested. It is seen that the accident severity is increasing year by year. The remedial measures need to be taken to counter the accident severities. The noise levels due to the traffic at signalized intersection are studied & remedial measures are suggested to minimize the noise levels. It is found that the noise levels are surpassing the permissible limits as prescribed by Central Pollution Control Board CPCB.*

Key Words: traffic mishaps, urban environment, remedial measures, signalized intersection, noise levels, CPCB

1.INTRODUCTION

The enhancement of urban surroundings is a significant topic in today's continually increasing cities. The management of traffic is one critical component that demands attention, since it has a direct influence on numerous major aspects impacting the quality of urban life. This overview focuses on the possibility of novel traffic engineering solutions to solve two major issues: traffic accidents and noise pollution caused by vehicles at signalised junctions.

Road traffic accidents are a primary source of death and injury worldwide, according to the World Health Organisation, with an estimated 1.35 million fatalities per year. Speed, alcohol or drug impairment, distraction or inattention, and bad road conditions are all variables that might lead to a traffic collision. It is critical to implement measures such as speed restrictions, sobriety checkpoints, and road maintenance programmes to prevent these tragedies.

Noise pollution may harm both physical and mental health, as well as disrupt sleep, communication, and quality of life. Traffic noise pollution comes from a variety of sources, including vehicle engines, road tyres, and horns. The degree of noise pollution varies based on the kind of road, the number of cars, and their speed. Cities and communities may manage traffic noise pollution by erecting noise barriers along highways, restricting the use of horns, and enforcing speed restrictions.

1.1 NEED OF STUDY

• Traffic accidents are a major public health problem because they can cause serious injury or death to individuals affected. Understanding the elements that lead to road traffic accidents and identifying measures to prevent them can be aided by research.
• Road traffic noise may have a detrimental influence on the quality of life of those who live near major roadways. It can be irritating and distracting, interfering with activities such as relaxing, conversation, and sleep. The study of road traffic noise aids in identifying regions with particularly high noise levels and measures to lower them.

1.2 LITERATURE REVIEW

[1] Dinesh Mohan and P.S. Bawa attempted to study and understand the fatal crash pattern in Delhi in year 1980. The police information was used. The findings show that Delhi's mortality pattern differed from those of other highly industrialized countries. Approximately 80% of the facilities were used by pedestrians, two-wheeler riders, and bus commuters. Certain national policies were implemented, including the placement of speed limiters on public buses and vehicles.

[2] Ranganathan B.A researched the Indian road accident scene. Speed has been identified as the leading cause of road accidents. Approximately 40% of accidents were caused by speeding vehicles, with

over 0.5 lakh deaths occurring throughout the years. It was decided that road safety should be a primary consideration in road planning and design.

[3] Syyed Adnam & Afag Khattak, the paper presented method to identify the accident- prone location in road.
The M-2 highway from Lahore to Islamabad was chosen for research. The accident concentration was determined by combining accident severity at a certain place. Causes, severity, contributory variables, environmental circumstances, and time period were all included in the analysis. Accidents were discovered to be mostly caused by negligent driving, napping at the wheel, braking failure, and other factors. A proper traffic guiding and control system was proposed to ensure safety.

[4] Fabio Borghetti et al provided operational technique for road accident analysis in order to improve road safety. The technique involves collecting data from the Road Police Department of the Lombardy Region (Italy) for the years (2014-2018) and identifying the most crucial road segments for prioritizing economic resource allocations. It was also applied to every segment of generic road infrastructure.

[5] Pradeep et al investigated Kaithal city traffic accidents on a stretch of Ambala road-ITI Kaithal-KKR Bypass-Bus stand Kaithal-passing via (SH-12) railway road Kaithal. During a three-year period (2016-2018), data was collected from different police stations, PWD B&R, and field research. Road accident data was examined based on a number of factors, such as the accident severity index, accident risk, change in mortality with population, kind of injuries, and others. It was revealed that the population component influenced the accident characteristic. The accident severity index climbed from 33.3% to 46% between 2016 and 2017, according to the data.

[6] Sachin Dasa and Sunny Tawar. The paper investigates the road traffic scenario on NH-65 in Haryana, India, from Chandhariwas to Hisar city in order to identify significant bottlenecks and offer realistic improvements and solutions. Over a six-year period (2011-2015), accident data from various police stations was collected. The study was conducted on a year, month, hour, and so on basis. According to the data, the majority of events were caused by head-on collisions and heavy traffic.

