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CONTRIBUTIONS TO ROAD SAFETY FROM ROADWAY CONDITION, TRAFFIC, AND MAN-MADE FEATURES

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ABSTRACT

India is a developing nation, and road safety is still in its infancy. As the number of vehicles increases, accident severity rises in ascending order. Accidents result in injuries, fatalities, property and health damage, social suffering, and overall environmental deterioration. India's traffic accident issue is concerning. Records indicate that a vehicle collision causes one death every 2.75 minutes. The high accident rate is generally due to factors such as poor road geometry, low visibility, road user behavior, car problems, and a lack of enough highways and other key routes to handle traffic needs. The nation suffers significant economic losses as a result of road accidents. Road safety is essential to reducing accidents involving both people and vehicles, which makes the road safer and more convenient for traffic.

INTRODUCTION

3,000 persons lose their right to life each day as a result of general road crashes. A human-caused worldwide humanitarian crisis, this one has already occurred. (2011 Annual Report of the Global Road Safety Partnership)

One of the most significant issues in our culture is road safety. Between 20 and 50 million people are injured and 1.2 million people are killed in traffic accidents each year. By 2020, it is estimated that road traffic accidents will contribute third-most to the global burden of disease and injury if current trends continue (Torregrosa et al., 2012)

The unfortunate distinction of having the most road accident fatalities worldwide has been attained by India. Road safety is becoming a significant social issue worldwide, particularly in India (Shivkumar and Krishnaraj, 2012).

Causes of Accident

- i. High speed
- ii. Fatigue
- iii. Restraints
- iv. Vehicular characteristics
- v. Environmental characteristics
- vi. Tyre defect
- vii. Brake failure
- viii. Overloading

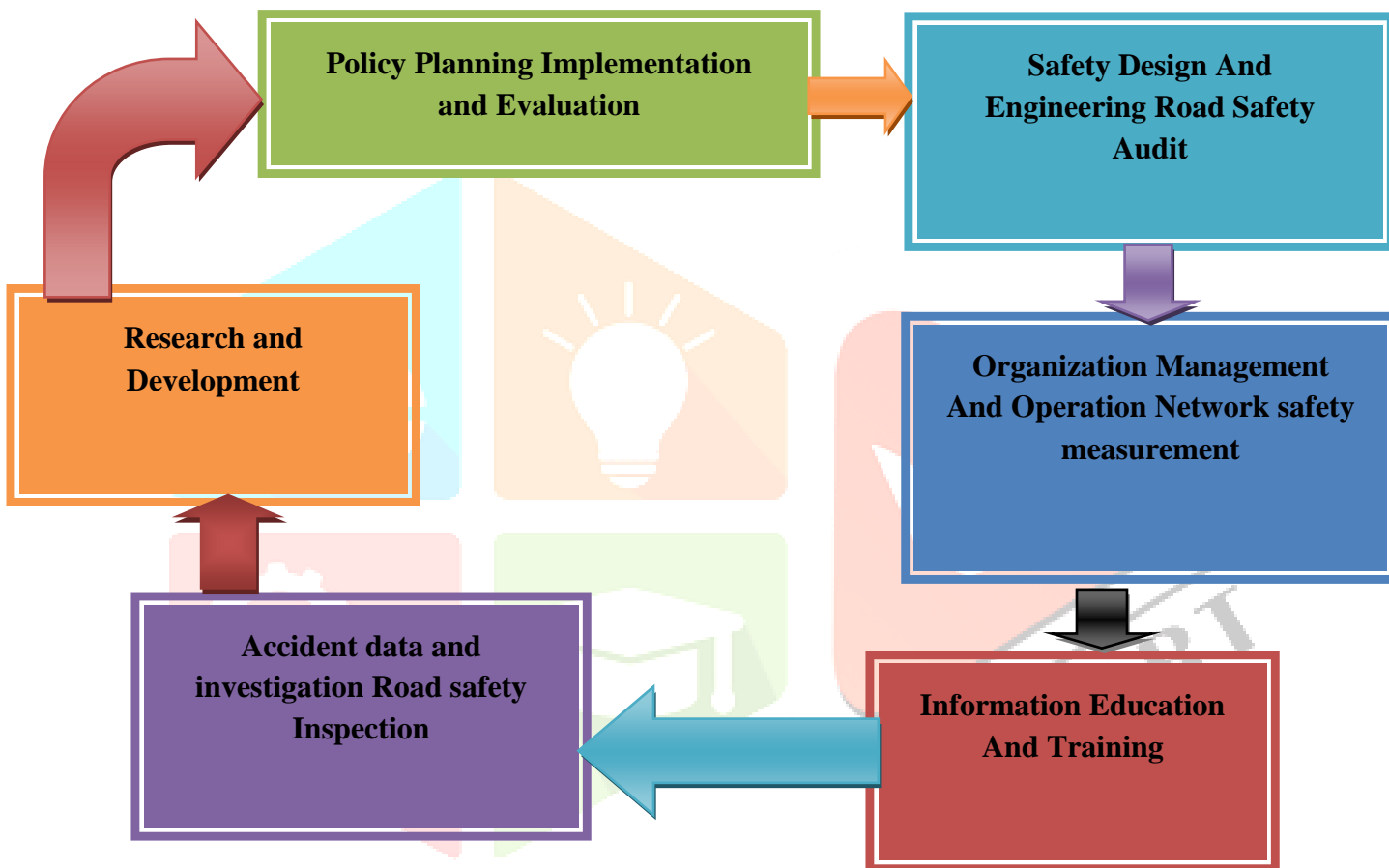
Table :1 Number of Road Accidents and Number of Persons Involved: 2002 to 2011

