CHAPTER 1

INTRODUCTION

आत्मानः रथिं विद्य शरीरं रथमेव तु
बुधि तु सारथिं विद्य मनं प्रग्रहमेव च /// 3 ///

इन्द्रियाणि हयानंहुविषयाँ स्तेषु गोचरान्
आत्मेन्द्रियमनोयुक्तं भोक्तेत्याहुमिनीः /// ४ /// ¹

ātmānāgvaṁ rathinaṁ viddhi śharīraṁ rathameva tu
buddhiṁ tu sārathiṁ viddhi manaḥ pragrāhameva cha
indriyāṁi hayānāhurvīṣhayānsteśu gocharān
ātmendriyamanoyuktāṁ bhoktētāḥurmanīshinaḥ

A man is the most beautiful part of God's Creation.

The chariot analogy is described in "Kathopanishad" and is depicted in the scene as well.

The analogy is described in
This is the analogy in brief ...

Body - the chariot, Jiva atma (embodied soul) - passenger
in the chariot - Arjuna, Buddhi (intellect) - charioteer -
Krishna. Manas (mind) - reins, Indriya (senses) - five
horses, The perceived world - path of the chariot

Kathopanishad gives a beautiful and valuable concept of human life as it should be lived, by comparing human body to a chariot. As Bhagavad Gita is the essence of the Upanishads, this concept is symbolically represented on the Kurukshetra battle field, by Arjuna’s chariot with Krishna as charioteer. This concept is very helpful to guide one through the journey of life.

The components of the chariot and comparable counterparts of the human body are as follows:

¹ Kathopanishad 1.3.3-4 21
Human body is the chariot, Individual self is the owner of the chariot, Intelligence (Buddhi) is the charioteer, Mind is the reins, The five senses are the horses, World experienced by the senses are the tracks on which the horses tread, The Individual self associated with the senses and the mind is the enjoyer.2

Only when the horses are reined in, the journey itself is possible and the chariot will carry the individual owner to the desired destination. For the successful running of the chariot all the relevant activities should be coordinated. The five senses should be controlled by intelligence with the help of a disciplined mind.

A chariot is used for the performance of a journey. A journey needs a path and a destination to be meaningful. The process of living in this world is the journey. The destination is self-discovery or realization of God. Most of the time we are absorbed more in decorating the chariot, than keeping it in an efficient working condition.

We must be careful how we will like. We may be the only Gita as the holy book some people read. The individual self is influenced by the senses; unless it has a disciplined mind to control the senses, it is likely to go astray. But if it seeks the grace of the Supreme Self, it is able to make its journey through life, goal-oriented and successful.

Globalization has brought India into the forefront of progress. Transport apart from being a major contributing factor in the growth and development of country has also promoted national and global integration. An efficient transport is indispensable to the economic development of a nation. Transport plays a significant role in the overall economic development. Transportation results into growth of infrastructure, industrialization and massive production. India has come a long way and has developed a well functioning transportation system and a supporting sound infrastructure which has become the basis of economic prosperity and better industrial growth.

2 Bhagavad Gita: Chapter 3, Verse 43
1.1 HISTORY

1.1.1 History of Transportation

The most important invention in the history of road transport was the wheel. The first carts wheels were formed with a single piece with the axes, which were installed under the wagon bodies by leather straps. Later, the switch took place to fix axles on which the wheels rotated separately.

The transport system has evolved with the development of human culture. It has developed through several stages like the hunting stage, the pastoral, agricultural, industrial and commercial stages. Man has made many achievements in the development of transport and at the same time has also helped civilization to develop. In human history, the only form of transport apart from walking was by using domestic animals.

The first earth tracks were created by human was by carrying goods and following game trails. Tracks were naturally created at points of high traffic density. As animals were domesticated, horses, oxen and donkeys, dogs, camels etc. became an element in track creation. With the growth of trade, tracks were flattened and at Mohanjadoro widened to accommodate animal's traffic.

Thus different animals were used in different regions according to the local conditions for transport. Use of animals for social life was a part of development of human culture. Animal drawn wheelers developed in Europe and India in the 4th Millennium B. C. and China in about 1700 BC. The history of trucks, like that of cars, started in 1876 with the invention of the four-stroke in the engine by Nikolaus August Otto.

Since then, technology has made great strides and modern trucks are equipped with clean engines that provided a great active and passive safety means trucks driven by engines that use fuels derived from refining guilty of CO₂ Production as well as emissions of harmful gases that pollute the environment. Specially, in the last twenty years the automotive industry has made enormous progress in the reduction of harmful gases, CO₂ and enhanced active and passive safety. Over time, technology has evolved to allow people to communicate more quickly and efficiently. It is the ultimate mode of convenience for people and allows therein staying connected at all times.
Transport system in India during Vedic Period

During the Vedic period the ancient Indian transport system was grouped under two divisions, land and water. The Rig-Veda Sloga's refer these forms of transport. The animals were tamed and were employed by men as draft animals during Vedic Period. Bull was as the other means of transport and communication. The camels were also frequently used for transport or carriage loads.

Transport in Ancient India

In ancient times the Indians had known the art of road building even during 4000 B. C. But the importance of road and transportation realized only when the organized government was established. During Kautilya, and Mourayan periods city roads were built 24 feet wide and the road to battlefield were constructed about 48 feet in width. In the regime of Chandra Gupta Mourya there was a transport department and a Grand Trunk connected Patna with NWF province. During the times roads were well developed and public transport existed for common men. But vehicles were only used by kings and elite of the society.

During medieval period

During Moghul period the roads and transport system were well developed for the growth of trade. Although, the public passenger vehicles were not found in large number, goods carriers were in larger scale. Mohammed Tughlaq had constructed a trunk road from Delhi to Daula according IBN Batuta. King Shershah Suri was very famous for constructing roads. The monumental volume "Tarikhe-Shershah" reveals that, in his time roads were managed by the state.

Transportation in India

The transport system in India comprises a number of distinct modes such as railways, roads, road transport, ports, inland water transport, coastal shipping, and airlines. Railways and roads are the dominant means of transport carrying more than 95 per cent of general public in the country. Although other modes such as coastal shipping and inland water would play a greater role, the railways and roads transport would continue to dominate the transportation systems.
Road Transport in India

Good road transport network is the need of the time for rapid growth of the human being especially in markets, schools, and hospitals; and for trade and investment. Roads also play an important role in inter-modal transport establishing links with Airports, Railway Stations, and Ports.

India has largest road network in the world, of 56,03,293 km,\(^3\) consisting of:

(i) Highways (NHs) : 1,01,011 km.
(ii) State highways (SHs) : 1,76,166 km.
(iii) Major district roads (MDRs) : 5,61,940 km.
(iv) Rural Road : 39,35, 337 km.
(v) Urban Road : 5,09,730 km.
(vi) Project Road : 3,19,109 km.

The origin of roads dates back to the period before the advent of recorded history. As civilization advanced, the growth of agriculture took place and human settlements began to be formed. From one settlement to another, tracks were formed. These tracks might have been the skeletal framework of modern highways.\(^4\)

The invention of wheel in early Mesopotamian Civilization – Ubaidian culture (approx 3500 – 5000 B.C.) was a revolution in the transport system. People learned the art of joining two wheels to get the advantage of an axle and thereby built two-wheeled and four-wheeled carts and chariots. The art of road building soon began with the need to provide a hard durable surface to withstand the abrading effects of the wheels.\(^5\)

The first forms of road transport were horses, oxen or even humans carrying goods over tracks that often followed game trails, such as the Natchez

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\(^3\) Annual Report 2017-18, Ministry of Road Transport and Highway, Government of India.
\(^4\) Indiastudychannel.com - History of Highway Development in India.
\(^5\) Road Transport Year book - Ministry of Road Transport and Highways, Govt. Of India.
Trace. In the Stone Age humans did not need constructed tracks in open country. The first improved trails would have been at fords, mountain passes and through swamps. The first improvements would have consisted largely of clearing trees and big stones from the path. As commerce increased, the tracks were often flattened or widened to accommodate human and animal traffic. Some of these dirt tracks were developed into fairly extensive networks, allowing communications, trade and governance over wide areas. The Incan Empire in South America and the Iroquois Confederation in North America, neither of which had the wheel, are examples of effective use of such paths.

The first goods transport was on human backs and heads, but the use of pack animals, including donkeys and horses, developed during the Stone Age. The first vehicle is believed to have been the travois, a frame used to drag loads, which probably developed in Eurasia after the first use of bullocks (castrated cattle) for pulling ploughs. In about 5000 BC, sleds developed, which are more difficult to build than travois, but are easier to propel over smooth surfaces. Pack animals, ridden horses and bullocks dragging travois or sleds require wider paths and higher clearances than people on foot and improved tracks were required. As a result, by about 5000 BC roads, including the Ridgeway, developed along ridges in England to avoid crossing rivers and bogging. In central Germany, such ridgeways remained the predominant form of long-distance road till the mid 18th century.

Roads in India during Early Modern History (British Period)

The period covering decline of the Mughals and the beginning of the British rule was a period of neglect of road system in India. Only William Bentinck and Lord Dalhousie took some steps to improve the roads. Lord Dalhousie organized to form the provincial P.W.D. in place of Military Board in 1885 for maintenance and construction of road. Specifications were framed for construction of road. These efforts had resulted in the establishment of a good

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6 Lay (1992), p25
7 Lay (1992), p9
8 Landau, Georg: *Beiträge zur Geschichte der alten Heer- und Handelsstraßen in Deutschland*, Kassel, Bärenreiter, 1958
system of trunk roads in the country by the end of the nineteenth century. Development of road received a real set-back after the introduction of railways in the mid of nineteenth century. The need of administration and military was well adequately served by railways. The improvement of roads was confined only to the feeder roads leading to railway yards / depot.

The primitive road transport means were limited to horse carts and bullock carts only. Whereas the “iron horse” (railway engine) was a quick means of transport. The time lag between the advent of the railways and the appearance of motorized vehicles in India was nearly half a century. This period can be considered to be the darkest period in the history of roads in India.

**Post First World War Period**

- After 1st World War (1914-1919) there was a rapid growth in motor transport.
- The pneumatic tired vehicles caused rapid deterioration of Indian roads which were already in sad state of neglect due to lack of Government interest and inadequate finance at the command of the local bodies.
- Though from the very beginning of twentieth century with the application of petroleum crude extracted bitumen, construction of all weather road started in America and Europe in large scale, it took around forty to fifty years to be applicable on Indian roads.
- Need for better road was felt and expressed in the council of States. In November’1927, following a debate on this subject in the Council, Govt. of India appointed a committee called Road Development Committee consisting of members from both the houses of the Central Legislature with Mr. M. R. Jayakar as Chairman.
  
  The committee, known popularly as Jayakar Committee was required to:

- Examine the desirability of developing the road system in India and the means by which such development could be achieved.

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9 Website of National Highway Authority of India.
• Examine the distribution of functions of central and provincial governments by formation of Central Road Board or otherwise.

Amongst the findings of Jayakar Committee the important points were:

• The road development in India was beyond the financial capacity of the local Governments. As it was a matter of national interest, it was a proper charge on Central Revenues.

• Since additional demands and requirements were created by growth of motor transport, the committee suggested imposition of additional taxation on motor transport such as –
  o A duty on motor spirit.
  o Vehicle taxation.
  o License fees for vehicles plying for hire.

• The additional funds from motor spirit duty were to go to the Central Revenue as Road Development Fund.

