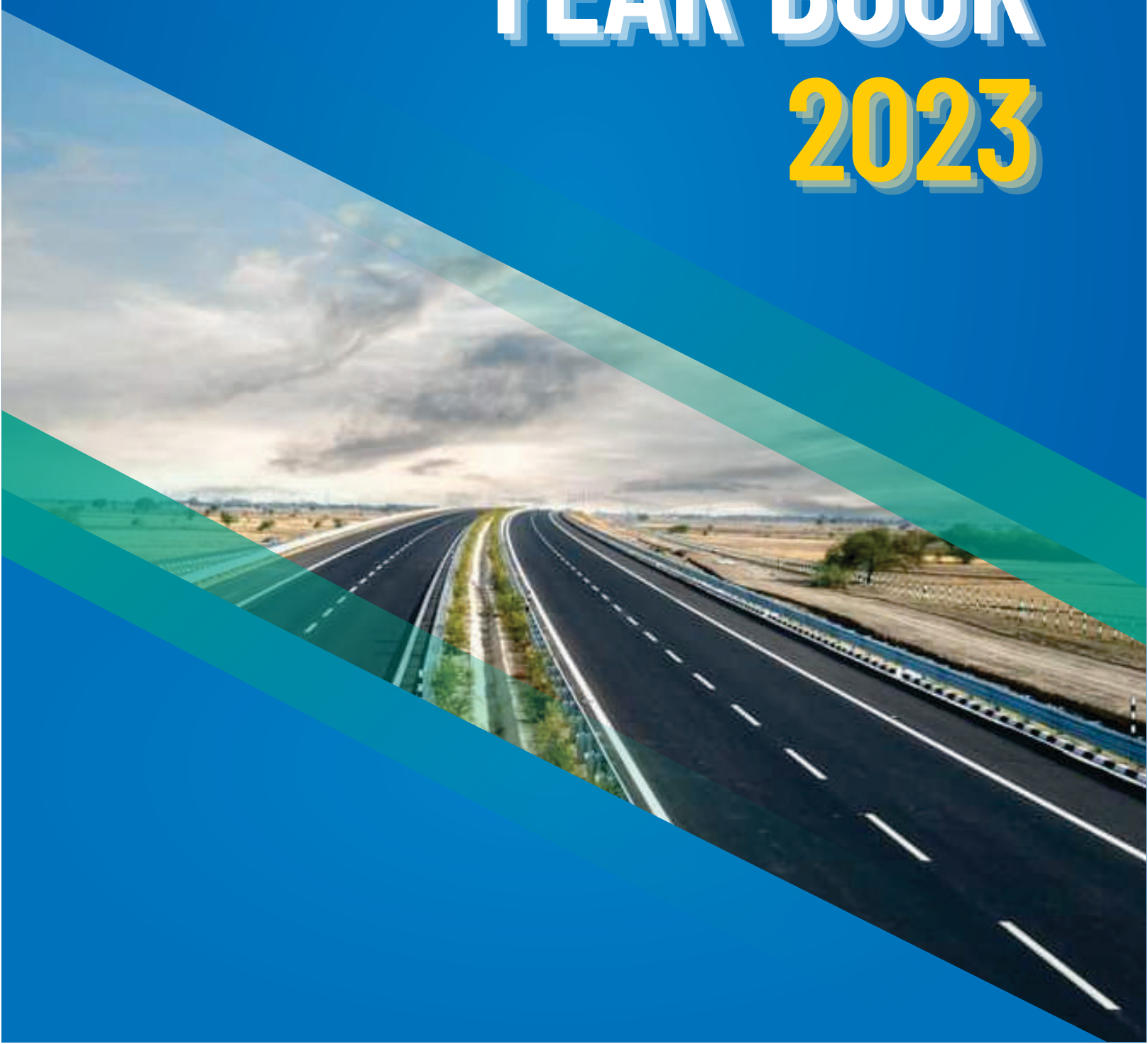




**INTERNATIONAL
ROAD FEDERATION
INDIA CHAPTER**

YEAR BOOK 2023





Ashoka Buildcon Limited

One of India's leading infrastructure developers is making its presence felt across 3 continents

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राष्ट्रपति
भारत गणतंत्र
PRESIDENT
REPUBLIC OF INDIA



MESSAGE

I am happy to know that the International Road Federation-India Chapter (IRF-IC) is bringing out its Yearbook 2023 on the theme of 'Safe Roads and Safe Mobility'.

Road Safety in India is a matter of serious concern. There are many causes of road accidents – not wearing helmets, drunken driving, speeding, use of mobile phones, traffic rule violations and others. In most cases, accidents happen either due to negligence or due to lack of road safety awareness of the road user. Therefore, road safety education is as essential as any other basic survival skill.

I commend organizations and agencies who are contributing to spread awareness and educate the masses on the menace of road accidents. I congratulate the India Chapter of International Road Federation who promote safe road mobility in the country through sustained efforts. I extend my warm greetings and felicitations to all those associated with the publication of Yearbook 2023 and send my best wishes for the success of the publication.



(Droupadi Murmu)

New Delhi
June 27, 2023

नितिन गडकरी
NITIN GADKARI



मंत्री
सड़क परिवहन एवं राजमार्ग
भारत सरकार
Minister
Road Transport and Highways
Government of India

MESSAGE

I am happy to learn that the International Road Federation (IRF), India Chapter is bringing out its Yearbook 2023 on Safe Roads & Safe Mobility.

