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"Guidelines for safer and better roads" - a methodology to incorporate best practices in planning safer road infrastructure in India.

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Abstract - A global report on road safety published by **World Health Organization** in 2015 showcases that 1.25 million people die every year due to road accidents. Almost **91%** of victim on road belong to low income and middle income countries which cater only half of world's vehicles. The report also predicts that by 2020 road accidents will be the 3rd greatest cause of death which will rise from 1.2 to 2 million people annually in the coming years. India's road network is the second largest road network of the world consisting approximately 33 lakh kilometers. Ministry of Road Transport and Highways, Government of India reports the number of deaths due to road traffic crashes was estimated to be 1, 46,133 in 2015. Whereas in 2014 the number of fatalities were 1, 39, 671. The Ministry has further fixed a sanction ceiling of 600 rupees crore for taking up Road Safety works on national highways for the year 2016-17. Considering on the measures already taken by various countries across the globe to cater the issue of road safety, India faces the challenge to strategize and develop better safety practices. To deal with road safety several European countries have already shown examples of successful preventive measures and guidelines. Road safety can be an important aspect in planning process. The research paper aims to address the issue of road safety on national highways in India and develop recommendations for safer roads considering the best practices across the globe which have successfully curve road fatalities.

Keywords - road safety, planning, best practices, fatalities.

INTRODUCTION –

Road safety is an important concern today. A global status report on road safety 2015 by WHO reveal that about 1.25 million people die every year as a result of road accidents and about 91 % of world fatalities on the roads occur in low income and middle income countries where as these countries cater only half of the world's vehicles. In the report WHO predicts that by 2020 road accidents will be the 3rd greatest cause of death which will rise from 1.2 to 2 million people annually.(1) The fact which cannot be denied is that Road accidents are 100 % preventable. The plateau in road traffic deaths ,set against a 4 % increase in global population and 16 % increase in motorization ,suggests that road safety effects over the past 3 years have saved lives. In the last 3 years 17 countries representing 409 million people have amended their laws on one or more key risk factors for the road

traffic injuries to bring them into line with best practices of the world (2). On the 10th may 2010 , the UNO general assembly adopted resolution with which it proclaimed the period 2011-2020 as the decade of action for road safety, with a goal to stabilize and the to reduce the forecast level of road traffic fatalities around the world by increasing activities conducted at the national regional and global levels. According to global status report on road safety 2015 only 34 countries representing 2.1 billion people have helmet law that meet best practices and apply a helmet standard. Vehicles sold in 80% of all the countries worldwide to meet the basic safety standards.(1)

SCENARIO IN INDIA -

In India, the total number of deaths due to road traffic crashes was estimated to be 1,46,133 in 2015 as per Ministry of Road Transport and Highways (MoRTH) accident statistics. There was an increase from 1, 39671 number of fatalities in road accidents in 2014. The analysis of road accident data 2015 reveals that about 1,374 accidents and 400 deaths take place every day on Indian roads which further translates 57 accidents and loss17 lives, on an average, every hour in our country (MoRTH, 2015). However, the compound annual growth rate (CAGR) in respect of number of road accident fatalities increased from 3.7 percent to 4.4 percent during the decade 199-2004 and 2005-2015. The total number of road accidents per lakh population increased in the country from 39.5 in 2014 to 40.0 in 2015. Similarly, the number of persons killed and injured per lakh population also increased from 11.3 to 11.7 percent and 39.8% to 39.9 % respectively, in 2015. This increase in number of persons killed in road accidents in the country delineates the fact that safety measures are neglected.(3)
As per the latest issue of the "World Road Statistics" 2015, brought out by the International Road Federation, Geneva, the highest number of fatalities in road accidents in the world for the year 2013 was reported to be India (1,37,572), followed by United States (32,719) and Russian Federation (27,025) for the same year. Total Number of Road Accidents in India in 2015 are 501423 and total Number of persons killed in India in 2015 are 146133 (World Road Statistics, 2015). National Safety Council of India has declared the Road safety week from 11 January to 17 January in India (NSCI, 2015).(1)