• However, the committee did not consider that necessary to create a Central Road Board but recommended the appointment of a Road Engineer to development of Roads.

Post Second World War Scenario

• The Second World War saw a rapid growth in road traffic which caused serious deterioration in the condition of roads. The situation compelled the Government to convene a conference of Chief Engineers of provinces at Nagpur in 1943. The conference become famous with name of “Nagpur Plan”.

Some of the salient recommendations of Nagpur Plan were :-

The roads should be divided into four classes:

• National Highways :- which would traverse provinces or states and be of national importance for strategic, administrative and other purposes.
• Provincial and State Highways: which would be the other main roads of a Province or State

• District Roads: Which would take traffic from the main roads to the interior areas of the Districts. According to their importance, some of those were considered as Major District Roads (MDR) and the remaining as Other District Roads (ODR).

• Village Roads: Link the villages to the road system.

• The National, Highways State Highways and Major District Roads were provided with hard and durable pavement crust.

• The Other District Roads and Village Roads should be provided with a properly engineered earth surface, but improvements such as gravelling, soil stabilization, macadam or track ways could be considered where necessary.

• Formula had been suggested to determine the length of different categories of roads and as per that formula, a 20 years time-span (1943-1963) was set to achieve the targeted length.10

Early Post Independence Development

• The 'Nagpur Plan' provided a rational basis for road development in India to upgrade the war-damaged road system.

• After independence, the Central Government is bearing the entire financial implications for the development and maintenance of the National Highways.

• The targets of 'Nagpur Plan' were mostly achieved by 1960 through the first and second five year plan (1951-56) and (1956-61).

The salient landmarks in these periods were:

(i) Central Road Research Institute (CRRI) which was started in 1950 in New Delhi. This institute was considered as one of the National Laboratories of the Council of Scientific and Industrial Research in India.

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10 Strategic Plan for Road Research in India.
National Highway Act was enabled in 1956, according to which
- The National Highways vest in Union.
- The Central Govt. may by notification, declare any highway to be National Highways (NH).

- A major amendment to the Act done in 1995 to enable privately financed Toll Roads to be built and operated.

**Road Development Plan (1961-81) : Bombay Plan or Chief Engineer’s Plan**

In 1959, a twenty years plan (1961-81) was drafted in the meeting of Chief Engineers which is popularly known as Bombay Plan or Chief Engineer’s plan. The objectives of the plan were :-

- Provision of good communication in the rural areas is essential to check increasing urbanisation.
- Strategic needs in economic, industrial and agricultural sides were to be duly taken care off.
- Targets of every category of roads were set based on some rational formula, which was 10,57,000 km. with total expenditure of Rs.5,200 crores.

**Mid of Post Independence Period**

- In the decades of 1980’s and 1990’s, some important steps such as the following were taken in Road Sector :
  - International lending agencies like the World Bank, the Asian Development Bank, OECF (Now JBIC) stepped in to provide loan assistance for road projects.
  - Engagement of consultants for project preparation and construction supervision.
  - Packaging of large size road projects.
  - State-of-art road construction technology and equipments.\(^{11}\)

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\(^{11}\) World bank’s report on Rural Roads of India.
National Highway Authority of India

- The most remarkable development in the road sector after independence is formation of National Highways Authority of India (NHAI).
- NHAI was constituted by an act of Parliament in 1988.
- The Authority became operational with effect from February’ 1995.
- NHAI has implemented National Highway Development Project (NHDP) in 1998, which has been in several phases.

The man with visionary who was instrumental behind building world class road in India

As the head of state, if the name of Sher Shah Suri is taken as the first man behind the development of highways, Sri Atal Bihari Bajpayee would definitely come next who had foreseen the need of world class road and implemented that within his tenure as the Prime Minister of India from 1998 to 2004. Before his tenure as in the development of highways was not tangible. Sh. Bhajpayee in the Capacity of Prime Minister of India not only gave impetus to NH works but also masterminded the nationwide plan to bridge the gap in connecting the villages with main roads by all weather roads. The programme is namely is Pradhan Mantri Gram Sadak Yojana –PMGSY, which began from 25th December 2000.

Pradhan Mantri Gram Sadak Yojana

The target of Project was 2000-

(i) Connectivity for villages with population more than 1000 –by 2003
(ii) Connectivity for villages with population more than 500– by 2007
(iii) Connectivity for villages with population upto 500 – by 2010

Though there may be some delay in achieving the target, this project had a deep impact on serving the rural population of India and in turn contributing to upliftment of the economy of the country
1.1.2 History of Vehicle

The invention of wheel was more important; it was the first step which made the civilization to move faster. The wheel is found in all the civilizations from Mesopotamia to Indus Valley. For some thousand years people used Rath (Chariot) or other carriages which were mostly driven by animals throughout the world. Even in those days there were traffic jams and accidents. Though there were no mechanized vehicles like cars, buses etc., there were horse or other animal driven carriages and the roads were not too wide. So, there were cases of traffic jams and accidents. That developed the ideas of traffic Rules. However, in the sixteenth century new machines were developed which made people move faster in automatic mechanized vehicles. It all started in 1769 when the world's first car was invented by Nicholas Joseph Cugnot, which was called "Steam truck" and was first used by the French Army. Since, then many developments took place and newer and newer cars were developed. But this process raised the number of accidents. Alas ! The first accident which took the life of a driver was in London on 25th February 1899. Then people in all the countries started thinking as to how to avoid Road Accidents. Some introduced Traffic Lights, which allowed some vehicles to pass while others had to wait for their turn. This was done to regulate traffic and avoid any crash or accidents.

In ancient India there were two books called Manusmriti and another Kautilya Arthashastra which described Rules and Regulations of the Road in great details. In olden days these law books prescribed punishment for violations of Rules or for causing accidents.

In the Western world the first Road Safety law was introduced in Britain in 1865. It was known as Red Flag Act. It needed one man to run before the car with red flag so that other cars knew that a vehicle was coming. Likewise, several other Rules were introduced to make the road safe and keep accident away.

A wheel is a circular component that is intended to rotate on an axle bearing. The wheel is one of the key components of the wheel and the axle is one of the six simple machines. Wheels, in conjunction with axles, allow heavy objects to be moved easily facilitating movement or transportation while
supporting a load, or performing labor in machines. Wheels are also used for other purposes, such as a ship's wheel, steering wheel, potter's wheel and flywheel.

Common examples are found in transport applications. A wheel greatly reduces friction by facilitating motion by rolling together with the use of axles. In order for wheels to rotate, a moment needs to be applied to the wheel about its axis, either by way of gravity or by the application of another external force or torque.

The invention of the wheel falls into the late Neolithic, and may be seen in conjunction with other technological advances that gave rise to the early Bronze Age. Note that this implies the passage of several wheel-less millennia even after the invention of agriculture and of pottery, during the Aceramic Neolithic (9500–6500 BC).

- 4500–3300 BC: Chalcolithic, invention of the potter's wheel; earliest wooden wheels (disks with a hole for the axle); earliest wheeled vehicles, domestication of the horse
- 3300–2200 BC: Early Bronze Age
- 2200–1550 BC: Middle Bronze Age, invention of the spooked wheel and the chariot
- The Halaf culture of 6500–5100 BC is sometimes credited with the earliest depiction of a wheeled vehicle, but this is doubtful as there is no evidence of Halafians using either wheeled vehicles or even pottery wheels.
- Precursors of wheels, known as "tournettes" or "slow wheels", were known in the Middle East by the 5th millennium BC (one of the earliest examples was discovered at Tepe Pardis, Iran, and dated to 5200–4700 BC). These were made of stone or clay and secured to the ground with a peg in the center, but required significant effort to turn. True (freely-spinning) potter's wheels were apparently in use in Mesopotamia by 3500 BC and possibly as early as 4000 BC, and the oldest surviving example, which was found in Ur (modern day Iraq), dates to approximately 3100 BC.
• The first evidence of wheeled vehicles appears in the second half of the 4th millennium BC, near-simultaneously in Mesopotamia (Sumerian civilization), the Northern Caucasus (Maykop culture) and Central Europe (Cucuteni-Trypillian culture), so the question of which culture originally invented the wheeled vehicle is still unsolved.

• The earliest well-dated depiction of a wheeled vehicle (here a wagon — four wheels, two axles) is on the Bronocice pot, a c. 3500 – 3350 BC clay pot excavated in a Funnelbeaker culture settlement in southern Poland.

• The oldest securely dated real wheel-axle combination, that from Stare Gmajne near Ljubljana in Slovenia (Ljubljana Marshes Wooden Wheel) is now dated within two standard deviations to 3340–3030 BC, the axle to 3360–3045 BC.

• Two types of early Neolithic European wheel and axle are known; a circumalpine type of wagon construction (the wheel and axle rotate together, as in Ljubljana Marshes Wheel), and that of the Baden culture in Hungary (axle does not rotate). They both are dated to c. 3200–3000 BC.

• In China, the wheel was certainly present with the adoption of the chariot in c. 1200 BC, although Barbieri-Low argues for earlier Chinese wheeled vehicles, c. 2000 BC.

• In Britain, a large wooden wheel, measuring about 1 m (3.3 ft) in diameter, was uncovered at the Must Farm site in East Anglia in 2016. The specimen, dating from 1,100–800 years BC, represents the most complete and earliest of its type found in Britain. The wheel's hub is also present. A horse's spine found nearby suggests the wheel may have been part of a horse-drawn cart. The wheel was found in a settlement built on stilts over wetland, indicating that the settlement had some sort of link to dry land.

• Although they did not develop the wheel proper, the Olmec and certain other American cultures seem to have approached it, as wheel-like worked stones have been found on objects identified as children's toys dating to
about 1500 BC. It is thought that the primary obstacle to large-scale development of the wheel in the Americas was the absence of domesticated large animals which could be used to pull wheeled carriages. The closest relative of cattle present in Americas in pre-Columbian times, the American Bison, is difficult to domesticate and was never domesticated by Native Americans; several horse species existed until about 12,000 years ago, but ultimately became extinct. The only large animal that was domesticated in the Western hemisphere, the llama, did not spread far beyond the Andes by the time of the arrival of Columbus.

- Nubians from after about 400 BC used wheels for spinning pottery and as water wheels. It is thought that Nubian waterwheels may have been ox-driven. It is also known that Nubians used horse-drawn chariots imported from Egypt.

The wheel was barely used, with the exception of Ethiopia and Somalia, in Sub-Saharan Africa well into the 19th century but this changed with the arrival of the Europeans.

A vehicle (from Latin: *vehiculum*) is a mobile machine that transports people or cargo. Typical vehicles include wagons, bicycles, motor vehicles (motorcycles, cars, trucks, buses), railed vehicles (trains, trams), watercraft (ships, boats), aircraft and spacecraft.

Land vehicles are classified broadly by what is used to apply steering and drive forces against the ground: wheeled, tracked, railed or skied. ISO 3833-1977 is the standard, also internationally used in legislation, for road vehicles types, terms and definitions.

- The oldest boats found by archaeological excavation are logboats, with the oldest logboat found, the Pesse canoe found in a bog in the Netherlands, being carbon dated to 8040 - 7510 BC, making it 9,500–10,000 years old.
- A 7,000-year-old seagoing boat made from reeds and tar has been found in Kuwait.
Boats were used between 4000 -3000 BC in Sumer, ancient Egypt and in the Indian Ocean.

There is evidence of camel pulled wheeled vehicles about 4000–3000 BC.