My Ministry which is the nodal Ministry for Road Transport & Highways and a life member of IRF stands committed to achieve 50% reduction of roads deaths by 2030 as a signatory to the UN Decade of Action. In this endeavor, I am glad that the efforts being made by the India Chapter of the International Road Federation towards furthering the cause of Road Safety across the country and assisting the Government in various ways to achieve the objectives of reducing Road Fatalities, are noteworthy.

IRF initiatives and its continual untiring efforts will go a long way to achieve this common goal. I appreciate IRF's contribution in championing this cause across the world.

The fast tracking of infrastructure growth in India with its concurrent effects on road safety is a very critical issue and government is doing all-round efforts in this regard. Mobility cannot be at the cost of safety. Therefore, it is important that we must identify the gaps which still persist. We must make a concerted effort to fill these gaps under a well chalked out programme.

I look forward to the Articles presented by eminent Road Safety Experts in the Yearbook and congratulate all concerned for their contributions.


(Nitin Gadkari)

Date: 21st June, 2023
Place: New Delhi

धर्मेन्द्र प्रधान
धर्मेश्वर गुप्ता
Dharmendra Pradhan



मंत्री
शिक्षा; कौशल विकास
और उद्यमशीलता
भारत सरकार

Minister
Education; Skill Development
& Entrepreneurship
Government of India



MESSAGE

I am happy to know that the **International Road Federation - India Chapter (IRF - IC)** is bringing out its Yearbook 2023 on "Safe Roads & Safe Mobility".

Roads are the arteries through which the economy pulses. By linking producers to market, workers to job, students to school and the sick to hospital, roads are vital to any development agenda. Road networks play an essential role in India's growth story. It contributes more than 3.6% of Gross Domestic Product (GDP) on around two-third of all transport related contributions to the GDP of India. Apart from being such an important means of development, we also have to be aware of road safety. We need to build the culture of road safety, respecting traffic signals in our children from young age. School authorities, teachers, parents also need to join hands with the government and civil society to instill road safety curriculum. I am glad to learn that IRF - IC has launched a school zone safety programme. I am confident that this effort will greatly contribute to the safety of school children.

I am hopeful that the articles by eminent road safety experts in the Yearbook 2023 will touch upon the education part as well. I wish an elegant publication of this Yearbook.

(Dharmendra Pradhan)

सबको शिक्षा, अच्छी शिक्षा



कौशल भारत, कुशल भारत

MOE - Room No. 301, 'C' Wing, 3rd Floor, Shastri Bhavan, New Delhi-110 001, Phone : 91-11-23782387, Fax : 91-11-23382365
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जनरल (डॉ.) विजय कुमार सिंह
पीवीएसएम, एवीएसएम, वाईएसएम (से.नि.)
GEN. (DR.) VIJAY KUMAR SINGH
PVSM, AVSM, YSM (Retd)



राज्य मंत्री
नागर विमानन;
सड़क परिवहन एवं राजमार्ग,
भारत सरकार
Minister of State for
Civil Aviation;
Road Transport and Highways,
Government of India

31 May, 2023

MESSAGE

The International Road Federation as an organization, has a formidable reputation for its work in the field of Road Safety. Its Past work has helped provide important inputs for shaping of our road policies.

I have noted with pleasure that the International road Federation- India Chapter (IRF-IC) is bringing out its Yearbook 2023 on Safe Roads & Safe Mobility. This book will influence a large number of people to come forward and contribute to the cause of Road Safety. This will be an enabler to reduce the fatalities on the roads.

I am extremely pleased to have joined hands with them as Chairman of Advisory council with an aim to assist them in the 'Yagna' being performed by them to help the society at large by reducing road accidents and fatalities. These untiring efforts on all the 5E's are indeed commendable. I salute this initiative and will do everything possible to make it a success.

I look forward to the Articles presented by eminent Road Safety Experts in the Yearbook and congratulate all concerned for their contributions.

[Gen (Dr.) V.K. Singh (Retd.)]

Shri K. K. Kapila
President (Emeritus)
International Road Federation,
A-8, Green Park Main,
New Delhi- 110016



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INTERNATIONAL ROAD FEDERATION INDIA CHAPTER

About International Road Federation (IRF)

International Road Federation (IRF), founded in 1948, is the only world forum advocating for better and safer roads through improved design, construction, maintenance and management. It is a not-for-profit organization bringing together members engaged in road infrastructure from both private and public sectors. It contributes to the credibility, recognition and qualities of road professionals worldwide.

IRF promotes sustainable mobility and campaigns for regulations to ensure sustainability.

IRF believes that safe, economically viable and ecologically friendly sound road network, covering rural and urban roads as well as motorways and expressways brings prosperity, fights poverty, promotes education and gives better access to health services.

The range of IRF members encompasses civil engineering companies and planners, road and traffic safety devices suppliers, road construction enterprises, motorway/expressway concessionaires and operators, manufacturers of construction equipment, universities and research institutes, government ministries, road authorities and financial institutions. Current membership numbers over 400, from 86 countries, covering all six continents.

IRF has been granted a special consultative status at the United Nations Economic and Social Council in 1951. It is an institutional partner with UN, WHO, World Bank, EU and many other international organizations.

About IRF-India Chapter (IRF-IC)

IRF India Chapter, which has been active in India since 2005, was formally set up on 5th February 2009 and registered under the Societies Registration Act 1860 of India. With aims and objectives in consonance with its parent body, its present membership includes 100 organizations.