Statistical data of Indian Road Network -

According to National highway Authority India, the total road network of India is 33 lakh kilometers which makes it the second largest road network in the world. It consists of the following when categorized: (3)

Table 1- Length of Road Network in India

LENGTH	NUMBER IN KILOMETERS
Expressways	200
National Highways	96,260.72
State Highways	1,31,899
Major District Roads	4,67,763
Rural and Other Roads	26,50,000
Total Length	**33 Lakhs Kilometers (Approx.)**

According to National Highway Authority of India, the Model shift reveals –

- About 65% of freight and 80% passenger traffic is carried by the roads.(3)
- National Highways constitute only about 1.7% of the road network but carry about 40% of the total road traffic. (3)
- Number of vehicles has been growing at an average pace of 10.16% per annum over the last five years.

Initiatives taken by Government of India (MORTH) –

The Ministry of Road Transport and Highways, Government of India is the body which looks after the development of road networks across the country. It also acts the major administrative body which funds and coordinates with all the States and Union Territories to handle the affairs of road network. To ensure better road safety conditions, Government of India has taken several initiatives, namely:

Road safety week

The Ministry of Road Transport and Highways, Government of India has taken considerable measures to ensure better and safer road network across the country. It has carried our several initiatives to promote safety. The ministry encourages the celebration of ROAD SAFETY WEEK (11-17 January) in India which is organized by the National Safety Council India.(4)
The Ministry of Road Transport and Highways has taken significant measures to full fill India's commitment to reduce road accidents by 50 % by the year 2020. The ministry has set aside rupees 600 crores to enforce road safety measures. The measures include constructing better roads, raising standards for safer vehicles and imparting emergency actions. The ministry plans to set aside at least 1 % of the cost used in any highway project for road safety. The government aims to reduce the number of road accidents by 50 % in the next two to three years according to statistics.

Funds for road safety

Provision has been made of rupees 2, 41,387 crore in 2017-2018 for transportation sector as a whole including rail road & shipping. In road sector, budget allocation for highways increased from 57,976 crore in Budget year 2017-2017 to rupees 64,900 crore in 2017-2018.(5)
The Ministry of Road Transport and Highways is primarily responsible for development and maintenance of National Highways. Apart from this, the Ministry also allocates funds to the State Governments/Union Territories for development of State Roads as per the provisions of the CRF Act, 2000 as amended by the Finance Act from time to time. Decision has been taken recently to earmark ten percent of such funds allocated to the State Governments /UTs for road safety works. The Ministry has fixed a sanction ceiling of rupees 600 crore for taking up Road Safety works on NHs for the year 2016-17.(6)
Further, the Ministry has a budget of about rupees 80 crore for implementing schemes to promote road safety through measures such as awareness campaigns, imparting driving training, etc. It has been decided to take up several items of engineering measures for rectification of identified black spots on NHs and State roads by implementing road safety works such as provision of service roads, improvement of junctions, provision of Foot Over Bridges/Underpasses, taking up of road safety audits and follow up actions thereto, etc.

BEST PRACTICES –

Several developed countries across the globe have considered and taken the issue of road safety as a serious concern. Here are few of the best practices which have shown remarkable results:

1. Case Study: Sweden (Vision Zero)

The roads in Sweden have been gradually changing over the last few years. Investments were made to reduce the risk of serious human injury (Vision Zero):

- The cross sections of around 1000 km of undivided roads in Sweden have been rearranged to cater for two lanes in one direction, a wire rope guardrail in a painted median and a single lane in the opposite direction (2+1 roads).This arrangement is estimated to have reduced head-on collisions by about 90%. Speed limits on the road network have been reviewed to reflect the safety standard of the road. (7)
- It is now unusual to find a road with a speed of 110 km/h without a median barrier. If barriers are not installed, the speed limit is reduced to 80 km/h.
- A 30-km/h speed limit has been established in built-up areas emphasizing that this must be the limit if pedestrians and cyclists are to survive a collision. It has been implemented on a large scale as a result of the application of Vision Zero to urban environments. (7)
- Roundabouts are becoming more common at intersections since the consequences of a collision are less severe than in a normal intersection due to the different angles of impact and lower speeds. Major investments to minimize the damage resulting from cars veering off the road. Guardrails are erected, and trees and boulders are cleared away from roadside areas.