The earliest evidence of a wagon way, a predecessor of the railway, found so far was the 6 to 8.5 km (4 to 5 mi) long Diolkos wagonway, which transported boats across the Isthmus of Corinth in Greece since around 600 BC. Wheeled vehicles pulled by men and animals ran in grooves in limestone, which provided the track element, preventing the wagons from leaving the intended route.

In 200 CE, Ma Jun built a south-pointing chariot, a vehicle with an early form of guidance system.

Railways began reappearing in Europe after the Dark Ages. The earliest known record of a railway in Europe from this period is a stained-glass window in the Minster of Freiburg in Breisgau dating from around 1350.

In 1515, Cardinal Matthäus Lang wrote a description of the Reisszug, a funicular railway at the Hohensalzburg Castle in Austria. The line originally used wooden rails and a hemp haulage rope and was operated by human or animal power, through a treadwheel.

1769 Nicolas-Joseph Cugnot is often credited with building the first self-propelled mechanical vehicle or automobile in 1769.

In Russia, in the 1780s, Ivan Kulibin developed a human-pedalled, three-wheeled carriage with modern features such as a flywheel, brake, gear box and bearings; however, it was not developed further.

1783 Montgolfier brother's first balloon vehicle came out.

1801 Richard Trevithick built and demonstrated his Puffing Devil road locomotive, which many believe was the first demonstration of a steam-powered road vehicle, though it could not maintain sufficient steam pressure for long periods and was of little practical use.
1817 Push bikes, draisines or hobby horses were the first human means of transport to make use of the two-wheeler principle, the draisine (or Laufmaschine, "running machine"), invented by the German Baron Karl von Drais, is regarded as the forerunner of the modern bicycle (and motorcycle). It was introduced by Drais to the public in Mannheim in summer 1817.

CURRENT SCENARIO OF REGISTERED MOTOR VEHICLE IN INDIA

The Vehicle population has been steadily increasing with the pace picking up significantly since the Eighties of the for various century. Increase in vehicle population in the face of the limited road space used by a large variety of motorized and non-motorized traffic heightened the need and agency towards road safety. Therefore, there is an urgent need of road safety engineer experts in the country who have the necessary expertise and infrastructure to advice on technical issue relating to road safety in various fields such as road engineering, vehicle engineering data collection and accident investigation, human resource, capacity building and trauma care to improve the road safe activities in the country.

There has been a continuous increase in the number of registered motor vehicles in India since 1951. The total number of registered motor vehicles increased from about 0.3 million in March, 1951 to 230.03 million as on 31st March, 2016. The total registered vehicles in the country grew at a Compound Annual Growth Rate (CAGR) of 9.9 per cent between 2006 and 2016. A graphic representation of the total number of all registered motor vehicles in India since 1951 to 2016.

The share of two wheelers in total registered motor vehicles in India stood at 73.5% in 2016 as compared to 8.8% in 1951. Concomitantly, the combined share of cars, jeeps and taxis in the total number of registered vehicles was 13.1% in March 2016, marking a steep decline from 52% in 1951.

The share of buses in total registered vehicles declined from 11.1% during the period 31st March 1951 to 0.8% for the period up to 31st March 2016.
buses were also included in the fleet of buses from 2001. The number of registered goods vehicles in the country, which had accounted for 26.8% in 1951 decreased to 4.6% of the total vehicles by 2016. The share of ‘Other vehicles’, which include tractors, trailers, three wheelers (passenger)/Light Motor Vehicles (LMVs) and other miscellaneous vehicles, increased from 1.3% in 1951 to 8.1% during 2015-16. 

<table>
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<th>Two Wheelers</th>
<th>Cars, Jeeps &amp; Taxis</th>
<th>Buses@</th>
<th>Goods Vehicle</th>
<th>Other Vehicle</th>
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<td>(as percentage of total vehicle population till 31th March)</td>
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<td>72.2</td>
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<td>1.1</td>
<td>4.9</td>
<td>8.8</td>
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<td>2007</td>
<td>71.5</td>
<td>13.1</td>
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<td>71.5</td>
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<td>1.4</td>
<td>5.3</td>
<td>8.6</td>
<td>105.3</td>
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<td>2009</td>
<td>71.7</td>
<td>13.3</td>
<td>1.3</td>
<td>5.3</td>
<td>8.4</td>
<td>115.0</td>
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<tr>
<td>2010</td>
<td>71.7</td>
<td>13.5</td>
<td>1.2</td>
<td>5.0</td>
<td>8.6</td>
<td>127.7</td>
</tr>
<tr>
<td>2011</td>
<td>71.8</td>
<td>13.6</td>
<td>1.1</td>
<td>5.0</td>
<td>8.5</td>
<td>141.8</td>
</tr>
<tr>
<td>2012</td>
<td>72.4</td>
<td>13.5</td>
<td>1.0</td>
<td>4.8</td>
<td>8.3</td>
<td>159.5</td>
</tr>
<tr>
<td>2013</td>
<td>72.7</td>
<td>13.6</td>
<td>1.0</td>
<td>4.7</td>
<td>8.0</td>
<td>176.0</td>
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<tr>
<td>2014</td>
<td>73.1</td>
<td>13.6</td>
<td>1.0</td>
<td>4.6</td>
<td>7.7</td>
<td>190.7</td>
</tr>
<tr>
<td>2015</td>
<td>73.5</td>
<td>13.6</td>
<td>1.0</td>
<td>4.4</td>
<td>7.5</td>
<td>210.0</td>
</tr>
<tr>
<td>2016</td>
<td>73.5</td>
<td>13.1</td>
<td>0.8</td>
<td>4.6</td>
<td>8.1</td>
<td>230.0</td>
</tr>
</tbody>
</table>

12 Road Transport Year Book, 2015-16, Ministry of Road Transport and Highway, Govt. of India.
AUTOMOBILE HISTORY

Our Country could achieve 90 per cent target of road safety by commitment and good planning for building and maintaining necessary infrastructure allowing citizens to enjoy quality of life with case safety and citizen may be achieved by designing automatic systems with least human intervening.

Automobiles history dates Back to 1770 when a French man, Nicholas Cugnot, built what is generally agreed to be the first road vehicle propelled by its own power.

The present-day automobile dates from about 1880 when German and French efforts to develop an internal-combustion engine began. Gottlieb Daimler patented an internal-combustion engine in Germany built a tricycle propelled by an internal-combustion engine in 1885.

Before 1895, both Charles E. Daryeaand and Elwood J. Haynes had experimental automobile in America. Pen Hard and Lavassor in France developed a car.

It was in 1900 that Design improvements awakened the public that this new form of transportation was really practical for use. As with every new venture, there was at first some opposition to the popularity of cars. The August 1902 issue of Minneapolis Journal reported how a Minnesotan driving a car was shot in the back by a local person opposed to the auto. The form magazine, Breeder’s Gazette, in its issue dated August 24, 1904 described the new owners of cars as “A reckless, bloodthirsty, villainous lot of purse-proud crazy trespassers”. It was in such a context that Henry Ford wrote in the Automobile Magazine in January 1906; “The greatest need today is a light, low-priced car with an up-to-date engine of ample horsepower and built of the very best material—one that is in every way an automobile and not a toy”.

Master draftsman, Joseph Galamb, recalled in his Reminiscences what Henry Ford had said to him. “I” have got an idea to design a new car Joe. Fix a place for yourself on the third floor, way back, and a special room, Get your board up there and a blackboard and we’ll start working on a new model”.

19
The experimental Room grew more and more crowded as sketches turned into blue prints for the parts until. As a resourceful designer and machinist by 15 feet, big enough to get a small car in, milling machines, drill presses and lathes” Heanry Ford insisted that automobiles had until then been built too heavy. Design simplicity and newer materials could reduce the weight of a car. In January 1908, word leaked out about a remarkable new vehicle that would be made by Henry Ford. In early 1908, forty workers assembled the car at Ford’s Piquette Avenue factory.

Archie Terrell was one of the first to test drive the car and he returned exhilarated. “That is a wonderful car”, he gushed. Orders flooded into Piquette up for full production.

In March 1908 the company sent an introductory brochure to its dealers about the plan to “Shortly produce a four cylinder, 20 horsepower, five passengers touring car” for a shockingly low price of $850. Cars were sold for $2500 at that time. Production and sale of vehicles became a business. In 1908 Ford started off his model ‘T’ with an initial run of 20,000 vehicles, an output unheard of at that time.

Since the early twenties, major improvements have been in every car feature, but basic changes have occurred in only a few instance. The major idea in the designers mind has been to produce a vehicle which will function at all time under all conditions with increasingly comfortable to ride in and easy to operate.

The early 1920’s saw the beginning of a period of gradual change and refinement in automobile design. By that time it was clear that the spark-ignition engine was to be the power plant of the modern motor vehicle. The sliding-gear transmission had established itself as predominant. Water-cooled engines were almost universal. The poppet value was used in almost every engine design. Engines were all located in the front of the chasis.

The early cars consisted of a chasis in which an engine to furnish power for movement was incorporated. A place for the driver was provided as a necessary after thought. Sometime he had little more than a box to sit on. Early
improvement designed to make riding not merely possible, but pleasant as well, followed carriage-building tradition made bodies which were fitted to the chassis as best they might be.

Gradually condition changed Chassis and engine reliability came to be normal expectancy and in passenger cars, car owners demanded greater riding comfort.

The whole history of automobile design emphasizes a knowledge of basic principle as the unifying link between the past, present, and future.

Design trends of recent years have provided the owner with cars that are safe, easier to drive, more reliable and more comfortable.

**1.1.3 History of Safety**

Road traffic safety refers to the methods and measures used to prevent road users from being killed or seriously injured. Typical road users include pedestrians, cyclists, motorists, vehicle passengers, and passengers of on-road public transport.

The basic strategy of a Safe System approach is to ensure that in the event of a crash, the impact energies remain below the threshold likely to produce either death or serious injury. This threshold will vary from crash scenario to crash scenario, depending upon the level of protection offered to the road users involved. For example, the chances of survival for an unprotected pedestrian hit by a vehicle diminish rapidly at speeds greater than 30 km/h, whereas for a properly restrained motor vehicle occupant the critical impact speed is 50 km/h (for side impact crashes) and 70 km/h (for head-on crashes).

As sustainable solutions for all classes of road have not been identified, particularly low-traffic rural and remote roads, a hierarchy of control should be applied, similar to classifications used to improve occupational safety and health. At the highest level is sustainable prevention of serious injury and death crashes, with sustainable requiring all key result areas to be considered. At the second level is real time risk reduction, which involves providing users at severe risk with a specific warning to enable them to take mitigating action. The third level is about reducing the crash risk which involves applying the road design standards and guidelines (such as from AASHTO), improving driver behavior and enforcement.
Road traffic crashes are one of the world’s largest public health and injury prevention problems. The problem is all the more acute because the victims are overwhelmingly healthy before their crashes. According to the World Health Organization (WHO), more than 1 million people are killed on the world’s roads each year. A report published by the WHO in 2004 estimated that some 1.2 million people were killed and 50 million injured in traffic collisions on the roads around the world each year and was the leading cause of death among children 10–19 years of age. The report also noted that the problem was most severe in developing countries and that simple prevention measures could halve the number of deaths.

The standard measures used in assessing road safety interventions are fatalities and killed or seriously injured (KSI) rates, usually per billion (109) passenger kilometres. Countries caught in the old road safety paradigm, replace KSI rates with crash rates — for example, crashes per million vehicle miles. Interventions are generally much easier to identify in the modern road safety paradigm, whose focus is on the human tolerances for serious injury and death. For example, the elimination of head-on KSI crashes simply required the installation of an appropriate median crash barrier. Also, roundabouts, often with speed reducing approaches, encounter very few KSI crashes.