IRF-IC undertakes various activities with the support of its Members, who are divided into three categories; namely; Corporate / Government members, Individual members and Lifetime members. The Lifetime membership support is offered to Government Bodies / Institutions. Some of the prominent Lifetime members include the Ministry of Road Transport & Highways, National Highways Authority of India, National Highways & Infrastructure Development Corporation Limited, Central Public Works Department, Delhi Development Authority, PWD Delhi and number of State Governments. Corporate members include Highway Authorities, Research Organizations, Professional Associations, Contractors, Concessionaires, Consultants, Automobile Manufacturers, Manufacturers and Suppliers of Road Safety Devices, NGOs, etc.

IRF-IC has undertaken various intense campaigns on 5E's namely, Engineering of Roads, Engineering of Vehicles & Policy Corrections, Education, Enforcement and Emergency Care with the focus on preparing a National Road Safety Action Plan for the country based on 5E's, the key components of the Safe System.

A School Zone Safety Portal, which is India's first Safe School Zone Monitoring Portal to save children by improving the school zones, was launched in early December, 2022. The SZMP Portal will bring visibility about the school zone road safety status to the public domain so that parents/citizens can see how safe the schools are and exert pressure on the school as well as civil administration for enhancing safety in the school zone.

Our initiatives are mentioned in the following pages. For more information, please visit www.indiairf.com or write to us at india@irf.org.in

INITIATIVES INTERNATIONAL ROAD FEDERATION INDIA CHAPTER

Our Mission

Better & Safer Roads, Safer Transport & Safer INDIA

Activities of IRF-IC

- Conferences / Seminars on Road Safety themes
- Intertraffic Exhibition, world's largest exhibition on Traffic Technology
- Road Safety curriculum in all subjects from class VI to X for high school level incorporating Road Safety topics. To download the books, click on the link below: <https://indiairf.com/project/starting-them-young-irf-initiative-for-integrating-road-safety-in-school-curriculum/>
- Conspicuity for Bicyclists & Tractor/Trolleys – Introduced use of retro-reflective tapes on parts of bicycles. Promote use of retro-reflective tapes on Tractor / Trolleys / Commercial Vehicles.
- Road Accident Data Recording (RADaR) system of scientific and comprehensive accident data collection
- CHANGER, a Green House Gas (GHG) Calculator for assessing the GHG emissions from the raw materials used in road construction projects
- Enhanced First Aid (eFD) programme for Commercial Drivers and Bystanders
- Blackspot Improvement Programme
- Annual participation in Road Safety Week/Month of MoRT&H
- Road Safety Anthem in various languages covering all Indian States, nay the world at large
- Short films on Road Safety
- Participants in National & International Trade Fairs
- Newsletter & Yearbook

Road Safety Action Plan for India 2022

The 5Es of Safe Road System has shown impactful results internationally, primarily because of its adoption and execution. On the other hand, though India also adopted the 5E strategy, the results have not been heartwarming as there has been no correlation between the Es and they have not been taken up together as a Programme. IRF India's National Road Safety Plan 2022 strived to focus on 5E Programme, with each of the E being addressed as a part of the programme.

Part 1 – 12 Webinars under the Series titled “Road Safety Challenges in India & Preparation of an Action Plan”

The first activity towards building the National Road Safety Plan 2022 was the 12 Webinars under the Series "Road Safety Challenges in India & Preparation of an Action Plan". Launched in February 2021 by the Hon'ble Minister of Road Transport and Highways, Mr. Nitin Gadkari, a webinar per month was organized through the year with the 12th and the concluding webinar in December 2021. 6 Webinars focused on the 1st E of Engineering of Roads, 1 Webinar on the 2nd E of Engineering of Vehicles and Policy Corrections, 1 Webinar on the 3rd E of Road Safety Education & Mass Awareness, 2 Webinars on the 4th E of Enforcement and Traffic Management and 1 Webinar on the 5th E of Emergency Care. The concluding webinar focused on the Sustainable Development with Road Safety.

The recommendations arising out of the Webinar Series were formulated as Draft National Road Safety Action Plan which is currently under discussion with the concerned Ministries of Road Transport, Education, Home, Health & Family Welfare. We anticipate it to be finalized for adoption before the close of this fiscal year.

The Draft Action Plan is available at :<https://indiairf.com/road-safety-action->

Part 2 – 7 State Safe Demonstration Corridors

While the National Road Safety Action Plan was being built, a ground level initiative of validating the efficacy of the 5E Programme was launched in 7 States with highest road traffic crashes, namely, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu and Uttar Pradesh. Titled as **Safe Demonstration Corridor**, a 100-150 Km worst performing road stretch in each of the 7 States were identified with the help of the State Government/NHAI. Activities under each of the E, as listed out in the table below, have been completed in 4 States and in the remaining 3 States, it will be completed before the close of this financial year. All the activities till date are being funded by the Corporates under their CSR as well as membership of IRF.

Webinars under the series titled “Road Safety Education & Awareness – A Comprehensive Approach”

3 Webinars titled “Road Safety Education & Awareness – A Comprehensive Approach” was organized during September to November 2022. These Webinars dwelt on the aspect of 3rd E of Road Safety, i.e., Education. The Webinars were organized with the support of IRF India Membership namely, Maruti Suzuki India, Ashoka Buildcon, Gawar Construction and 3M India. The World Economic Forum also lent its support for the successful execution of the series.