[7] Dr. Manish Pal and Dipankar Sarkar. The goal of the paper was to look at the impacts of vehicle idling on traffic delays, fuel loss, and noise pollution at five Agartala city junctions with various traffic volumes. A sound level metre was used to estimate the amount of commotion. Fuel utilization was calculated for each vehicle seating state by filling the petrol tank to capacity and operating the engines while the car was fixed. The revenue loss for each vehicle was calculated by multiplying the fuel loss by the current cost of fuel. A regression equation was used to determine the relationship between traffic delay and noise intensity.

[8] Rakesh Kumar et al. measured noise pollution in Nagpur, India, using a sound level metre placed on a bicycle. The noise level was measured at each site for five minutes at one-second intervals during morning and evening rush hour traffic, generating roughly 300 measurements per location. Documents such as leg, L90, L10, L_{max} and L_{min} were resolved clamour level data. Investigation. The spatial analysis tool was used to generate spatial and strategic noise maps, and the geographic information system (GIS) was utilised to input similar noise levels. According to tour guides, the city's hubbub is at an all-time high.

[9] Aditya Kamineni et al conducted research to construct a complete noise prediction model utilizing traffic and route parameters. Noise levels were measured using close-to-field and far-field estimates. The continuous noise level was determined by logging dates at one-second intervals and averaging them over time. Similarly, the SVAN 945A pocket sound level metre (SLM) was set up to measure the noise level7 witnessed while wearing the SVAN PC suit. These noise level tests were conducted in conjunction with examinations of spot speed and traffic volume. The observed noise level was higher above the limitations imposed by India's federal pollution control board (2000).

[10] D. banerjee et al. examined the spatial-temporal aspects of road traffic noise in Asansol, West Bengal. For the review, a computerized SLM type2 with an estimation range of 0-150 dB was used. All estimations were completed during working days and under proper climatic conditions. The noise assessment found that road traffic noise surpasses CPCB of India guidelines for adequate evaluation and analysis even in a medium-sized industrial city like Asansol.

2. OBJECTIVES

i. Analyzing traffic accident data and recommending remedial measures
ii. To assess and evaluate traffic-related noise levels at signalized intersection.

3. METHODOLOGY

3.1 Analyzing traffic accident data and recommending remedial measures

3.1.1 GENERAL
The research focuses on analyzing traffic accidents in Bangalore city. With this purpose in mind, data on traffic accidents from numerous sources during the last 10 years has been collated. Following data analysis, modifications and corrective action are advised to lessen the severity of the accidents.

3.1.2 SOURCE OF DATA
The information of street mishap of 10 years has been gathered from police records.

3.1.3 TABULATION AND COLLECTION OF DATA
The data gathered from various sources is organized year by year in a clear manner.

Accident severity: The accident severity index assesses the seriousness of an accident. It is defined as the number of individuals died per 100 accidents.

Fatal and Non-Fatal: Non-Fatal refers to an event or incident in which injuries occurred but did not result in death, whereas fatal refers to an event or incident that results in death.

Table -1: Accident Severity from 2012- 2021

YEAR	TOTAL ACCIDENT	PERSON KILED	ACCIDENT SEVERITY
2012	5504	758	13.79
2013	5232	770	14.72
2014	5008	738	14.70
2015	4831	741	15.29
2016	6504	794	12.16
2017	5061	639	12.63
2018	4607	681	14.78
2019	4691	768	16.37
2020	3239	642	19.82
2021	3217	655	20.36