The old road safety paradigm of purely crash risk is a far more complex matter. Contributing factors to highway crashes may be related to the driver (such as driver error, illness, or fatigue), the vehicle (brake, steering, or throttle failures), or the road itself (lack of sight distance, poor roadside clear zones, etc.). Interventions may seek to reduce or compensate for these factors, or reduce the severity of crashes. A comprehensive outline of interventions areas can be seen in management systems for road safety. In addition to management systems, which apply predominantly to networks in built-up areas, another class of interventions relates to the design of roadway networks for new districts. Such interventions explore the configurations of a network that will inherently reduce the probability of collisions.

Interventions for the prevention of road traffic injuries are often evaluated; the Cochrane Library has published a wide variety of reviews of interventions for the prevention of road traffic injuries. For road traffic safety purposes it can be
helpful to classify roads into three usages: built-up urban streets with slower speeds, greater densities, and more diversity among road users; non built-up rural roads with higher speeds; and major highways (motorways / Interstates / freeways/Autobahns, etc.) reserved for motor-vehicles, and which are often designed to minimize and attenuate crashes. Most injuries occur on urban streets but most fatalities on rural roads, while motorways are the safest in relation to distance traveled. For example, in 2013, German autobahns carried 31% of motorized road traffic (in travel-kilometres) while accounting for 13% of Germany's traffic deaths. The autobahn fatality rate of 1.9 deaths per billion-travel-kilometres compared favorably with the 4.7 rate on urban streets and 6.6 rate on rural roads.

1.2 ROAD SAFETY SCENARIO

The Road Safety Scenario in India is a matter of grave concern. Our country has the highest number of road accidents and fatalities in the country. Which have also become a major public health care and news to be addressed on holistic changes.

Today, Road Safety is a complex issue of concern, considering its magnitude and gravity and the negative impacts on the economy, public health and the general welfare of the people. Although various road safety improved programs are being implemented, even then number of road accidents and fatalities continue to rise. The Government of India has been focusing on AE's is :

(i) Education.
(ii) Enforcement.
(iii) Engineering, and
(iv) Environment and Emergency Care of Road accident Victims in order to prevent road accident and fatalities.

One must try to avoid aggressive critical and bullying or scowling attitude with others on the roads. Instead while on roads, one must be kind and have integrity, humility and generosity. During 2016, a total of 4,80,652 road accidents were reported by all the States /Union Territories. Of these 1,36,071 (28.3 per cent) were fatal accidents. The number of persons killed in road accidents were 1,50,785 i.e an average of one fatality per 3.2 accidents. The total number of
persons injured in road accidents were 4,94,624. State wise distribution of number of road accidents, number of persons killed and injured in road accidents and number of fatal accidents. Distribution of number of accidents amongst all States/U.Ts is depicted. The analysis of road accident data 2016 reveals that on an average 1317 accidents and 413 deaths take place every day on Indian roads which further translates into 55 accidents and loss of 17 lives every hour in our country.

Road accident severity measured by the number of persons killed per 100 accident has become more severe in 2016 over the previous years. Though the total number of road accidents has been lower in 2016 than the previous eight years, the number of persons killed has seen sharply increased in 2016 over 2015. Road accidents being the result of inter-play of multiple factors, multi-prong measures are needed to reduce the number of accidents and fatalities. The Ministry has formulated road safety strategy based on 4-Es, namely Education, Engineering (of both roads and vehicles), Enforcement and Emergency care. The strategy is under implementation and substantial progress has been made towards putting in place necessary resources, programmes and legislation for improving road safety scenario in the country.
MAIN FINDINGS OF ‘ROAD ACCIDENTS IN INDIA – 2016’

- Road Accidents and Fatalities in India 2015 /2016

<table>
<thead>
<tr>
<th>Parameter</th>
<th>2015</th>
<th>2016</th>
<th>Increase/decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Accidents</td>
<td>5,01,423</td>
<td>4,80,652</td>
<td>-4.1%</td>
</tr>
<tr>
<td>Fatal accidents</td>
<td>1,31,726</td>
<td>1,36,071</td>
<td>+3.3%</td>
</tr>
<tr>
<td>Persons Killed</td>
<td>1,46,133</td>
<td>1,50,785</td>
<td>+3.2%</td>
</tr>
<tr>
<td>Persons Injured</td>
<td>5,00,279</td>
<td>4,94,624</td>
<td>-1.1%</td>
</tr>
</tbody>
</table>

From year 2015 to 2016, there is decrease in Road Accidents with 4.1%(4,80,652), decrease in injured Persons by 1.1% (4,94,624) and slightly increase in fatalities by 3.2% (1,50,785).

In Every Day: 1317 Accidents and 413 Persons killed in 2016.

In Every hour: 55 Accidents and 17 Persons killed in 2016.

- Age Group of Victims of Road Accidents

<table>
<thead>
<tr>
<th>Age Group</th>
<th>% Share of Fatality</th>
<th>Persons Killed</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-34 year</td>
<td>46.3%</td>
<td>69,851</td>
</tr>
<tr>
<td>18-45 Year</td>
<td>68.6%</td>
<td>1,03,409</td>
</tr>
<tr>
<td>18-60 Year</td>
<td>83.3%</td>
<td>1,25,583</td>
</tr>
</tbody>
</table>

Age profile of road accident reveals that youth of 18 - 35 years accounted for 46.3 % (69,851), Age 18-45 year share of 68.6% (1,03,409) & working age group of 18-60 year share of 83.3 % (1,25,583) in total road accident fatalities.

- Road Accidents on NHs/SHs

<table>
<thead>
<tr>
<th>Type of Roads</th>
<th>Accidents</th>
<th>Person Killed</th>
<th>Person Injured</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH</td>
<td>29.6%</td>
<td>34.5%</td>
<td>29.6%</td>
</tr>
<tr>
<td>SH</td>
<td>25.3%</td>
<td>27.9%</td>
<td>25.8%</td>
</tr>
<tr>
<td>Other Roads</td>
<td>45.1%</td>
<td>37.6%</td>
<td>44.6%</td>
</tr>
</tbody>
</table>

The NHs constitute 2 % of total road network, but they accounted for 29.6 % of total road accidents & 34.5 %, of total number of persons killed. As compared to the previous year i.e, 2015 road accident has gone up on NHs from 28.4 % to 29.6 % in 2016. The SHs accounted for 25.3 % of total accidents and 27.9 % of the total number of persons killed in road accident in 2016.
• **More Than 83% of Road Accident & Fatalities by 13 States**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Accident</th>
<th>Killed</th>
</tr>
</thead>
<tbody>
<tr>
<td>States</td>
<td>Tamil Nadu, Madhya Pradesh, Karnataka, Maharashtra, Kerala, Uttar Pradesh, Andhra Pradesh, Rajasthan, Telangana, Gujarat, Chhattisgarh, West Bengal, Haryana.</td>
<td>Uttar Pradesh, Tamil Nadu, Maharashtra, Karnataka, Rajasthan, Madhya Pradesh, Andhra Pradesh, Gujarat, Telangana, West Bengal, Punjab, Haryana, Bihar.</td>
</tr>
<tr>
<td>% Share</td>
<td>86.5%</td>
<td>83.7%</td>
</tr>
<tr>
<td>1st Rank</td>
<td>Tamil Nadu (14.9%)</td>
<td>Uttar Pradesh (12.8%)</td>
</tr>
<tr>
<td>2nd Rank</td>
<td>Madhya Pradesh (11.2%)</td>
<td>Tamil Nadu (11.4%)</td>
</tr>
<tr>
<td>3rd Rank</td>
<td>Karnataka (9.2%)</td>
<td>Maharashtra (8.6%)</td>
</tr>
</tbody>
</table>

The top 13 States account for more than 86% road accidents and persons injured & 84% killed in road accidents. Tamil Nadu topped the No of road accidents in the entire country with % share of 14.9% followed by Madhya Pradesh (11.2%) and Karnataka (9.2%). In case of road accident deaths, Uttar Pradesh topped the list with 12.8% followed by Tamil Nadu (11.4%) and Maharashtra (8.6%).

• **Different Causes of Road Accidents and Road Fatalities**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Accident</th>
<th>Killed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>%</td>
</tr>
<tr>
<td>Alcohol/Drugs</td>
<td>14,894</td>
<td>3.7%</td>
</tr>
<tr>
<td>Mobile Phone</td>
<td>4,976</td>
<td>1%</td>
</tr>
<tr>
<td>Overloaded Vehicle</td>
<td>61,325</td>
<td>12.8%</td>
</tr>
<tr>
<td>Hit &amp; Run Cases</td>
<td>55,942</td>
<td>11.6%</td>
</tr>
<tr>
<td>Head on Collision</td>
<td>96,466</td>
<td>20.1%</td>
</tr>
<tr>
<td>Over speeding</td>
<td>3,33,446</td>
<td>66.5%</td>
</tr>
<tr>
<td>Overtaking</td>
<td>36,604</td>
<td>7.3%</td>
</tr>
</tbody>
</table>

3.7% of Road accidents & 5.1% fatalities due to Alcohol/Drugs, 1% of Road accidents & 1.5% fatalities due to Mobile Phone, 12.8% of Road accidents & 14.1% fatalities due to Overloaded Vehicle, 11.6% of Road accidents & 15.2% fatalities due to Hit & Run, 66.5% of Road accidents & 61.0% fatalities due to Over Speeding.
• **Road Accidents without to Helmet and Seat Belts**
  - No of Accidents occurred by two wheelers due to non-wearing Helmet
    10,135 out of total 52,500 two Wheelers is 19.3%
  - 5638 Accidents occurred due to non-wearing Seat Belt

• **Due to Driver’s fault Accident, Fatalities & Injury**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Accidents %</th>
<th>Fatalities</th>
<th>Injury %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Due to Driver’s fault</td>
<td>84%</td>
<td>80.3%</td>
<td>83.9%</td>
</tr>
</tbody>
</table>

Due to Driver’s fault Accident Occurred 84%, Fatalities 80.3% & Injury 83.9%

• **Road Accidents Due to vehicle Categories**

<table>
<thead>
<tr>
<th>Category of Vehicle</th>
<th>Two-Wheelers</th>
<th>Car/JEEP /Taxi</th>
<th>Truck/Tempo /Tractor/Articulated Vehicle</th>
<th>Buses</th>
<th>Auto Rickshaws</th>
<th>Other Vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of Total Accident</td>
<td>33.8%</td>
<td>23.6%</td>
<td>21.0%</td>
<td>7.8%</td>
<td>6.5%</td>
<td>2.8%</td>
</tr>
</tbody>
</table>

The Share of two wheelers in total road accidents has increased from 28.8 % in 2015 to 33.8% in 2016

• **Responsible Factor For Road Accidents and Fatalities**

<table>
<thead>
<tr>
<th>Faults</th>
<th>Accidents</th>
<th>Killed</th>
<th>Injured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver of motor vehicle</td>
<td>4,03,598(84.0)</td>
<td>1,21,126 (80.3)</td>
<td>4,14,785 (83.9)</td>
</tr>
<tr>
<td>Driver of non-motorized</td>
<td>6,546 (1.4)</td>
<td>2,250 (1.5)</td>
<td>7,620 (1.5)</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>8,298 (1.7)</td>
<td>3,091 (2.0)</td>
<td>7,465 (1.5)</td>
</tr>
<tr>
<td>Passenger</td>
<td>5,200 (1.1)</td>
<td>2,181 (1.4)</td>
<td>4,535 (0.9)</td>
</tr>
<tr>
<td>Mechanical Defect</td>
<td>6,688 (1.4)</td>
<td>2,823 (1.9)</td>
<td>6,956 (1.4)</td>
</tr>
<tr>
<td>Road Engineering</td>
<td>1,289 (0.3)</td>
<td>589 (0.4)</td>
<td>1,217 (0.2)</td>
</tr>
<tr>
<td>Road Condition</td>
<td>7,158 (1.5)</td>
<td>2,983 (2.0)</td>
<td>6,579 (1.3)</td>
</tr>
<tr>
<td>Stray Animal</td>
<td>1,604 (0.3)</td>
<td>629 (0.5)</td>
<td>1,307 (0.3)</td>
</tr>
<tr>
<td>Poor light condition</td>
<td>3,833 (0.8)</td>
<td>1,631 (1.1)</td>
<td>4,477 (1.0)</td>
</tr>
<tr>
<td>Other causes</td>
<td>20,858 (4.3)</td>
<td>7,312 (4.8)</td>
<td>23,380 (4.7)</td>
</tr>
<tr>
<td>Causes not known</td>
<td>15,580 (3.2)</td>
<td>6,170 (4.1)</td>
<td>16,303 (3.3)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4,80,652</td>
<td>1,50,785</td>
<td>4,94,624</td>
</tr>
</tbody>
</table>
Due to Driver’s Fault 84% Accidents and 80.3% Fatalities occurred in 2016.