5E Programme in the State of Haryana

Extending the Programme to other States, namely Haryana, 3 short road stretches, namely, Kundli Border to Samalkha (41 Km), Gurugram to Dharuhera (41 Km) and Faridabad to Phulwari (43 Km) were identified by the State Government for undertaking the 5E Programme. The Programme is presently underway.

| Engineering of Roads | Engineering of Corrections | Education | Enforcement | Emergency Care |
|--|--|---|--|--|
| <ul style="list-style-type: none"> Road Safety Audit Design correction & BOQ Submission to Authorities for Bids Follow up to get the correction done | <ul style="list-style-type: none"> Policy Interventions retrofitting of (FUPD, SUPD, RUPD, Retro-reflective tapes etc.) Advocacy for Mandatory Safety features in 2 wheelers/4 wheelers Provision of other safety features such as Alcolock to reduce drunken driving | <ul style="list-style-type: none"> Training of School children on road safety Introduction of road safety education in schools/ education institutions Mass awareness to road safety issues through road safety anthem and road safety films in all Indian languages | <ul style="list-style-type: none"> Training of Police Personnel on traffic management in association with IRTE Training on Accident data collection Knowledge on Good Samaritan Law | <ul style="list-style-type: none"> Training of Bystanders / Commercial drivers on first aid trauma care Knowledge on Good Samaritan Law Identify 10 to 15 medical facilities on either side of road stretches : Study for gaps in infrastructure and skilled capacities with the help of AIIMS Trauma Care Medical resources Plan to upgrade Medical facilities to L1/L2 Trauma Centres at least in every 100 Kms. Provision of Physiotherapy & Neuro Rehabilitation for traumatic brain & spine injury victims/survivors |

Trauma Care Training Programmes at IDTR

IRF India in association with Maruti Suzuki trained 3,500 drivers on First Aid Trauma Care. The hands on training were imparted at the Institute of Driving and Traffic Research (IDTR) in Delhi and Haryana.

IRF-IC’s School Zone Monitoring Portal

Our schools are also not behind, as nearly 10% of the fatalities occur in children near their schools. Most school zones don't have adequate road safety signages per the road safety norms of Indian Road Congress. IRF(IC) launched India's first Safe School Zone Monitoring Portal in November 2022 to save children by improving the school zones. The SZMP Portal will bring visibility about the school zone road safety status to the public domain so that parents/citizens can see how safe the schools are and exert pressure on the school administration & civil administration. IRF aims to make around 5,00,000 school zones safe by 2030. ugram to Dharuhera (41 Km) and Faridabad to Phulwari (43 Km) were identified by the State Government.

Engaging with Technology as enabler of Road Safety

In addition to the above, IRF(IC) is also encouraging the adoption of the latest technologies in road safety, like AI, Blockchain, IoT and Mobile Applications. IRF(IC) recently started developing World's first Blockchain-based Web portal for road safety. The Blockchain-based portal, along with a Mobile App, will solve most of the commuter's problems related to road safety, vehicle, insurance and emergency care with real-time alerts & assistance.

Road Safety Anthem

What better way to catch mass attention and create awareness consistently than a catchy song. Fulfilling the vision of its Founder President, Mr. K. K. Kapila, IRF India was a part of the creation of the following Road Safety Anthem in 23 Indian and 10 International languages.

सड़कों पर सावधानी पहली प्राथमिकता है,
नियम का पालन करना है भैया, नहीं करनी है मनमानी
गुस्सा नहीं करना, मुस्कान फैलानी है
दाएं देखो, बाएं देखो, फिर दाएं देखकर पार करो
पैदल सड़क पर जो हो, हेडफोन ना यूज़ करो |
थोड़ी सी लापरवाही जीवन भर का है रोना
चौकन्ना रहकर ही, चमकाओगे हर कोना
सड़कों पर सावधानी पहली प्राथमिकता है.....

To download the Anthem in your choice of language, please click on :

<https://indiairf.com/road-safety-anthems/>

Become a Part of the Road Safety Mission

Road Safety is a consistent yagnya and needs endless ahutis. You can be a part of this mission by becoming a member of IRF India. We offer Corporate, Associate and Individual Memberships. All information related to membership is available in our website www.indiairf.com

Come join us and help us take the road safety mission far and wide across the country.

Achievement / Milestones

- Issuance and adoption of additional engineering measures towards 'forgiving roads' as well as mandatory Road Safety Audits at various stages of road development by MoRT&H
- Tax exemptions for investments in road safety under Sections 80G of Income Tax Act 1961, provisions of CSR under Section 135 of the Companies Act 2013
- Recipient of the Maruti-Times Now Road Safety Award
- Signing of the Delhi Declaration at the Global Transport Ministers Forum 2017
- 18th World Road Meeting 2017
- Roundtable series on Intelligent Transport Systems
- Statement of Intent with NITI Aayog for strategic development of Intelligent Transport System

5E Programme in Progress



Measuring the MBCB on Moradabad-Bareilly Stretch



Observing movement of traffic and road geometry at Gurgaon to Dharuhera NH-48 Stretch, Haryana