Number of Road Accidents and Number of Persons Involved: 2002 to 2011					
Year	No of Accidents		Number of Persons		Accident Severity
	Total	Fatal	Killed	Injured	
2002	4,07,497	73,650	84,674	408,711	20.8
2003	4,06,726	73,589	85,998	435,122	21.1
2004	4,29,910	79,357	92,618	464,521	21.5
2005	4,39,255	83,491	94,968	465,282	21.6
2006	4,60,920	93,917	105,749	496,481	22.9
2007	4,79,216	1,01,161	114,444	513,340	23.9
2008	4,84,704	1,06,591	119,860	523,193	24.7
2009	4,86,384	1,10,993	125,660	515,458	25.8
2010	4,99,628	1,19,558	134,513	527,512	26.9
2011	4,97,686	1,21,618	1,42,485	5,11,394	28.6

Source: Road statistics of India (2011)

METHODOLOGY

The Road Safety policy circle



STEPS :

1. Policy Planning Implementation and Evaluation
2. Safety Design And Engineering Road Safety Audit
3. Organization Management And Operation Network safety measurement
4. Information Education And Training
5. Accident data and investigation Road safety Inspection
6. Research and Development

LITERATURE REVIEW

Many factors may exhibit a measurable influence on driving behavior and traffic safety on highways. These include:-

- 1) Human factors such as improper judgment of road ahead, driving under the influence of alcohol, drug driving education and experience & s age.
- 2) Traffic factors like speed, volume, density, capacity, traffic mix and variation.
- 3) Vehicle deficiencies such as defective brake, headlight, tyres, steering and vehicle condition.
- 4) Road condition like slippery or skidding road surface, ravel, pot hole, ruts etc.
- 5) Road design such as inadequate sight distances, shoulder width, number of lanes, improper curve design, improper lighting and traffic control devices.
- 6) Weather condition like fog, heavy rainfall, dust, snow etc.
- 7) Other causes such as enforcement, incorrect sign and signals, service stations, badly located advertisements, stray animals etc.

Hiselius (2004) studied the accident frequency and homogeneous flow of vehicle. It was found that the accident rate decreases when the traffic flow is homogenous in nature. For Lorries there was an decrease in no of accident and for car the accident rate was constant.

Tornros and Boiling (2005) conducted an experiment with 48 drivers by covering a distance of 15 Km on a two-lane road. They concluded that driving performance reduced by dialing hand held phone and speed decreased with hands free phone. Reaction time to warning sign at road side decreased for hand held phone user.

Aarts and Schagen (2006) studied relationship between speed and risk of a crash. The conclusion was when speed increases crash increases.

Hassan and Aty (2012) studied about 680 young driver behavior involvement in traffic crash in Florida. The result revealed that aggressive violation, in-vehicle distraction and demographic characteristics were the significant factors affecting young drivers involvement in crashes at the age of 16-17. Invehicle distraction, attitude towards speeding and demographic characteristics were the significant factors effect young drivers crash risk at the age of 18-24.

Bamzai et al., (2012) investigated into safety impacts of highway shoulder attributes in Illinois. Data were analyzed to establish correlation between shoulder related crashes by type and severity category.