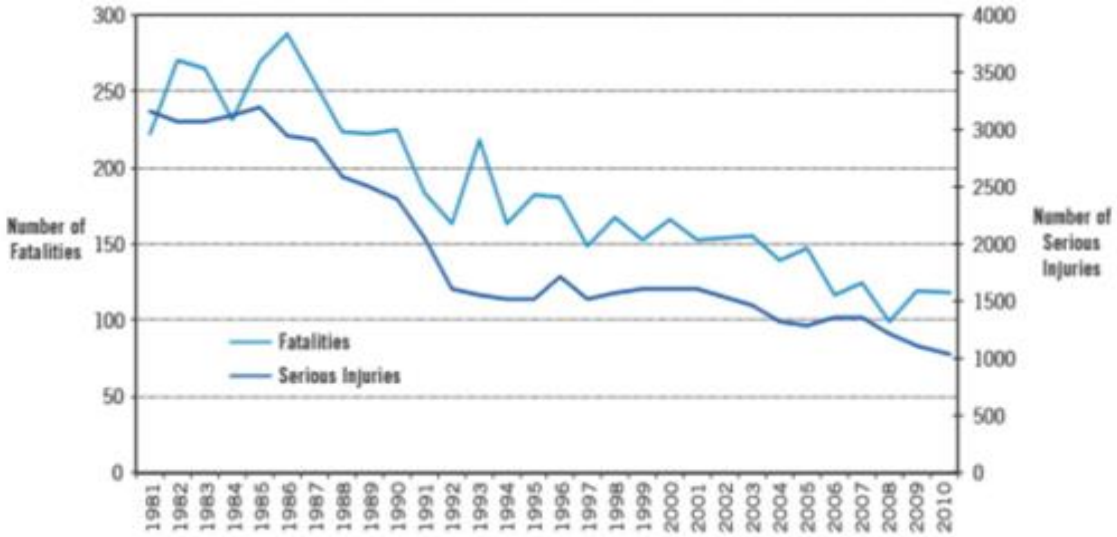

Figure 1 – Trend of Number of fatalities & Number of serious injuries in last 30 years in Sweden.

Source - Swedish Transport Administration (2010) Road Safety: Vision Zero on the move.

2. Case Study: Northern Ireland

Vision -
To make a journey on Northern Ireland's roads as safe for all road users as anywhere in the world.

Targets (2020) -

- Reduction in fatalities up to 60 %.
- Reduction in people seriously injuries up to 45 %.

Focus area -

- Reduce the number of road deaths and serious injuries.
- Improving safety on rural roads.
- Protect young drivers (age range 16-24) and motorcyclists.(8)
- Reducing inappropriate and illegal road user behaviors including speeding, drink and drug driving and careless and dangerous driving.
- Improving knowledge and understanding of, road safety problem.

Measures –

- Consideration of specific needs of vulnerable road users.
- Develop cycling infrastructure.
- Safer roads: Including Speed limit review and traffic calming.
- Improve road environment incl. lines, lighting verges, barriers.
- Exchange knowledge of best practice and carry out research.
- Embed road safety in planning process.
- Promote safer vehicles.
- Adopt the speed limit enforcement guidelines.
- Changes to driver testing.