Traffic Management & Enforcement Training of Madhya Pradesh Police Personnel



Road Safety Education Being Imparted in a School in Tumkur, Karnataka



Heimlich Maneuver



CPR Demonstration

IRF Organisation

Office Bearers : Mr. K. K. Kapila, Founder President, IRF-IC and President (Emeritus), IRF Geneva; Lt. Gen. Harpal Singh (Retd), President; Mr. D. O. Tawade, Sr. Vice President, Mr. R. K. Pandey, Sr. Vice President; Mr. Akhilesh Srivastava, Executive Vice President; Mr. Novman Ahmed, Vice President; Mr. S. S. Puwar, Vice President; Mr. S. K. Nirmal, Secretary; Dr. Mahesh Kumar, Treasurer

IRF Secretariat : Mr. Manoj Kumar Gupta, CEO; Ms. Aruna Shankari, PMU Head

Support Team : Mr. Deepak Malhotra, Admin Head; Mr. P. K. Gupta, Liaison Officer; Ms. Himanshi Rajput, Accounts & HR Lead, Mr. Akhilesh Kumar, Admin Executive, Ms. Anjali Dhull, Trainee

PMU Team : Mr. Jasvinder Duhan; Mr. Maninder Singh; Mr. Saurav Seharawat; Mr. Sumit Dhull

Trauma Care Team : Ms. Tarannum Sheikh; Mr. Hari Krishna Dubey; Mohd. Shuaib Turk; Ms. Kiran Yadav; Ms. Niharika Singh; Mr. Sahil Abbas; Mr. Nazim Siddique; Mohd. Gulrej Turk; Ms. Nisha Naruka; Mr. Sanjeev Prajapati; Mr. Vijay Singh, Mr. Ujwal Phoghat, Mohd. Firoj.

Neuro Rehabilitation Team - Indian Head Injury Foundation: This includes physiotherapy, occupational therapy and neuro rehabilitation of traumatic injury victims/survivors. Peer Mentoring of Spinal Cord Injury victims. Team : Commodore Ranbir Talwar, VSM (Retd), Executive Director and Dr. Rajendra Prasad, Neuro & Spine Surgeon, Apollo Hospitals, Delhi - IHIF Medical Director.

IHIF Physiotherapy Neuro Rehab Centres are located in - DELHI, JODHPUR, PATNA, NOIDA

IRF IC's School Zone Safety Programme

Introduction:

Road Safety is a severe challenge in India, with over 150,000 people, mostly young, losing their lives every year on Indian roads. With just 1% of global vehicles, Indian roads are responsible for 22% of fatal crashes and 11% of global road fatalities. This translates to an alarming average of 1130 accidents, 422 deaths per day, or 47 accidents and 18 deaths every hour. Our Schools are also not behind. With over 15 lakhs schools in India, unfortunately schools students contribute nearly 10% of fatalities due to poor infrastructure in the vicinity of schools. One child in India dies in every 45 minutes in a road accident with 31 children losing their lives daily and around 38% children in the age group of 0 to 14 years and 64% children in the age group of 14 to 18 years die on account of road traffic injuries. As per the accident data of the Ministry of Road Transport and Highways, there has been an increase in the fatalities of school children below 18 years of age. From 6.4 per cent in 2017 it steadily rose to 6.6% in 2018 and to 7.4% in 2019. This makes school children one of the most vulnerable road users and it is necessary to protect our children while they travel to and from schools by making the School Zones as well as their travel Safer through suitable Engineering and Enforcement measures.

IRF India School Zone Safety Programme:

School Zone Safety refers to the measures and precautions implemented to ensure the safety of students in and around school areas, especially during school hours. These areas are specifically designed to help keep children safe as they travel to and from school. Certain parameters like Road Markings and Traffic Signages, Pedestrian crossings, Speed-calming measures, Footpaths etc. are being addressed. Recently, IRF (IC) launched a School Zone Safety Programme, which follows the guidelines outlined in the IRC: SP: 32 for fostering a culture of safety near schools.

This comprehensive program employs a two-pronged approach, combining the School Zone Safety Portal and Capacity Building modules.

- 1) School Zone Safety Portal:** The SZS Portal will bring Visibility about the School Zone Road Safety status in the public domain so that parents/citizens can see how safe the schools are, and can exert pressure on the school and civil administration. Each school will receive a unique login ID so they can have all the information related to the school's road safety zone. This will help the relevant departments and school administration to ensure the application of road safety zone standard. The School Zone Safety compliance by Schools will be ranked based on the results of the Audit/Survey with colour coding, thereby enabling parents and citizens to identify and relate them with safer infrastructure. It is envisaged that the programme will also hold the Authorities accountable for improving the infrastructure surrounding School Zones. After the preliminary audit and identifying the vulnerabilities, IRF will also assist the concerned department in carrying of Detailed Engineering Road Safety Audit of the schools as per the severity reported and work out the appropriate estimates for rectification. Therefore, rectification/improvements, IRF will carry out Final Audit and report on the Web Portal with revised scores for public view, so that people can appreciate the action taken by the concerned department.