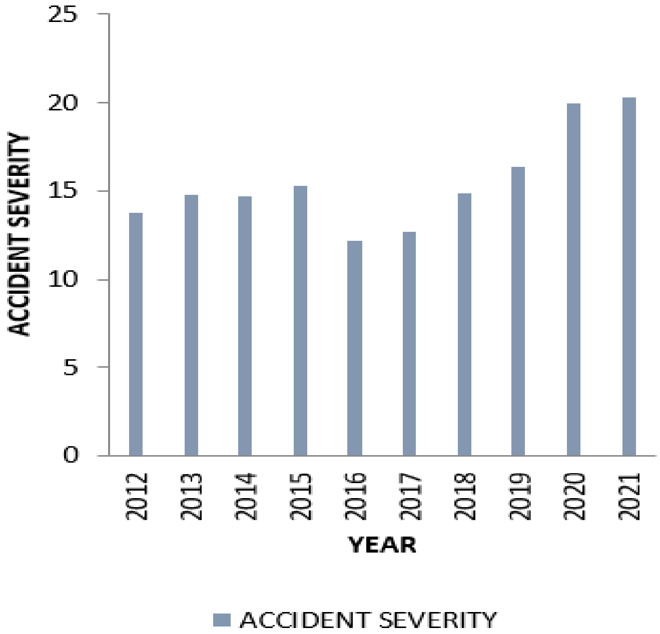

Figure -1: Accident Severity trend

Table -2: Fatal & Non- fatal accidents

YEAR	TYPE OF ACCIDENT		
	FATAL	NON-FATAL	TOTAL
2012	738	4759	5497
2013	735	4490	5225
2014	709	4292	5001
2015	712	4112	4824
2016	756	5751	6507
2017	607	4456	5063
2018	659	3948	4607
2019	742	3945	4687
2020	620	2615	3235
2021	617	2592	3209

3.1.3 RESULTS
Traffic accidents for previous 10 years are analyzed and following results are obtained:
i. Accident severity has increased year after year as the city's population has increased over the past ten years.
ii. The number of accidents is maximum during the year 2006.

3.2 To assess and evaluate traffic-related noise levels at signalized intersection.

3.2.1 GENERAL

The major goal of calculating and analyzing traffic-related noise levels at signalized intersections is to analyze and quantify the amount of noise created by vehicles and its influence on the surrounding environment. This entails monitoring the noise levels at signalized junctions and analyzing the data to determine trends and fluctuations in noise levels.

3.2.2 DATA COLLECTION

The noise level data is collected at the Banashankari bus stop Intersection of the Bangalore city.

A sound level meter is strategically positioned at the chosen junction. The ambient noise levels in decibels (dB) can be captured and recorded by this instrument. The density of various vehicle kinds was determined by recordings of the traffic flow along with counting them.

For a week, data is normally collected at the signalized intersection in the morning, day, and afternoon.

3.2.3 MONITORING PROCEDURE

The noise monitoring was carried out in accordance with the standard approach specified by the Central Pollution Control Board CPCB in 2005.

i. For noise monitoring, the following standard technique has been adopted:

ii. The tripod stand was elevated 1.5 meters above the ground.

iii. The equipment has been calibrated at each noise monitoring site due to the low relative humidity and low wind speed (less than 5 m/s).

Table -3: Noise level data of Banashankari Intersection

TIMES OF DAY	TIMMING	SUNDAY			MONDAY			TUESDAY		
		Lmax	Lmin	Lavg	Lmax	Lmin	Lavg	Lmax	Lmin	Lavg
MORNING	8:00-8:30	84.7	80.4	83.3	90.4	83.7	85.1	89.7	82.7	84.8
	8:30-9:00	85.2	80.1	82.5	90.3	84.7	86.4	90.5	83.5	85.5
	9:00-9:30	85.9	78.9	83.1	99.1	87.3	88.7	96.9	85.6	87.1
	9:30-10:00	89.3	84.3	85.6	94.6	85.5	86.7	95.1	85.5	86.5
AFTERNOON	12:00-12:30	92.7	86.1	88.0	87.9	83.4	84.6	89.3	84.3	85.4
	12:30-13:00	89.1	87.1	87.8	86.5	81.3	83.1	87.4	82.8	83.1
	13:00-13:30	91.2	87.3	87.5	87.1	82.4	83.6	86.9	83.7	84.8
	13:30-14:00	94.1	88.2	88.1	84.8	81.9	82.7	89.8	83.5	85.4
EVENING	17:00-17:30	88.1	77.9	82.6	85.9	78.5	81.8	86.9	83.7	85.1
	17:30-18:00	83.9	81.5	82.1	89.8	84.5	85.4	90.8	85.9	86.1
	18:00-18:30	88.6	80.9	84.3	92.5	87.1	88.5	92.5	82.37	85.5
	18:30-19:00	94.9	83.9	87.5	95.8	87.5	88.8	94.4	83.8	89.4