Due to Pedestrian Fault 1.7% Accidents and 2% Fatalities occurred in 2016.

Due to Passenger Fault 1.1% Accidents and 1.4% Fatalities occurred in 2016.

Due to Road Engineering Fault 0.3% Accidents and 0.4% Fatalities occurred in 2016.

Due to Mechanical Fault of Vehicle 1.4% Accidents and 1.9% Fatalities occurred in 2016.

**Most Vulnerable Road Users killed in 2016**

<table>
<thead>
<tr>
<th>Category of Road Users</th>
<th>Two-wheelers</th>
<th>Pedestrians</th>
<th>Bicycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Share of Total Killed</td>
<td>34.8%</td>
<td>10.5%</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

- 34.8% Two-wheelers, 10.5% Pedestrian and 1.7% Bicycles total 47% vulnerable Road users killed in 2016

**Percentage share of Road Accidents, Fatalities in 50 Million Plus City**

<table>
<thead>
<tr>
<th>City</th>
<th>Mumbai</th>
<th>Kolkata</th>
<th>Indore</th>
<th>Bangalore</th>
<th>Delhi</th>
<th>Chennai</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of Road Accidents</td>
<td>3379</td>
<td>4104</td>
<td>5143</td>
<td>5323</td>
<td>7325</td>
<td>7486</td>
</tr>
<tr>
<td>Rank</td>
<td>6th</td>
<td>5th</td>
<td>4th</td>
<td>3rd</td>
<td>2nd</td>
<td>1st</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Road Accidents</th>
<th>Fatalities</th>
<th>Injured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of 50 Million Plus Cities</td>
<td>18.7%</td>
<td>11.8%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Highest No</td>
<td>Chennai(7486)</td>
<td>Delhi(1591)</td>
<td>Chennai(7349)</td>
</tr>
</tbody>
</table>
50 Million-Plus Cities accounted for 18.7% in total road accidents in the country, 11.8% in total persons killed in road accidents and 16.7% in total persons injured in road accidents. Chennai had the highest number of road accidents (7,486) while Delhi had the highest number of deaths (1,591) due to road accidents.

- **Road Accident Occurred at Junctions in 2016**
  - 73% of total Road Accidents occurred at uncontrolled Junctions.
  - 37% of total Road Accidents at Junctions.

- **Road Accidents occurred due to Speed Breakers and Pot-holes**
  
<table>
<thead>
<tr>
<th>Parameters</th>
<th>Accidents</th>
<th>Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed breakers</td>
<td>9,583</td>
<td>3,396</td>
</tr>
<tr>
<td>pot-holes</td>
<td>6,424</td>
<td>2,324</td>
</tr>
</tbody>
</table>

6,424 Road Accidents and 2,324 fatalities occurred due to Pot-holes and 9,583 Accidents and 3,396 fatalities occurred due to Speed breakers in 2016.

- **Lane wise Road Accidents Occurred on Road in 2016**
  
<table>
<thead>
<tr>
<th>Lane Wise Road Category</th>
<th>Single Lane</th>
<th>Two Lane</th>
<th>Four Lane</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of Road Accidents</td>
<td>1,77,067</td>
<td>1,90,800</td>
<td>67,179</td>
</tr>
</tbody>
</table>

Maximum No of Road Accidents occurred on Two Lane Road (1,90,800) in which more accidents (35,290) occurred on without median Two Lane Road in 2016.

- **Highest no of Road Accidents occurred in Month and Period in 2016**
  
<table>
<thead>
<tr>
<th>Parameters</th>
<th>Month</th>
<th>Period of Day/Night</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>March</td>
<td>15:00 to 18:00</td>
</tr>
<tr>
<td>Accidents</td>
<td>42,843</td>
<td>89,755</td>
</tr>
<tr>
<td>% of Total Accidents</td>
<td>8.9%</td>
<td>17.9%</td>
</tr>
</tbody>
</table>

Maximum no of Accidents (43,368) occurred in the Month of May and 17.9% of total Accidents Occurred between time period of 15:00 to 18:00.
### STATE-WISE COMPARATIVE STUDY OF ROAD ACCIDENT / FATALITIES IN YEAR 2016 / 2017

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Andhara Pradesh</td>
<td>23726</td>
<td>22461</td>
<td>-1265</td>
</tr>
<tr>
<td>2</td>
<td>Arunachal Pradesh</td>
<td>249</td>
<td>221</td>
<td>-28</td>
</tr>
<tr>
<td>3</td>
<td>Assam</td>
<td>7453</td>
<td>7339</td>
<td>-114</td>
</tr>
<tr>
<td>4</td>
<td>Bihar</td>
<td>8222</td>
<td>8855</td>
<td>-631</td>
</tr>
<tr>
<td>5</td>
<td>Chhattisgarh</td>
<td>13580</td>
<td>13513</td>
<td>67</td>
</tr>
<tr>
<td>6</td>
<td>Goa</td>
<td>4304</td>
<td>3917</td>
<td>-387</td>
</tr>
<tr>
<td>7</td>
<td>Gujarat</td>
<td>21859</td>
<td>19081</td>
<td>-2778</td>
</tr>
<tr>
<td>8</td>
<td>Haryana</td>
<td>11234</td>
<td>11258</td>
<td>24</td>
</tr>
<tr>
<td>9</td>
<td>Himachal Pradesh</td>
<td>3168</td>
<td>3105</td>
<td>-63</td>
</tr>
<tr>
<td>10</td>
<td>Jammu &amp; Kashmir</td>
<td>5501</td>
<td>5629</td>
<td>128</td>
</tr>
<tr>
<td>11</td>
<td>Jharkhand</td>
<td>4932</td>
<td>4560</td>
<td>-372</td>
</tr>
<tr>
<td>12</td>
<td>Karnataka</td>
<td>44403</td>
<td>42542</td>
<td>-1861</td>
</tr>
<tr>
<td>13</td>
<td>Kerala</td>
<td>39420</td>
<td>33486</td>
<td>-5934</td>
</tr>
<tr>
<td>14</td>
<td>Madhya Pradesh</td>
<td>53972</td>
<td>53180</td>
<td>-792</td>
</tr>
<tr>
<td>15</td>
<td>Maharashtra</td>
<td>39878</td>
<td>35839</td>
<td>-4039</td>
</tr>
<tr>
<td>16</td>
<td>Manipur</td>
<td>538</td>
<td>578</td>
<td>40</td>
</tr>
<tr>
<td>17</td>
<td>Meghalaya</td>
<td>620</td>
<td>675</td>
<td>55</td>
</tr>
<tr>
<td>18</td>
<td>Mizoram</td>
<td>83</td>
<td>68</td>
<td>-15</td>
</tr>
<tr>
<td>19</td>
<td>Nagaland</td>
<td>736</td>
<td>696</td>
<td>-40</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
<td>----------------</td>
<td>----------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total number of Road Accidents</td>
<td>Persons Killed</td>
<td>Persons Injured</td>
</tr>
<tr>
<td>20</td>
<td>Odisha</td>
<td>10532</td>
<td>4463</td>
<td>11312</td>
</tr>
<tr>
<td>21</td>
<td>Punjab</td>
<td>6952</td>
<td>5077</td>
<td>4351</td>
</tr>
<tr>
<td>22</td>
<td>Rajasthan</td>
<td>23066</td>
<td>10465</td>
<td>24103</td>
</tr>
<tr>
<td>23</td>
<td>Sikkim</td>
<td>210</td>
<td>85</td>
<td>356</td>
</tr>
<tr>
<td>24</td>
<td>Tamil Nadu</td>
<td>71431</td>
<td>17218</td>
<td>82163</td>
</tr>
<tr>
<td>25</td>
<td>Telangana</td>
<td>22811</td>
<td>7219</td>
<td>24217</td>
</tr>
<tr>
<td>26</td>
<td>Tripura</td>
<td>557</td>
<td>173</td>
<td>853</td>
</tr>
<tr>
<td>27</td>
<td>Uttarakhand</td>
<td>1591</td>
<td>962</td>
<td>1736</td>
</tr>
<tr>
<td>28</td>
<td>UP</td>
<td>35612</td>
<td>19320</td>
<td>25096</td>
</tr>
<tr>
<td>29</td>
<td>West Bengal</td>
<td>17670</td>
<td>6944</td>
<td>14915</td>
</tr>
<tr>
<td>30</td>
<td>A &amp; N Islands</td>
<td>238</td>
<td>17</td>
<td>323</td>
</tr>
<tr>
<td>31</td>
<td>Chandigarh</td>
<td>428</td>
<td>151</td>
<td>329</td>
</tr>
<tr>
<td>32</td>
<td>D &amp; N Haveli</td>
<td>70</td>
<td>45</td>
<td>100</td>
</tr>
<tr>
<td>33</td>
<td>Daman &amp; Diu</td>
<td>428</td>
<td>151</td>
<td>329</td>
</tr>
<tr>
<td>34</td>
<td>Delhi</td>
<td>7375</td>
<td>1591</td>
<td>7154</td>
</tr>
<tr>
<td>35</td>
<td>Lakshadweep</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>36</td>
<td>Puducherry</td>
<td>1767</td>
<td>226</td>
<td>1994</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>484189</td>
<td>151235</td>
<td>485650</td>
</tr>
</tbody>
</table>

**Source:** Ministry of Road Transport and Highways and Hon'ble Supreme Court Committee on Road Safety.
State-wise comparative Road Accidents and Fatalities in 2017 Year with Comparison to Year 2016 shows only Eight States or Union territories increase fatalities number. The following table shows the data of 2017 increase number of fatalities:

<table>
<thead>
<tr>
<th>S. No</th>
<th>States/UTs</th>
<th>2017 Accident</th>
<th>2017 Fatalities</th>
<th>% Accident</th>
<th>% Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>A &amp; N Islands</td>
<td>189</td>
<td>21</td>
<td>-20.6</td>
<td>23.53</td>
</tr>
<tr>
<td>2.</td>
<td>Bihar</td>
<td>8855</td>
<td>5429</td>
<td>7.7</td>
<td>10.77</td>
</tr>
<tr>
<td>3.</td>
<td>Odisha</td>
<td>10855</td>
<td>4790</td>
<td>3.07</td>
<td>7.33</td>
</tr>
<tr>
<td>4.</td>
<td>Nagaland</td>
<td>696</td>
<td>63</td>
<td>828</td>
<td>6.78</td>
</tr>
<tr>
<td>5.</td>
<td>Chhattisgarh</td>
<td>13513</td>
<td>4107</td>
<td>-0.49</td>
<td>5.09</td>
</tr>
<tr>
<td>6.</td>
<td>Uttar Pradesh</td>
<td>38811</td>
<td>20142</td>
<td>8.98</td>
<td>4.25</td>
</tr>
<tr>
<td>7.</td>
<td>Madhya Pradesh</td>
<td>53180</td>
<td>9959</td>
<td>-1.47</td>
<td>3.24</td>
</tr>
<tr>
<td>8.</td>
<td>Haryana</td>
<td>11258</td>
<td>5120</td>
<td>0.21</td>
<td>1.91</td>
</tr>
</tbody>
</table>

STATE-WISE ANALYSIS OF ROAD SAFETY INCIDENTS, STATUS ON THE 6E’S

Road Fatalities

India accounts for the highest number of road deaths in the world annually. The top 15 states that have recorded the highest number of deaths due to road accidents in the years 2015 to 2017 are highlighted below. These states accounted for 87% of all road deaths in the country.