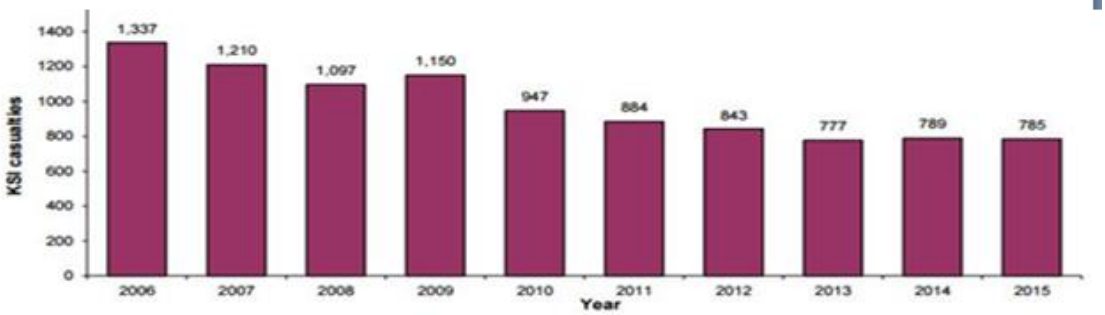

Figure 2- Killed or seriously injured causalities resulting from road traffic collisions in Northern Ireland from 2006 to 2015

Source - Police Recorded Injury Road Traffic Collision Statistics, 2015 Key Statistics Report, Published on 24th March 2016

Progress – The 785 people killed or seriously injured (KSI casualties) on Northern Ireland's roads in 2015 is 365 fewer than that of 2009 and 2,475 fewer than the highest level of 1977 (reductions of 31.8% and 75.9% respectively).(9)

3. Case Study: England Road Safety Action Plan

Vision -
To ensure that Britain remains a world leader on road safety.

Target -

- Total 37%-46% reduction in fatalities
- Total 40%-50% reduction in KSIs

Road Safety Fund (2016-2017) -

Additional funding of £175 million targeted at upgrading some of England's most dangerous local roads where the risk of fatal accidents and serious collisions is highest. (10)

Focus –

Safer vehicles and road engineering.

- Improving knowledge, attitudes and overall behavior as regards to road safety among young people.
- Targeted enforcement: Target serious and/or repeat offenders with heavy sanctions and make more use of remedial education for those making mistakes.

Enforcement -

- Introduce a fixed penalty offence for careless driving.
- Increase penalty fines.
- Withdrawal of statutory option for (blood test) drink drivers.
- Create new drug offence – dealing with specific drugs.
- Enhance power to seize vehicles Technology.
- Enhance road side detection of drink and drugs education.
- Better educational offerings for offenders.
- New post-test qualification knowledge sharing and a new website for the comparison of local performance information.
- Develop a portal for road safety professionals. (11)

Progress towards vision-

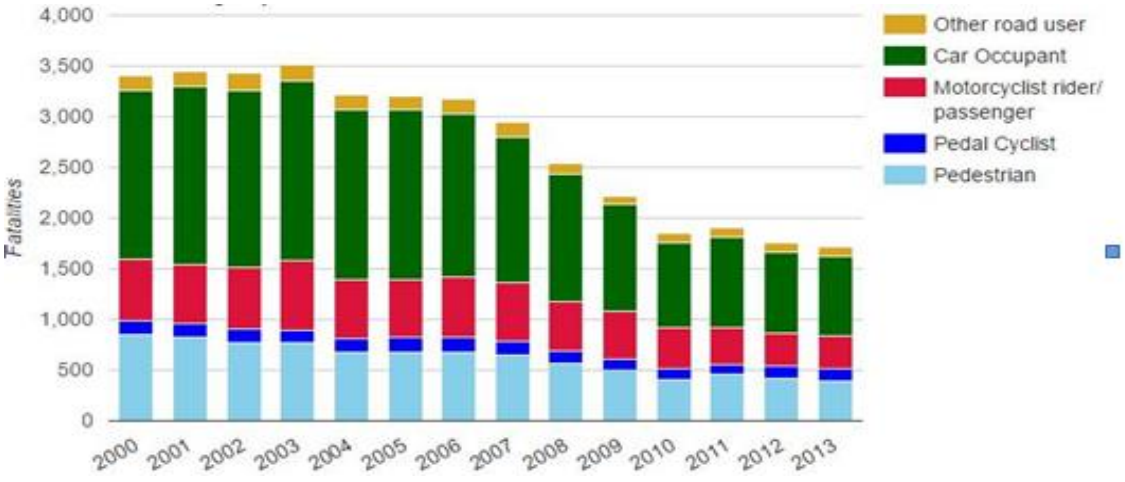

Figure 3 – Number of fatalities resulting from road accidents in Great Britian by road user group 2002 to 2013