2) **Capacity Building:** The Programme will be imparted online and will consist of 08 theory modules to be covered in 05 days. This will be followed by Module 09 on demonstration of School Zone Safety Portal of IRF-IC where the survey findings will be uploaded. Module 10 will consist of tutorial to undertake field survey. This will be followed by a Physical Audit of a school chosen from list of schools available in the SZS Portal. The broad contents of the certification programme are as under:

- Introduction to Road Safety Scenario, Fundamentals, Road Safety Policy, Motor Vehicle Acts
- Traffic Control Devices and Technical Specifications
- Road Safety Engineering
- Traffic Calming Interventions
- Vulnerable Road User(VRU) Safety and Road Accidents
- Temporary(Work Zone) Traffic Management
- Introduction to School Zone Sections, Definitions, Checklist for School Zone Safety Score(Rating)
- Introduction to Road Safety Audit and School Zone Safety Audit Guidelines

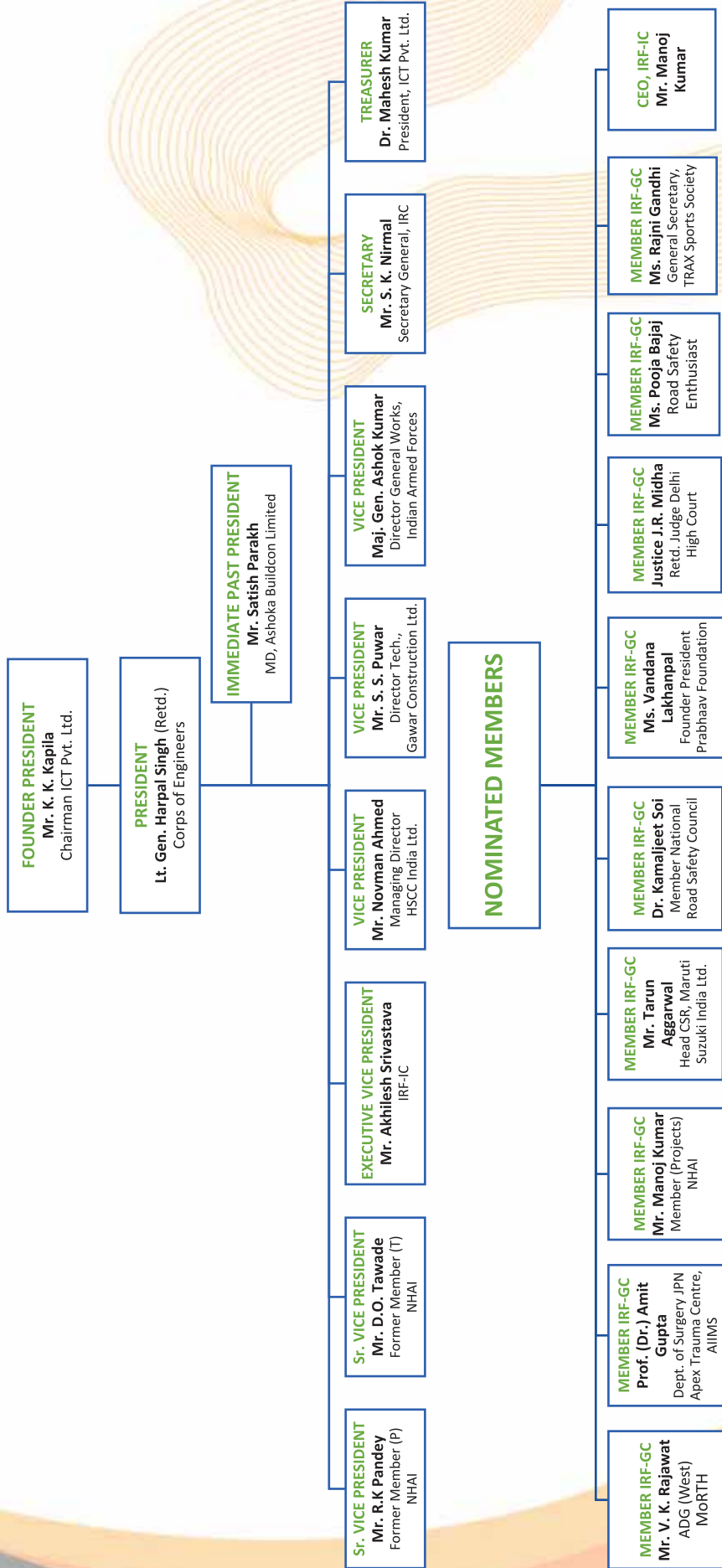
The modules will be supported by Study/reference materials and at the end of each module there will be a Quiz. The trainee can move to the next module only on scoring requisite marks in the Quiz. After successful completion of the programme i.e. uploading of the survey results, the trainee will be assessed based on the performance and certified. **The eligibility of this course is a degree/diploma in Civil Engineering or a student of final year. The introductory course fee is Rs. 5000. Therefore, the Paid Survey opportunities in schools will be facilitated by IRF India for successful students.**

What we propose: A joint certification for this initiative by the Central Road Research Institute (CRRRI), Indian Roads Congress (IRC), along with IRF India. This certification will validate the participants' knowledge and skills, providing them with recognition for their commitment to school zone safety. We believe that by collaborating with esteemed organizations like IRC and CRRRI, we can ensure the highest standards of certification for the School Zone Safety Programme. This will help in promoting road safety, creating safer school zones, and reducing the alarming rate of accidents and fatalities involving school children.



INTERNATIONAL ROAD FEDERATION INDIA CHAPTER

GOVERNING COUNCIL 2023-2025



Draft Road Safety Action Plan (RSAP) for India – At a Glance

International Road Federation (India Chapter)

Background

Road accident related deaths and injuries are going to be the 4th largest cause of healthy life-years lost by the global population by 2030, particularly in low and middle income countries. Road accidents/crashes have disproportionate impact on the poor, as majority of the victims are vulnerable road users, having limited affordability to the cost of treatment, which also push families further into poverty. The Global status report on road safety, launched by WHO in December 2018, highlighted that the number of annual road traffic deaths had reached 1.35 million by then, and road traffic injuries were the leading killer of people aged 5-29 years. The report also mentioned that the burden was disproportionately borne by pedestrians, cyclists and motorcyclists, especially those living in the developing countries.