Somchainuek etal (2013) investigated road side safety on Thai NH. The result showed that speeding vehicles were involved in roadside crashes accounted for about 70% of the total crashes and 30% of road side crashes were due to road side trees.

PURPOSE

- (i) To study the annual, monthly, daily and hourly variation in accident rate on selected Stretch of urban two-lane road.
- (ii) To study the effect of traffic volume, density and capacity on accident rate on urban Two-lane road.

(iii) To study the maintenance of road surface and shoulder on rate of accident.

(iv) To develop an accident prediction model based on AADT, road condition, road side Features.

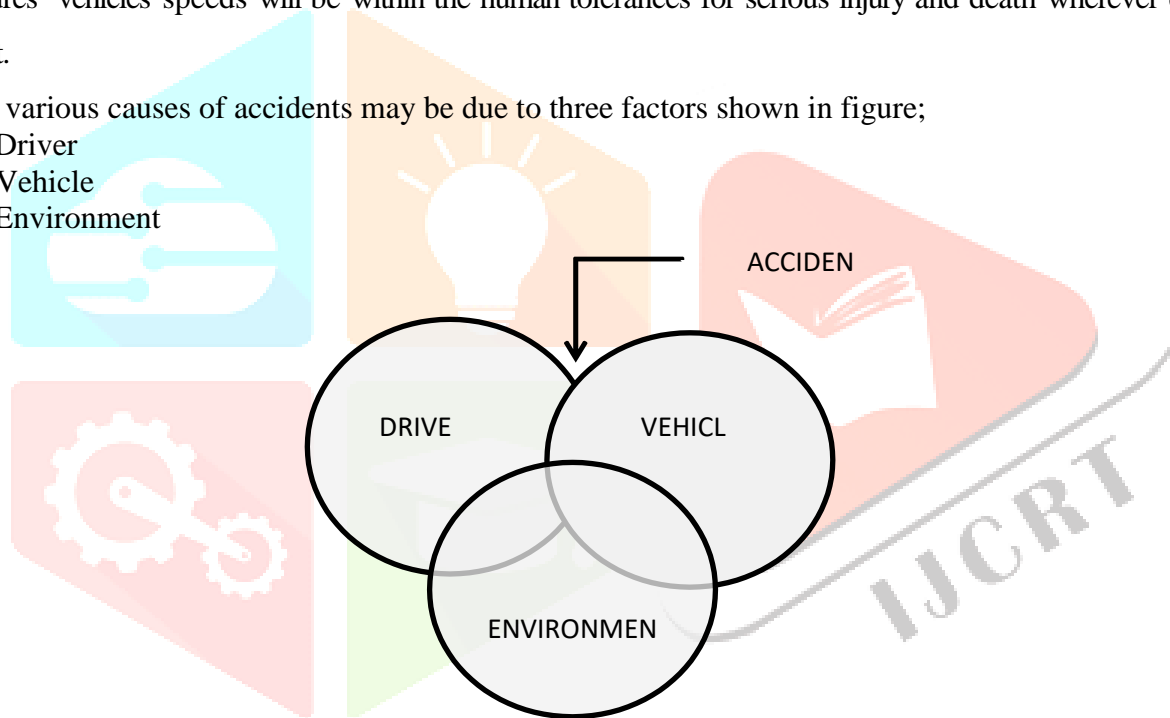
Road Safety & Various Causes of Accident

Road traffic safety refers to methods and measures for reducing the risk of a person using the road network being killed or seriously injured. The users of a road include pedestrians, cyclists, motorists, their passengers, And passengers of on-road public

transport, buses and trams. Best practice road safety strategies focus upon the prevention of serious injury and death crashes in spite of human fallibility. Safe road design is now about providing a road environment which ensures vehicles speeds will be within the human tolerances for serious injury and death wherever conflict points exist.

The various causes of accidents may be due to three factors shown in figure;

- (i) Driver
- (ii) Vehicle
- (iii) Environment



The details of these factors are shown in Table 1.2 below

Table 1.2 Various Factors Related to Accident

Driver-Related	
Alcohol and drugs	Sickness
Unsafe speed	Cell Phone Use
Drowsing or Fatigue	Distraction
Fatigue	Improper Passing or Turning
Disregard traffic controls	Non Use of Restraint
Vehicle-Related	
Over Loading	Steering defect
Brake defect	Tire failure
Light defect	Improper wheel alignment
Environmental- Related	
Road side hazard	Vision obstruction
Ruts	Improper traffic control
Debris or Garbage on the road	Road Side Hazard
smoke or fog	Fixed Objects
Glare	Water ponding
Improper/nonworking traffic controls	Shoulders defective