<table>
<thead>
<tr>
<th>S. No</th>
<th>States</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Uttar Pradesh</td>
<td>17,666</td>
<td>19,320</td>
<td>20,142</td>
</tr>
<tr>
<td>2</td>
<td>Tamil Nadu</td>
<td>15,642</td>
<td>17,218</td>
<td>16,157</td>
</tr>
<tr>
<td>3</td>
<td>Maharashtra</td>
<td>13,212</td>
<td>12,935</td>
<td>12,215</td>
</tr>
<tr>
<td>4</td>
<td>Karnataka</td>
<td>10,856</td>
<td>11,133</td>
<td>10,609</td>
</tr>
<tr>
<td>5</td>
<td>Rajasthan</td>
<td>10,510</td>
<td>10,465</td>
<td>10,444</td>
</tr>
<tr>
<td>6</td>
<td>Madhya Pradesh</td>
<td>9,314</td>
<td>9,646</td>
<td>9,959</td>
</tr>
<tr>
<td>7</td>
<td>Andhra Pradesh</td>
<td>8,297</td>
<td>8,541</td>
<td>8,041</td>
</tr>
<tr>
<td>8</td>
<td>Gujarat</td>
<td>8,119</td>
<td>8,136</td>
<td>7,289</td>
</tr>
<tr>
<td>9</td>
<td>Telangana</td>
<td>7,110</td>
<td>7,219</td>
<td>6,595</td>
</tr>
<tr>
<td>10</td>
<td>West Bengal</td>
<td>6,234</td>
<td>6,544</td>
<td>5,953</td>
</tr>
<tr>
<td>11</td>
<td>Bihar</td>
<td>5,421</td>
<td>5,077</td>
<td>5,429</td>
</tr>
<tr>
<td>12</td>
<td>Punjab</td>
<td>4,893</td>
<td>5,024</td>
<td>4,278</td>
</tr>
<tr>
<td>13</td>
<td>Haryana</td>
<td>4,879</td>
<td>4,901</td>
<td>5,120</td>
</tr>
<tr>
<td>14</td>
<td>Kerala</td>
<td>4,196</td>
<td>4,287</td>
<td>4,061</td>
</tr>
<tr>
<td>15</td>
<td>Chhattisgarh</td>
<td>4,082</td>
<td>3,908</td>
<td>4,107</td>
</tr>
</tbody>
</table>

Source: International Road Federation Study, 2016
These states have been analyzed to study the trend of road accidents, road deaths and injuries along with the existing institutional mechanism to tackle road safety. Institutional mechanisms that have been reviewed are:

- Presence of Road Safety Council and District Road Safety Committee
- Formulation of Road Safety Policy at State level
- Capacity Building Exercises undertaken for various stakeholders
- Training Programs on Road Safety

Along with this, the road safety engineering measures undertaken, law enforcement initiatives, efficiency of emergency response systems have been highlighted.

Regular Sharing of photos and videos about road safety is the good reach and engagement of Regular coverage of live events also spread awareness. The social media platforms such as Twitter, Instagram Facebook and youtube can promote road safety awareness.

Our aim to promote road safety should be on national and regional level, mainly focusing on major states and cities where in maximum number of accidents take place. Monitoring committees should be set up in all the states to take supervision and meetings periodically with all stakeholder and visits to in identifies sites.

1.3 HYPOTHESIS

1. Law enforcement is the joint responsibility of Transport Department and Police but unfortunately in India Transport Department is more involved in revenue oriented work and police is overburdened to maintain the law and order. Hence both departments seldom offer their best towards road safety.

2. Enforcement is not comprehensive and transparent in India. Lack of proper resources and man power is the major hurdle. Even the departments lack proper skilled personnel for road safety issues.
Enforcement is limited to urban areas and there is no measure to control traffic in rural and suburb areas.

Scientific data collection method is required to study the actual cause of road fatalities.

A central database for road crashes can help in scientific research and analysis that can help in preventing further road crashes.

Enhanced road safety education at each level is required including schools and colleges.

There is no concept of Road Safety Audits in India hence road are becoming deadlier.

Road Safety Law should work in order to bring coordination and transparency between different government departments.

Road user behavior must be analyzed and related work should be done in this area.

Licensing, Registration and Permit system are not up to date which results in ambiguous documentation therefore it doesn’t help in tracking the history of the vehicle and the person. A unified licensing and registration system is the need of the hour.

Highway safety, vehicle standard, road standards are not yet made and fulfilled.

1.4 REVIEW OF LITERATURE

The review undertaken was a standard literature review. Part of the study is to consider briefly whether any of the topics would be suitable for a meta-analysis. The intention was to undertake a meta-analysis of findings where this would provide additional value to the study, either because the effect of an intervention was unclear, or because it was of particular value to Traffic rules and safety.
REIVEW OF BOOKS


This book is helpful for my concept of 6'E’s one of them enforcement is an important part for road safety. India is not using these methodology to solve accident problems. America is using the fundamant known as reconstruction.


The World Report sets out available country data on deaths and injuries from road crashes. It also presents projected future country losses worldwide, if systematic and large-scale measures are not urgently taken to prevent them. Globally these deaths and injuries already create unacceptable public health, economic and social development losses. Every year more than 1 million people are killed and up to 50 million more injured or disabled on the world’s roads.

Road Safety: A Book of Reading, Central for Road Safety, Central Institution Road Transport.

This book was published by central institute of road transport, Pune, for the betterment of Road Safety and Road Technologies including solving problem of training and education. This book denotes that Indians need driving simulators and training manuals. There are 48 articles related to road safety specially dealing with 3 'E's concepts.

Road Safety Scenario in Uttar Pradesh A Case Study (2001), Ashish Mishra and Ch. Hanumantha Rao, published by Centre for Road Safety Central Institute of Road Transport, Pune.

This report analyzes that Uttar Pradesh State has reported a substantial increase in the number of accident and the number of fatalities, giving rise to
grave concern regarding road safety. It is a fact that effective road safety policies can be implemented with the active coordination among the Traffic Police, Transport Department and the Public Works Department. It is observed from the research that the growth in fatal accident during 1996-99 was sixteen percent of national highway followed by ten percent on state highway and thirteen percent. Uttar Pradesh ranked the seventh highest in the total number of road accidents in the country during 2013. Uttar Pradesh State is ranked as first state share in total number of person killed in road accident. Total number of sharing is 11.7 percent.

**Road accident in India (2014) Published by Transport Research Wing, Ministry of Road Transport and Highways, Government of India, New Delhi.**

The report shows that the total number of road accident increased marginally from 4,86,476 in 2013 to 4,89,400 in 2014. The total number of persons killed also increased by about 1.5 per cent from 1,37,572 in 2013 to 1,39,671 in 2014. However road accident injuries have marginally reduced from 4,94,893 in 2013 to 4,93,474 in 2014. An analysis of road accident data of 2014 revealed that on a average about 56 accidents take place and 16 lives are lost every hour in India.


Administrative Reforms Committee, submitted Report for the betterment of road safety and the reported number was 16 in august 2012. The committee introduced briefly to lead agency of road safety department of transport, objects framework, responsibilities, administrative structure, including, issues and challenges. The report focused on registration, licenses, fitness, permit, Pollution by vehicle and the departmental procedure how to reduce number of road accident and necessity of states / districts road safety council the structure-constitution administrative structure, powers, road safety authority; The training and education of transportation in states and miscellaneous provisions for huge development in traffic control regulation and law.
Accident Analysis of Selected Indian Cities / States / Corridors (2002), published by Centre for Road Safety Central Institute of Road Transport, Pune.

Another book published by Central Institute of Road Transport collected and Edited by various authors mainly Ashish Mishra and Arup Khan, N. Ramasaamy, Sanjay Kumar Singh and many more. This book is a case study of accident analysis in various cities, states and corridor like Mumbai, Bangalore, Uttar Pradesh, Chennai, Lucknow, Patna and Hilly Regions (Sikkim north east in India) and corridor including national highway 5 (Andhra Pradesh), National Highway No. 8 (Specially Maharashtra). Accident investigations of Punjab Roadways Bus and Salem (Tamil Nadu).


To protect environment from pollution this book is helpful for a scenario in future. Today the recreation of fuel is impossible, but we have time to find out the alternative options. This book suggest some of fuels like hydrogen as a freedom fuel, Compress Natural Gas (CNG), Coal to Liquid (CTL) Gas to liquid (GTL), Biomass to Liquid (BTL), Wood Gas, Eco Friendly Plastic Fuel and some of future alternative technology. Future alternative fuels are pulverized mental fuel (PMF), Ammonia Liquid Nitrogen, Boron, Compressed Air, Water and Sun. The Fifth "E" concept is related to environment and the future fuel is suggested by the same book.


The present status of the Transport Department came into existence in July, 1974. State Government had set up a task force to re-organise the Transport department in December, 1972 According to the recommendations of the task force, the post of Transport Commissioner was created as head of the Department. The work related with the registration of vehicles, issuing of driving licences and permits, fitness of vehicles, deposition and recovery of Motor
Vehicle Tax and enforcement of Motor Vehicle Act and Rules is being done by the reorganized Transport Department since July, 1974.


This engineering book is so friendly for understand the fundamentals of automobile. One of my concepts regarding my research is "E" (The 6"E") engineering (Vehicle Engineering). Manufacturing of a Vehicle is also a part which is more important for a safe road use. We can avoid more accident by using safety devices at the time of manufacturing, more safer and efficient smart vehicles is a demand of time. This book is very helpful to understand the basic structural engineering for safe and efficient vehicles. Basically this book belongs from engineering side but as I recommend vehicle engineering for road safety purpose so the fundaments of automobile will helpful for my research.

The Karnataka Motor Vehicles inspector's association, Bangalore, "Guidance for drivers" for drivers (2009) This book gives the syllabus for the various tests conducted by the department and should be used full all concerned the difficult situation faced on the road and remedial and precautionary measures are given in the succeeding chapters, and will be useful even for experienced drivers.