Based on a resolution of the UN General Assembly, the committee of nations adopted an UN Decade of Action for Road Safety (2011-2020), which could not make its desired impact on this global problem, in spite of a huge amount of guidance that were available from some of the developed countries, which were able to control this menace by systematic actions. Even with the guides and manuals provided in the framework of Five Pillars of the Decade of Action, the developing countries were not able to even stabilise the growth of road crashes and deaths. In view of this, the third Global Ministerial Conference in February 2020 decided to extend the target by a second decade of action for road safety (2021-2030), which later was endorsed by the UN General Assembly.

Careful examination of the causes due to which the first decade of action failed to achieve its objectives reveal a few very important facts. It was very clear that most of the low and middle income countries had no multi-sectoral road safety action plan, which was to be implemented in a coordinated way for the targeted results, and therefore, all the efforts were isolated and unplanned interventions. The road safety problem is a multi-factor event caused by several connected causes due to which the road users fail to cope with the road environment leading to deaths and injuries in the road network. The multiple factors causing these conditions, that need to be corrected to ameliorate the hazards and risks on roads, which are actually the responsibilities of multiple agencies/organizations, who are directly and indirectly connected with the happenings. With the twelve voluntary targets for road safety, the Global Communities agreed to achieve 50% reduction in death and serious injuries by 2030, aligned to the Sustainable Development Goals. Its first target was to prepare and adopt a multi-sectoral road safety action plan by end of 2020. However, the entire world was totally engrossed with the medical emergency caused by the Covid-19 pandemic, and very few countries could pay any attention to achieve this target. But those who did, were able to see the difference in road safety situation through coordinated actions guided by a structured action plan.

The first pillar of the UN Decade of Action for Road Safety (2011-2020) had envisioned creating road safety management capacity in all the organizations involved in implementation of a road safety action plan in line with the UN's 5 pillar strategy. Many countries and regions had failed to achieve any improvement in their road safety scenario, in spite of having some sort of action plan, only because these organizations did not have any capacity or real understanding of their responsibilities towards road safety. Such a situation probably existed in India, and the curve of road deaths and injuries climbed unabated during the first decade of action for road safety, as the responsible organizations could not support the activities falling under different pillars.

As an integral part of its *Mission of Road Safety*, at the beginning of 2021, IRF-India Chapter (IRF-IC) had taken up the idea of developing the Road Safety Action Plan for India. Accordingly, it had planned and executed a series of 12 webinars titled “Road Safety Challenges in India & Preparation

of an Action Plan” during 2021. The Webinars focussed on important aspects of road safety, in alignment with the five pillars of first UN Decade of Action for Road Safety.

It has been experienced in India that the subject of Road Safety is considered to be the responsibility of only the Ministry of Road Transport and Highways, though the various facets of road safety warrant integral involvement of other Ministries like Home Affairs, Heavy Industries, Education, Health and Family Welfare with primary roles and some others with secondary roles. The National Action Plan envisaged by IRF-IC finds a place for each of the above named Ministries so as to optimise the efforts for achieving the decadal goals by 2030.

This Webinar series, comprised of twelve webinars covered all aspects of the five pillars of road safety as well as the global plan for the second Decade of Action 2021-2030. The webinar topics were designed for all stakeholders of Road Safety in Central and State Governments, Industries, Corporates, all skilled professionals and the general public across all levels of the society to participate and contribute by giving ideas and information to the development of an all-encompassing and sustainable Action Plan for the Road Safety in India. This Action Plan, after agreement with all concerned Ministries/Departments will be communicated to the Central and State Governments for their adoption through the decade with a vigorous and systematic execution plan and necessary funding to realise the target of reducing road deaths and injuries to half by 2030.

IRF-India Chapter had launched this ambitious plan with an Inaugural Webinar on the topic of “Road Safety Engineering & Challenges” during the National Road Safety Month, which was celebrated all over the country during 18th January 2021 to 17th February 2021. IRF-IC’s Webinar Series was inaugurated on 9th February 2021 by Shri Nitin Gadkari, Honourable Union Minister of Road Transport & Highways.

The Action Plan

The aim of IRF-India Chapter has been to compile all ideas from the deliberations held in the 12 webinars as well as other best practices from within the country and around the world relating to structured multi-sectoral road safety action plan. The structure of the action plan presented here is with the themes and sub-themes requiring systematic actions. Each theme/sub-theme shall be responsibility of a Ministry/Department of Central/State Government with a logical time frame and necessary funding for developing and implementing the action plan in a time bound manner for achieving the positive outcome of the actions planned.