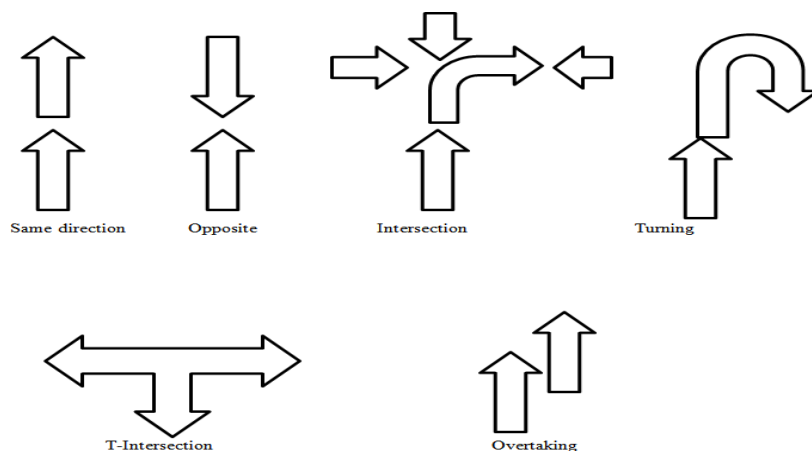
Types of Accident, Position of Vehicles and Consequences

Accident imposes both tangible and intangible cost. The details are shown in Table 1.3 and Fig 1.2

Table 1.3 Types of Accident, Position of Vehicles and Consequences

Type of Accident	Position of Vehicles
Head on	Vehicle from opposite direction
Rear end	Vehicle in same direction
Angle and turning	Vehicle from adjacent direction(Intersection)
Parking or Backing	Overtaking
Roll over	On path
Run-off-road	Off path
Moped bike	On curve turning
Fixed Objects(Trees and Poles)	Off path curve
Pedestrian	
Animal	
Consequences	
Property Loss	Contusion (Head injury without skin unbroken)
Spot Death	Fracture
Loss of consciousness	Freezing
Amputation (Loss of one or more limb)	Trauma
Head/Neck injury	Laceration (Injury involving cut)
Abrasion	Vision/Speech/Hearing Impairment
Sprain (Ankle/Joint twist)	Chest pain/Respiratory impairment

Traffic Sign



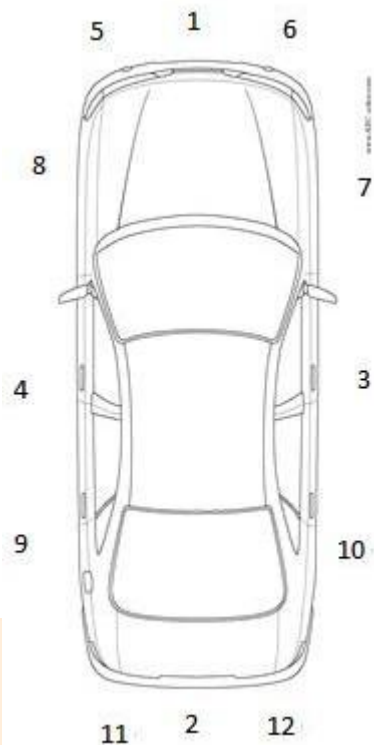


Fig1.2 Position of vehicle and pointsss on vehicle where object collides.

Table 3.3 Details of accidents

Year	Fatal	Major injury	Minor injury
2002	15	16	37
2003	11	35	50
2004	16	25	45
2005	20	32	39
2006	21	34	40
2007	18	41	84
2008	4	24	61
2009	13	32	81
2010	18	34	84
2011	11	30	58
Total	147	303	579