Source - Police recorded road casualties in Great Britain, 2014

In the last 10 years there is continuous progress in the road safety sector under the implementation of England road safety action plan. Car occupant category is most venerable category among all the categories.(12)

4. Case Study: Scotland Road Safety Action Plan

Vision -

A steady reduction in the numbers of those killed and those seriously injured, with the ultimate vision of a future where **no-one is killed on Scotland's roads**, and the injury rate is much reduced.

Focus -

- Rural Roads.
- Sharing intelligence and good practice
- Drink Drive.
- Children Seatbelts.
- Drivers aged 17-25.
- Speed limit.

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Budget measures -

- Reduce the drink drive limit.
- Introduce powers for the police to carry out breath testing anytime, anywhere.
- Increase marketing throughout the year.
- Increased enforcement to raise the perceived risk of being caught.
- Promote the use of data enabled roadside breath screening devices by Scottish police forces.
- Raise awareness of the dangers of fatigue among drivers.

Target -

- 40% reduction in KSIs.
- 50% reduction in child KSIs.
- 10% reduction in the slight casualty rate.

Progress towards vision & target -

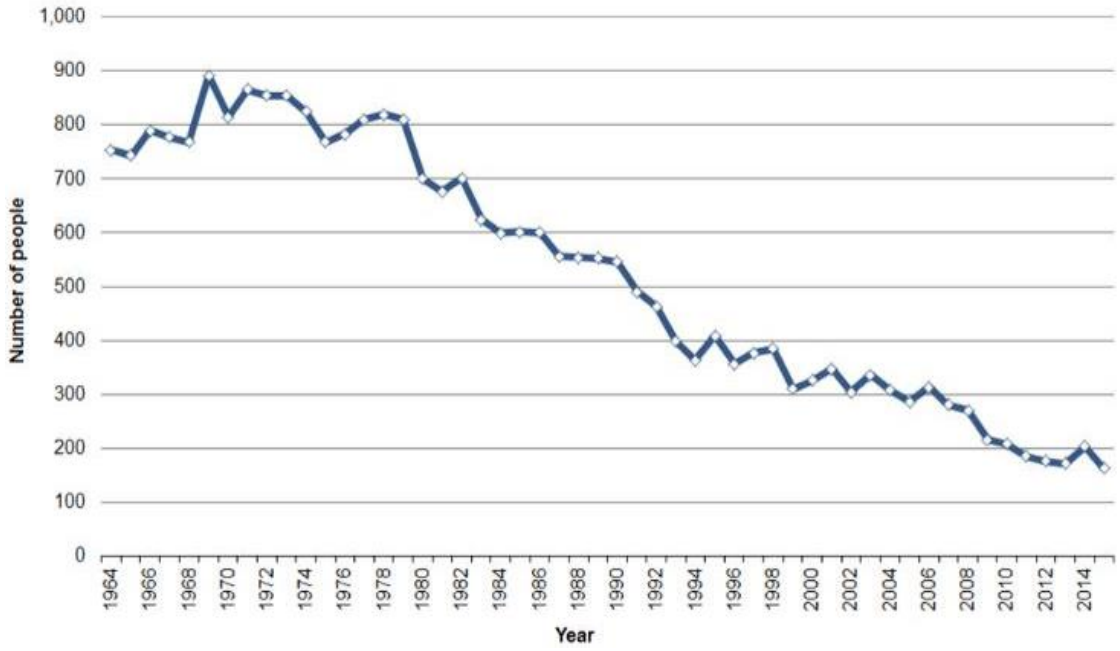

Figure 4 - Trend of number of people killed on Scotland Road in the last 50 years (1964-2014).

Source - Scotland Road Safety Action Plan report, based on data provided by Scotland traffic police.