Road Safety Auditors (12th to 16 July, 2010) International Road Federation (India) and Australian Road Research Board, Central Road Research Institute, New Delhi

A certificate course organized by central road research institute which is conducted by international road federation India and Australian Road, Research Board. I found this book during that certificate course. This book is providing matter relating to auditing of roads. Auditing of Road is a new concepts for India. There are two types of audits first is for new road which is complexly road safety audit includes feasibility stage, draft design, complete design stage, construction stage, Pre opening to Public. Second audit is for existing roads through international road safety auditors, they are certifying by this same course. The auditor will audit existing roads, fly over, junction and black sports (Accidental prone Zone).

Basically this book is a complete guide for European union which clears the union, the economy, agriculture, education, social policies, environment etc. but chapter 26 of part third is a guide line of transport in European Union. Which gives a complete knowledge about speed transport, regulations, roads, road safety, road crossing and transport infrastructure which is helpful for a comparative study.

Book on road safety signage and signs (2015), published by Ministry of Road Transport and Highways, Government of India.

Ministry of Road Transport and Highways, Government of India published this book every year for all Indian citizens. In this book there are some road safety tips for pedestrians, cyclists, two wheeler riders and LMV and HMV and Government Policies and Initiative on Road Safety. This is to insure people about their safety. Basically this book is complete guide for road users so book this is important from my research point of view.


This book is related infrastructure, especially transport, has always played a key role in the growth and the development of nations. We are now in the second phase of globalization.

Prof. M. Naganathan, "Tamil Nadu Economy : Urban and Rural Divide

Urban phenomenon is as ancient as our civilization dating back to third century B.C. The people of Indus civilization had lived in cities and towns with well connected sewerage system and road network. Now the archaeological evidence confirms that this civilization undoubtedly belonged to dravidians. The indigenous system built by our ancestors equally lost its significance and its cultural and environmental legacy due to the invasion and onslaught of various conquerors in the subsequent periods in the Indian sub-continent.
P. Anbalagan, "Non-Motorized Transport in India"

Transportation is one of the basic requirements for the development of the society. Invention of wheel stimulated the expansion of modern society. Specialization and modernization in the transportation network lead to advancement in social and economic development. Hence, it is an integral part of our social, political and economic development, which contributes immensely to our personal well-being and to the society in general.

A.M.UMA Swaminathan, "Parking and Pricing in Residential Localities in Mumbai- A case Study of Kole-Kalyan Village"

Parking as an issue, has started gaining greater importance with increase in consumer demand for new cars and with lack of sufficient infrastructure for parking in the cities. The congestion in traffic due to illegal parking in several streets/roads have made authorities/ academicians/activists, organize workshops and think on measures to be taken to improve the parking system all through the cities. One such workshop organized by the Mumbai transformation support Unit. MTSU (2008) in Mumbai has come out with suggestions relating to pricing for parking on streets/roads along with methods of arriving at these prices.

L. Clement Baskar, "Factors Influencing the Demand for Transport Services with reference to Chennai (Tamil Nadu)"

Economic growth and spatial development are quite often governed by the quality and quantity of infrastructure provided. While inadequate transport facilities causes congestion, delays and hazards resulting in significant socioeconomic costs to the society, an oversupply, apart from being uneconomical, often acts as counter to the long-term spatial development strategies of settlements and regions. Supplying and maintaining an optimal level of infrastructure is the key to planned development.

Duraipandi Mavoothu, "Inter-City Infrastructure Achievements : The Lessons for Intra-City Infrastructure Programmes"

For most developing countries, the 21st century will mark the transition from a primarily rural to a mainly urban economy (Manmohan Singh, 2009). Projections have been made that the pace of urbanisation would go up in the next
few decades which would double Asia's urban population during 2000-30, its share in global urban population going up from 48 per cent to 54 per cent (Amitabh Kundu, 2009).

**Vehicular Pollution and Traffic Congestion in Chennai City =- Problems and Suggested Remedies**

Environmental pollution is a serious issue in both industrialized and developing countries. Of all types of environmental pollution, the one that is most visible in our day to day lives is the pollution caused by vehicular emissions.

➢ **REVIEW OF JOURNALS**

**Indian Journal of Transport Management (2006) published by Central Institute of Road Transport, ISSN No. 0972-5695, Vol. 30.**

This book have includes total six articles related to transport, transport policies and transport data. Author Shiv Agarwal, Shiv Prasad Yadav and S.P. Singh, Wrote article on a data envelopment analysis based efficiency assessment of public transport sector of Uttar Pradesh State in India.

**ITE Journal (2015) published by Institute of Transportation Engineers ISSN No.0162-8178, Vol. 85.**

This monthly journal is published by institute of transportation engineers, Washington, USA. Helpful for enhance knowledge of road safety word wide. ITE journals is return by transportation engenderers planners and other responsible for the safe and efficient movement for people and goods. Monthly involvement of Road Vehicles Technologies, New Road User Rules and applied sciences Highway research information, environment.

**European Journal of Transport and infrastructure research (2015), 15 (2) ISSN No. 1567-7133.**

Proactive Evaluation of traffic signs using a traffic sign simulator written by Tom Brijs and Kris Brijs in this paper presents the traffic science innovative research tool to study the influence of these elements on road user's routing decisions.

This journal involves sixteenth articles related to digital risks used of internet for passengers, GIS and GPS applications and computerized in states transport undertakings.


This journal involves fifth articles related to regulation regarding roads traffic management driver licensing regulatory reforms in goods transports sector a case and reformative prospects for environment protection.


This journal involves nine articles related to fuels cell technologies, CNG experience of Delhi, Bus Body Designing and assessment of accuracy of automatic traffic countries under mix traffic condition.


This journal involves fifth articles related to Vehicle detection technology for intelligent main and dummy signal system, Computerized Parking and role of intelligent transport system in road safety.


This two days national conference held at Goa sponsored by ministry of road transport and highway government of India and Co-sponsored by department for transport United Kingdom. There were five themes of different concepts and more than 32 participants with different thoughts like driving training need and scope, systems and methods of training, training and assessment of trainers, cost of training and last the Indian Scenario and Future.
An article return by Nilima Chakrabarty and Ors. "A Pilot Study on Driving Performance and Crash Characteristics under Simulated Indian Traffic Condition". In this paper a details study of driver their vigilant mind and sound health, alertness proper decision making, faster reactions which can help in reduction of road accidents.

Author Geetanjali Singh denote Traffic Congestion Detection and Management Using Vehicular Ad-Hoc Networks which is developing thing intelligence transportation system (ITS). The road traffic congestion are recurring problem in India. One of the major reasons that lead to traffic congestion is the poor infrastructure and attitude of road users in India.

The main focus of the conference was on the Role of Education in Road Safety and present Status of Road Safety and Future Challenges.

➢ REVIEW OF DECISIONS

Paramjit Bhasin and Ors. vs. Union of India and Ors. AIR, 2005 Writ Petition (Civil) No. 136 of 2003.

Decided by honorable justice Arijit Pasayat and Justice C.K. Thakker. It was directed union of India and States Punjba, Hariyana, Gujrat, Madhya Pradesh, Rajasthan, Maharashtra, Karnataka and Uttar Pradesh. The decision was related to section 113, 114 alongwith 194 of Motor Vehicle Act 1988, Overloading is a crime and every person helping in overloading whether owner (factory, mines, etc.) transporter, Vehicle owner and drivers all responsible for the same crime. Goods will be offloaded at cost of transporter and the state government will permit only when offloading of excess weight.
Cases decided by honorable justice Mr. Justice J.R. Midha, it was observed in this case that the victims of the road accident are doubly unfortunate, first in getting involved in an accident and second, in not getting compensation and the helpless victims are compelled to approach the Motor Accident Claims Tribunal, where the cases processed like normal civil suits and it takes years to adjudicate the matter. Most of victims of road accident are from lowest strata of the society and are solved bread winners having large family. The legal represented for deceased have no knowledge of investment and savings. It was directed to claims tribunals that it shall fix a date for reporting compliance in the award itself and Scheme for protection of the award amount.


Case was decided by honorable justice Mr. Ranjan Gogoi and Honorable justice Rohinton Fali Nariman. It was decided in this case that a person who is helping injured person by an accident never be disturb socially or any other manner. It was directed to both of ministries the road transport and ministry and low and justice in conclusion with consultation with each other, to issue necessary directions with regard to the protection of good Samaritans until appropriate legislation is made by the union legislature.

S. Rajaseekaran v.s union of india & ors. Writ petition (civil) no. 295 of 2012

The petitioner is a leading orthopaedic surgeon of the country and the Chairman and Head of the Department of Orthopaedic Surgery in the Ganga Hospital at Coimbatore. He was/is also the President of the Indian Orthopaedic Association, the largest professional body of orthopaedic surgeons in the country. In the course of his professional duties spanning over several decades the petitioner, while rendering professional service to victims of road accidents, has come to realise that the large number of accidents that occur every day on the Indian roads, causing loss of human lives besides loss of limbs and other injuries.
resulting in human tragedies, are wholly avoidable. In the light of the experience gained and propelled by a desire to render service beyond the call of duty, the petitioner has filed this writ petition under Article 32 of the Constitution seeking the Court’s intervention, primarily, in the matter of enforcement of the prevailing laws and also seeking directions for enactment of what the petitioner considers to be more appropriate legislative measures and for more affirmative administrative action. The petitioner also seeks directions from the Court for upliftment of the existing infrastructure and facilities with regard to post-accident care and management to minimize loss of life and physical injuries to victims of road accidents.

**REVIEW OF REPORT**


The global status report on road safety 2013 presents information on road safety from 182 countries, accounting for almost 99% of the world’s population.

Report on the Volvo bus Ap02-ta0963 road accident on 30/10/2013 at Palem, Mahaboobnagar district of Andhrapradesh report presented by Government of Karnataka Transport Department

The All India Tourist bus bearing number AP02TA0963 belonging to Diwakar Road Lines represented by Smt. J.C. Uma Reddy, started its journey from Bangalore to Hyderabad at about 10:30 PM with 44 passengers along with one driver and one attendant (Passengers list in Annexure-I) and enroute the driver picked up additional passengers.

A theoretical approach to assess road safety campaigns, Evidence from seven European countries, (2009), published by Belgian Road Safety Institute (BIVV-IBSR)

This Report is divided in ten chapters and road by more than twelve authors is to presents the result from seven different campaign conduced within
the cast project. The campaign was carried out in seven different countries (Austria, Belgium, Greece, The Netherland, Poland, Slovenia and Sweden). The theoretical framework used to evaluate campaigns was an extended and sometimes modified version of the theory of planned behavior.

Chees Van Goverden, Piet Rietveld, Jorine, Koelemeijer, Paul Peeters (2006), "Subsidies in Public transport" European Transport

This report is basically related to European transport but it will be helpful in my research, because in such cases we are follower of European law. The pricing of public transport may range from charging the full price to supplying it for free. The present situation in most European countries is between the two extremes implying a partial cost recovery. In this paper we will explore both extremes on the axis of cost recovery: free public transport, and public transport without subsidies.


Public transport case known concept for India but free public transport is must be introduced for the purpose of the safety and environment production. This report is helpful regarding the concept of the free public transport.