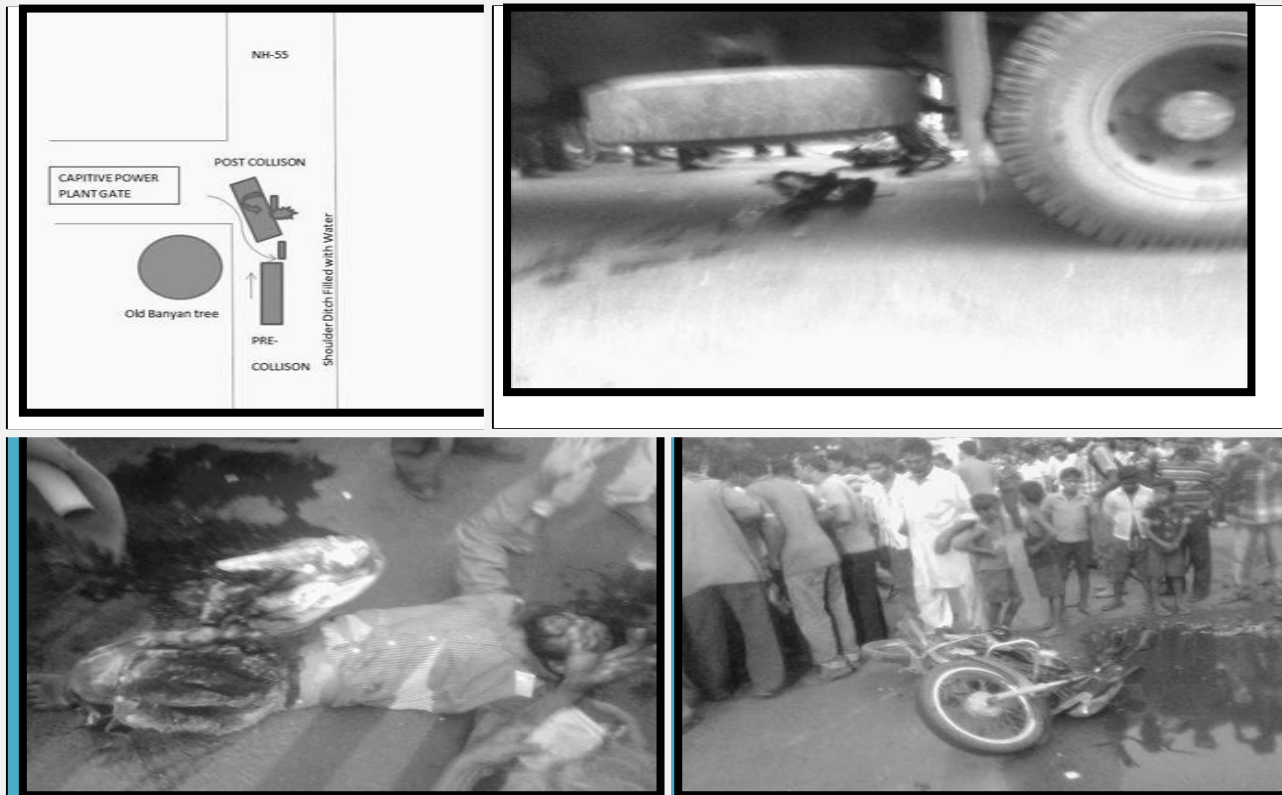


Table 1.1 Road accident in India (2002-2011)

RESULT AND CONCLUSION

RESULT:

YEAR	ACCIDENT	DEATH
2012	233	172
2013	1727	2307
2014	465	444
2015	951	907
2016	1240	547
2017	1242	371
2018	2499	647
2019	2341	664
2020	1761	547
2021	2048	667
TOTAL	=14507	=7273

CONCLUSION

- (1) The available literatures on accident analysis indicate that 77.5 percent of road accidents in India are caused due to driver's error.
- (2) Heavy vehicles like truck are involved in maximum no of accident on two-lane roads. It is estimated that fatalities caused by truck is 59 % followed by other (26%) and bike(7%) and jeep (5%) and bus (3%). Road safety awareness should be raised among road user.
- (3) Stretch IV has the highest no of accidents which accounts for 34.1% of total accidents. The accident rate can be decreased by road side clearance, proper maintenance of shoulders, lighting, and junction improvement. Speed limits should be brought down by providing humps near accident spots. Sight distance near curves should be obstruction free.
- (4) Stretch I have the second highest no of accidents accounts for 32.5% of total accident. The Accident rate can be reduced by providing signalized junction, junction improvement, and shoulder Clearance, installation of humps, shifting of poles, removal of trees near the edge of pavement etc.
- (5) No of accidents in stretch II accounts for 29.6% of total accidents. The accident rate can be Minimised by clearing-off shoulders, reducing speed limit, junction improvement, providing Signals on the median, shifting structures on the shoulder.
- (6) Stretch III has minimum no of accidents accounts for 3.7% of total accidents. Speed limit reduction near junction should be reduced to prevent accidents.

FUTURE SCOPE

Road safety can be improved by developing accident prediction model based on annual average daily traffic, roadway etc.

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