Table -4: Noise level data of Banashankari Intersection

TIME OF DAY	TIMMING	WEDNESDAY			THURSDAY			FRIDAY			SATURDAY		
		Lmax	Lmin	Lavg	Lmax	Lmin	Lavg	Lmax	Lmin	Lavg	Lmax	Lmin	Lavg
MORNING	8:00-8:30	86.4	79.8	82.7	87.6	80.5	84.1	86.4	80.1	83.3	84.5	80.7	82.9
	8:30-9:00	90.1	84.2	86.6	90.3	82.6	84.9	90.1	82.4	84.1	83.9	78.3	80.5
	9:00-9:30	91.6	85.3	87.1	89.5	82.5	84.2	90.6	82.8	85.5	82.1	79.5	81.2
	9:30-10:00	92.1	83.1	87.3	91.6	82.1	86.9	89.7	82.1	84.1	87.8	82.9	84.9
AFTERNOON	12:00-12:30	81.5	72.5	77.5	81.6	74.2	75.9	83.1	78.9	80.1	92.6	76.2	79.6
	12:30-13:00	81.2	74.8	79.1	86.1	81.5	82.4	81.6	80.1	81.1	86.1	75.1	80.1
	13:00-13:30	81.5	76.3	78.5	84.5	78.9	81.4	78.2	72.9	76.9	85.8	79.4	82.1
	13:30-14:00	81.7	71.5	76.9	82.6	76.8	78.1	81.3	76.2	78.5	89.9	81.3	83.5
EVENING	17:00-17:30	84.4	79.9	82.3	85.1	80.4	83.2	88.9	82.1	84.9	88.1	79.1	83.4
	17:30-18:00	88.0	82.7	84.8	89.6	82.4	85.9	89.7	83.1	87.1	87.5	80.1	84.3
	18:00-18:30	92.4	81.9	86.2	92.4	82.2	86.8	92.6	86.3	88.9	89.1	81.1	83.2
	18:30-19:00	93.6	82.5	88.5	90.2	81.5	86.1	91.1	84.8	88.2	94.2	84.9	86.5

Table -5: Vehicle count data for week

DAYS	TIMING	2-WHEELER	3-WHEELER	4-WHEELER
SUNDAY	MORNING	1435	1210	1502
	AFTERNOON	1425	1138	1011
	EVENING	1484	1282	2055
MONDAY	MORNING	2469	1680	1209
	AFTERNOON	1085	1056	1357
	EVENING	2062	1950	1809
TUESDAY	MORNING	2032	1958	1978
	AFTERNOON	1976	1426	1459
	EVENING	2042	1943	1844
WEDNESDAY	MORNING	1814	1658	1875
	AFTERNOON	1062	938	1567
	EVENING	1609	1445	1619
THURSDAY	MORNING	1978	1754	1678
	AFTERNOON	1998	1038	1115
	EVENING	1519	1316	1611
FRIDAY	MORNING	1636	1436	1344
	AFTERNOON	1437	1375	1285
	EVENING	1536	1459	1338
SATURDAY	MORNING	1558	1328	1207
	AFTERNOON	1375	1275	1241
	EVENING	2079	1931	1984

4. CONCLUSIONS

i. Road traffic accidents (RTAs) are a significant concern in modern urban areas, leading to loss of lives, injuries, and property damage. A comprehensive analysis of RTAs at signalized intersections is crucial for understanding the causes and implementing effective safety measures.

ii. Estimation of traffic noise at signalized intersections is essential to assess its potential impact on nearby residents and determine appropriate noise mitigation measures.

iii. Based on our observations, it is concluded that the severity of accidents in Bengaluru City rises annually due primarily to carelessness on the part of drivers, poor road maintenance, and not adhering to government guidelines.

iv. Because of the increasing number of vehicles on the road, the intersection is subjected to extremely high noise levels that exceed the CPCB's acceptable limit.

v. Due to the regularity of traffic bottlenecks at intersections, many people choose two-wheelers over four-wheelers.

vi. The majority of these issues are preventable by increased public knowledge, clearer traffic signs, and the avoidance of needless horn use, among other things.

5. REMEDIAL MEASURES

To address road traffic accidents & noise pollution at signalized intersections, several remedial measures can be implemented.

i. Improve Road design, signs, and markings to improve visibility and lower the risk of accidents.

ii. Install speed bumps, roundabouts, or chicanes to slow vehicles in high-accident zones.

iii. Increase police presence and enforce traffic laws on a regular basis to dissuade reckless driving and assure compliance with traffic regulations.

iv. Build sidewalks, pedestrian crossings, and overpasses to keep people safe from automobiles.

v. Build sound walls or barriers along roadways near signalised crossroads to reduce noise transmission to neighboring residential or business areas.

vi. Adjust traffic signal timings to reduce the amount of stops and starts, which can assist lower vehicle noise levels.

vii. Promote electric vehicle (EV) adoption by offering incentives and building charging infrastructure. EVs are quieter than internal combustion engine automobiles.

vii. Electronic signage can be utilised to show messages warning cars not to honk excessively.

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