The number of killed people on Scotland roads is continuously decreasing year by year in 2014 it was recorded below 200 people , where as in 1970 it was around 900 people which shows that there is drastic improvement in road safety measures taken by people as well as government .(13)

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RECOMMENDATIONS DERIVED FROM BEST PRACTICES –

1. Designing safe Transportation Systems -

Road accidents are 100 % preventable, since the risk of incurring injury in a crash is largely predictable and many countermeasures, proven to be effective in some of the best practices –

- Preventing pedestrians and cyclists from accessing motorways and preventing motor vehicles from entering pedestrian zones are two well-established measures for minimizing contact between high-speed traffic and unprotected road users.
- Prioritizing the higher occupancy vehicles in the road network.
- Pre Road safety audit of design at planning stage.

2. Designing for roadsides Crash Protective -

Road accidents also occur when vehicle leave the road , there is sometimes collision between vehicles and roadside barriers or road side objects such as poles , road signs and tress so provisions to be followed as guidelines while designing road side crash protective –

- Introducing a wide clear or free zone at the side of the road while designing the roads.
- Designing the roadside objects and barriers such that they absorb part of the impact energy.(14)
- Introducing better vehicle design vehicle protect the occupants from the consequences of collisions with roadside objects.(13)

3. Safe road network planning –

In an efficient road network, exposure to crash risk can be minimized by ensuring that trips are short and routes direct, and that the quickest routes are also the safest routes. (15) Route management techniques can achieve these objectives by decreasing travel times on desired routes, increasing travel times on undesired routes, and re-directing traffic. Some guidelines are given for safe planning:

- Functional Classification of road network according to primary their functions
- Setting speed limits according to the road functions & purpose.
- Improving road layout and designs with including road safety measures.(15)

4. Safety Audits of New Transport Project at Various Stages –

Whenever a new transport projects are proposed, safety impact assessments are needed to ensure so that proposals do not have an adverse safety impact on the surrounding network. Audits are carried out in the following stages of a project:

- During the feasibility study of the project.
- At the draft design stage of the project.
- At the detailed design stage of the project.
- Before the project becomes operational.
- A few months after the project is operational.(16)

5. Setting and Enforcing Alcohol Impairment Laws –

In India drink-driving, alcohol is significant and widespread factor in road crashes specifically at night time .The scientific literature and national road safety programs agree that a package of effective measures is necessary to reduce alcohol-related crashes and injuries.

- Limit the Blood alcohol concentration for all the driving population.
- Specify an age below which the purchase or public consumption of alcoholic beverages is illegal.(17)
- Random breath testing.(13)
- Lower blood alcohol concentration limits for young or inexperienced drivers.
- High penalties and even punishment of imprisonments for excess alcohol defaulters.

6. Enforcement of rules and regulation –

As it is well known that good enforcement of rules and regulations are integral part of road safety. Here some guidelines are given for enforcement are:

- Signage regarding road speed limits should be mandatory as speed limit is closely linked with road function, road design and road safety.(15)
- Automatic speed enforcement, such as by means of speed cameras, is now employed in many countries.
- Vehicles with in built speed limiters sensors in heavy goods and public transport vehicles.(9)
- Enforcement levels need to be high and maintained and assessed over a period of time, so as to ensure that the defaulters can be pointed out easily.
- Once defaulters are caught, their penalties should be collected immediately.
- Using selective enforcement strategies to target particular risk behaviors and choosing specific locations both improve the effectiveness of enforcement.
- Of all the methods of enforcement, automated means – such as use of cut and surveillance is better means – for are cost effective and enforcement.

7. Minimizing risk through transport policies -

Perhaps the least used of all road safety strategies are those that aim to minimize risk.

- Reducing the volume of motor vehicle traffic by means of better land use;
- Providing efficient networks where the shortest or quickest routes coincide with the safest routes.
- Promoting non mortised transport means by introducing incentive policies.
- Encouraging people to switch from high accidental vulnerable transport modes to lower accidental vulnerable transport modes.(15)
- Placing restrictions on motor vehicle users, on vehicles, or on the road infrastructure.

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