Road Accident in India 2013, Government Of India Ministry Of Road Transport & Highways Transport Research Wing New Delhi

Road safety is an issue of national concern, considering its magnitude and gravity and the consequent negative impacts on the economy, public health and the general welfare of the people. Today, Road Traffic Injuries are one of the leading causes of deaths, disabilities and hospitalizations, with severe socioeconomic costs, across the world. The United Nations has rightly proclaimed 2011-20 as the decade of action on road safety so that the present rising trend of road accident stabilizes and is reversed by the year 2020.
➢ REVIEW OF STATUTES

- The Constitution of India

States are entitled to established laws related to taxation of motor vehicles, because according to state legislative under entry 57 of List II of the Seventh Schedule to the Constitution of India the states are powered to collect taxes. This is the main reason for lack of union legislation relating to unified registration and licensing system.

- Central Motor Vehicle Act 1988

Statement of objects and Reasons. - The motor vehicles Act, 1939 (4 of 1939), consolidates and amends the law relating to motor vehicles. This has been amended several times to keep it up to date.

- Central Motor Vehicle Rules 1989
- The Rules of the Road Regulation 1989
- Rajasthan Motor vehicle rules 1990
- National Road Safety Policy

REVIEW OF FOREIGN LAW

1. The Transport Act 2000, UK.

2. Motor Vehicle and Highway Safety Improvement Act Of 2012 USA.


4. Hazardous materials transportation safety Improvement act of 2012 USA


1.5 RESEARCH METHODOLOGY

➢ DOCTRINAL

My research from doctrinal side involves such reach libraries from India and abroad. Following libraries are helpful to collect many journals, books and many ideas related to my subject:

- Library of Transportation Research Institute, Hasselt University, Belgium, 2010.
- Library of Central Road Research Institute, Delhi, 2011.
- Library of Intelligence Transport System in 18th word Congress of Road Safety, Orlando Florida, 2011.
- Library of Central Institutes of Road Transport, Pune (CIRT), 2012.
- Library of Collision Forensic Solution, Omaha, Nebraska, USA, 2012.
- Library of Engineering Staff College of India, Hyderabad, 2014.
- Library of All India Federation of Motor Vehicles Department Technical Executive Officer's Association.
- Road Safety Cell, Transport Department, Govt. of Rajasthan.
- Transport research wing and Road Safety Cell, Ministry of Road Transport and Highways Govt. of India.
- Publication Cell of Society of Indian Automobile Manufacturers (SIAM), New Delhi.
- Library of Automotive Research Association of India (ARAI), Pune.
- Library of Institute of Driving Training and Research, (IDTR), Railmagra, Dist. Rajsamand.
- Library of Faculty of Law, MLSU, Udaipur.
- Library of Center For Road Safety, Sardar Patel, University of Police Safety and Criminal Justice, Jodhpur.
- Library of IL&FS Automated Drivers Training, Testing and Skill Institute, Ajmer.
- Library of Institute Road Traffic Education (IRTE), Faridabad.
- Library of Road Transport and Planning Cell Indian Institute of Technology (IIT), Delhi.
- Library of Rajasthan Police Academy, Jaipur.

➢ NON DOCTRINAL

Field Work

- Visited and Observed: Transportation Museum, Zurich, Switzerland.
- Data collection through Road Safety Education and Awareness, Camps in various Places of Rajasthan.
- Practical Training of Road Safety Auditor by International Road Federation and Austrian Road Research Board at Central Road Research Institute (CRRI), Delhi.
- Practical Training through Scientific Investigation of Road Crash, Omaha, Nebraska (USA).
- Practical Training through Driver Diagnostics : Performance Evolution and Training, conducted by Central Road Research Institute (CRRI), New Delhi.
QUESTIONNAIRE

Questionnaire made circulated to various people related to road used, education and safety.

- Students, Researchers.
- Road Safety Law Enforcement Officers.
- Vehicle Manufacturers and Dealer.
- Automobile Engineers and Road Engineers.
- Vehicle Insurance Surveyor
- Advocates and Doctors.
- Different road users (Motorize and Non Motorize).
- Driving License and Fitness Issuing Officers.
- IT and ITS experts
- Vehicle testing agency officers.
- Media and Wessel Blowers.
- Professors and Bureaucrats.
- NGO's and working groups.

INTERVIEW

- Honourable Union Minister Mr. Rajnath Singh Ministry of Home Affairs, Government of India.
- Mr. Nitin Gadkari, Union Minister (Minister of Road Transport and Highways Govt. of India, New Delhi).
- Mr. Yunus Khan, Transport and PWD Minister, Government of Rajasthan.
- Dr. C.P. Joshi Former Union Minister (Minister of Road Transport and Highways Govt. of India, New Delhi).
- Smt. Kirti Saxena, Senior Advisor Transport Research Wing, Ministry of Road Transport and Highways, Government of India.
• Shri Mansukh L. Mandviya, Minister of States for Transport Minister, Ministry of Road Transport and Highways Government of India.

• Dr. Tanu Jain Additional Director General (Health Services) Minister of Health and Family welfare Government of India.

• Dr. Gaurav Gupta, India Public Health Specialist, WHO, New Delhi.

• Shri Gangafal Additional Transport Commissioner (Road Safety) Transport Department, Government of Uttar Pradesh.

• Shri Chandrashekhar Rao Insurance Regulatory and Development Authority of India, New Delhi.

• Shri P.S. Anand Rao, Executive Director Association of State Road Transport Under Trial, New Delhi.

• Shri Rajesh Gupta, Deputy Secretary (Road Safety) Minister of Road Transport and Highways.

• Shri Abhay Damle, Joint Secretary (Transport) Ministry of Road Transport and Highways.

• Shri Sanjay Mitra, Secretary, Ministry of Road Transport and Highways, Government of India.

• Professor I.V. Trivedi Former Vice Chancellor, MLSU, Udaipur.

• Mr. Ashfaq Ahamed, President All India Federation of Motor Vehicles Department Technical Executive Officer's Association, Bangalore (Karnataka).

• Mr. Manoj Bhatt, Ex-Director General of Police Rajasthan and Director, Center for Road Safety, SPUP, Jodhpur.

• Mr. Bhupendra Singh Yadav, ADGP, Police and Pro Vice Chancellor Sardar Patel University of Police, Security and Criminal Justice, Jodhpur.

• Mr. Shivkant, Under Secretary, Road Safety Cell, Ministry of Road Transport and Highway, Government of India.
• Mr. Rajiv Lochan, Ex-Director (Road Safety), Ministry of Road Transport and Highway, Government of India.

• Kol. C.B.S. Rathore, Managing Director, IL&FS Automated Drivers Training, Testing and Skill Institute, Ajmer.

• Mr. Bhaskar Rao, Inspector General Police, Former Transport Commissioner Karnataka.

• Mr. Deepak Upreti, Ex. Commissioner and Principal Secretary Transport Department Government of Rajasthan.

• Honorable Justice Mr. R. S. Rathore (Retd.) Rajasthan High Court.

• Professor K.C. Sodani, Vice Chancellor, MDS University, Ajmer.

• Mr. O.P. Shemar Ex-Director Transport Research Wing, Minister of Road Transport and Highways Govt. of India, New Delhi.

• Mr. Ajay Vikram Singh IAS (Retd.) Ex. Secretary of Ministry of Road Transport and Highways, Government of India.

• Dr. Nishi Mittal, Member Hon'ble Supreme Court Committee, on Road Safety, Vigyan Bhawan, New Delhi.

• Sh. S. D. Banga, Secretary, Hon'ble Supreme Court Appointed Road Safety Committee, Vigyan Bhawan, New Delhi.

• Sh. Sunil K. Chaturvedi, CEO, Automotive Skill Development Council, Agust Kranti Marg, New Delhi.

• Sh. Kaiptain Saner Patil, Director, Central Institute of Road Transport (CIRT), Pune.

• Sh. Prashant Kakade, Course Coordinator, CIRT, Pune.

• Sh. Dattatraya Saste, Technical Consultant (Motor Vehicle Legislation), Ministry of Road Transfer and Highways Govt. of India.

• Dr. Dinesh Vyas, Emergency Expert and First Responder International Master Trainer, USA.
- Sh. Rani Prasad, Chief Engineer (Road Safety), Road Safety Engineering Cell, MoRTH, Govt. of India.
- Sh. Baniborat Mandal, Director B. M. Associate, Road Safety Auditors, Dwarka, New Delhi.
- Sh. Mangilal Verma, Additional Chief Engineer PWD, Udaipur.
- Sh. C. L. Verma, Chief Enggining, PMGSY PWD, Govt. of Rajasthan, Jaipur.
- Smt. Preeti Choudhary, Deputy Superintendent of Police (Traffic), Traffic Police, Ajmer.
- Sh. R. P. Goyal, Superintendent of Police, Udaipur.
- Sh. Pradeep Vyas, ADG (Traffic), Rajasthan Police, Jaipur.
- Sh. Rajeev Agarwal, S. E., World Bank Project (RRSMP), Ph.D. Jaipur.
- Sh. Kumar Vishwajeet, IPS, IG (Traffic), Andhra Pradesh.
- Sh. Rajesh Modak, DIG (Traffic) Lucknow.
- Sh. Rajeev Sharma, ADG (Traffic) Rajasthan Police, Jaipur.
- Sh. Suagat Biswas, Transport Commissioner, Govt. of J. & K.
- Sh. R. S. Raghunath, Retd. Deputy Transport Commissioner, Bangalore.
- Sh. S. Guruprasad, Transport Commissioner, U. P. Lucknow.
- Sh. Sahastra Budhe, Additional Transport Commissioner, Maharastra.
- Sh. Satar Khan, Additional Transport Commissioner (Enforcement), Transport Department, Govt. of Rajasthan.
- Sh. Pawan Arora, Directr, Local Body, Urban Development Department Govt. of Rajasthan.
- Smt. Sunita Singh, Additional Transport Commissioner (Road Safety), Transport Department, Govt. of Uttrakhand.
• Sh. Shiv Singh Sarangdevot Vice Chancellor, JRN, Vidhyapeeth (Deemed to be) University, Udaipur.

• Dr. Lokesh Shekhawat former Vice Chancellor, JRN, University, Jodhpur.

• Sh. H. K. Senapaty, Director, NCERT, New Delhi.

• Prof. Geetam Tiwari, TRIPP, IIT, New Delhi.

• Sh. Mayank Agarwal, Additional Director IIMC, New Delhi.

• Dr. Praveen Kumar, ITS Expert, IIT Roorkee.

• Sh. Amar Srivastava, President India Road Safety Campaign, IIT Delhi.

• Dr. Reepunjaya Singh, Professor OTS, Jaipur.

• Sh. Mahendra Maheshwari, Hon'ble Judge, High Court, Rajasthan.

• Sh. R. S. Rathore, Retired Judge, High Court Rajasthan and Vice Chairman NGT, New Delhi.

• Sh. Mukesh Bhargav, ADJ, (Exam), Rajasthan High Court, Jodhpur.

• Sh. Shakti Singh Shekhawat, ACJM, JDA, Jaipur.

• Sh. Gaurav Agarwal, Advocate, Amicus-curie, Case upto 215/2012 S. Rajseekaran v/s Union of India, Supreme Court of India.

• Sh. Ajit Kumar, Sinha, Sr. Advocate, Supreme Court of India.

• Smt. Rajni Gandhi, Secretary, TRAX, NGO for Road Safety, New Delhi.

• Smt. Prerna Singh Trustee, Pipuls Trust, Jaipur.

• Sh. Anurag Kulshresth President India Alliance for Road Safety NGO, New Delhi.

• Dr. Maya Tondon, Sahayata Trust, Jaipur.

• Dr. Rohit Baluja, President, Institute of Road Traffic Education and Director, College of Traffic Management, Faridabad.

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