In the detailed Action Plan the column ‘Road Safety Issue & Action Plan’ gives the existing status of the specific road safety issue for clear understanding of the concern, and then the action plan suggesting actual actions to be taken and the benefits to be derived. However, a brief of the Draft Road Safety Action Plan is provided here in an “**at a glance**” format.

| Sl. No. | Road Safety Issue & Action Plan |
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| A: Road Safety Management Capacity, Funding, Inter-Departmental/Inter-Ministerial Coordination and Institutional Developments-E0 | |
| (a) | Creation & Empowerment of Central and State Level Authorities |
| 1 | National Road Safety Board (NRSB) should be constituted with authority for coordination like an independent Ministry of the Government. |
| 2 | State Road Safety Board (SRSB)/Authority to be the Lead Agency for coordination in state for short, medium and long term actions. |
| 3 | District Road Safety Committees (DRSC) to act on road safety problems in a coordinated way with planned interventions. |

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| (b) | <i>Capacity Building in All Agencies/Organizations Linked to Road Traffic/Safety.</i> |
| 1 | Launch a national capacity building programme for Road/Transport Authorities/Agencies for enhancing both the knowledge and skills (in Centre and all States). |
| 2 | Develop a uniform training plan for imparting knowledge and enhancing skills for engineers in private organizations to deliver safe and forgiving roads. |
| 3 | Organizations/agencies involved with road traffic in their projects, should establish a specialised Road Safety Cell or Traffic Engineering Cell. |
| 4 | Similar to CISF, a dedicated cadre of Highway Police Patrol System (HPPS) is to be created by Ministry of Home Affairs. |
| 5 | MoRTH to collaborate with Ministry of Home Affairs and State Home Departments for the training of traffic police personnel on modern enforcement and traffic management techniques. |
| 6 | Road Safety Auditors' course and accreditation system to be developed and implemented by NRSB for creating a large pool of credible auditors. |
| 7 | Transport Departments in States need complete revamping in structure, function, responsibility and transparency in their operation. |
| 8 | Make road safety engineering training mandatory with certification for consulting engineers and contractors' personnel. |
| 9 | Drop driver licensing from RTO functions with a centralised driver license processing unit in all States with automated testing procedure including computerized test on rules. |
| (c) | <i>Funding for Road Safety</i> |
| 1 | Create dedicated non-lapsable Central Road Safety Fund (CRSF) with budgetary support and regular contributions from CRIF and other road transport revenues, and to be shared to State Road Safety Fund (SRSF) |
| 2 | Road Safety Fund shall have an independent management committee for total transparency. In addition, road safety provisions shall be 10% of the project cost, in line with global recommendation, including for implementation of recommendations of the RSA at various stages. |
| (d) | <i>Updating Legal System for Traffic</i> |
| 1 | Road Traffic Act (RTA) or Road Safety Code (RSC) as the law to make the road users responsible for their actions along with modifications on insurance law. |
| 2 | NRSB has to manage and maintain common driver license register to eliminate duplicate licenses, and mandate linking Aadhaar to the driver license in a time bound manner. |
| 3 | Develop and manage a smart accident database using modern method of data collection using hand-held electronic devices along with the reporting and analysis tool. |
| 4 | The accident data collected for city/district/region is to be shared among all stakeholder departments connected to road safety. |
| B. Development of a Common Robust Crash Database System for All States – E0 | |
| 1 | Develop and manage a smart accident database using modern method of data collection using hand-held electronic devices along with the reporting and analysis tool. |
| 2 | The accident data collected for city/district/region is to be shared among all stakeholder departments connected to road safety. |
| C: Engineering of Roads – Planning, Design, Construction, and Operation – E1 | |
| (a) | <i>Planning & Design of Road</i> |
| 1 | Legitimate time is required for the exhaustive investigation and preparation of design details for self-explaining and forgiving roads. |
| 2 | Review speed limits of all NH and SH passing through towns and villages, and provide controlled speed limit with signs, markings and traffic calming measures. |
| 3 | Ensure Road Safety Audit (RSA) by experience audit team as a mandatory requirement, especially at detailed design and pre-opening stages. |

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| 4 | Road projects delivered or under implementation as BOT/DBFOT or EPC be audited identifying safety deficiencies for making them safe and forgiving. |
| 5 | 75% of the road travel is on NH, SH and Expressways, and therefore, strict operational guidelines be followed for their planning, design, construction and operation, which shall be part of standard contract. |
| 6 | All divided highways shall be provided median opening, if any, only with storage lanes mandatorily to avoid rear shunt accidents. |
| 7 | The detailed design (i.e. DPR) must provide the full design of the intersections, complete in all respect, with the legitimate land acquisition required, even when a roundabout is proposed. |
| 8 | Blackspot rectification must follow the standard IRC or international guidelines for investigation and identification of countermeasures along with monitoring after implementation. |
| 9 | Urban Local Bodies (ULBs) to improve road network through their Traffic Engineering/Road Safety Cell with legitimate VRU facilities. |
| 10 | Modern road marking can be highly effective in controlling run-off accidents, and ribbed edge line found to have benefit-cost ratio of 20:1 in developed world. |
| 11 | Segregated exclusive motorcycle lanes are found to be promising method for safety of 2-wheeler traffic in high speed highways. Similarly, provision of cycling and walking infrastructure and operations to be part of city transport policy. |
| 12 | In absence of capacity and skills for review and checking of the detailed design, DPRs should be subjected to independent Third Party Proof Checking (TPPC) only through QBS selection process. |
| 13 | ATMS should be designed and implemented by a competent expert agency under PPP arrangement for 10-15 years' concession, and must not be part of civil works contract. |
| 14 | Greater transparency and accountability required from the Road Authorities / Agencies / Consultants and Concessionaires/Contractors involved in the design, construction and maintenance (O&M) of the road for all their actions to avoid potential public action. |
| 15 | Even for NH and SH also a hump with 9.5m long chord length can be adopted for controlling speed at 50 kmph or less for the locations with mixed traffic with VRUs in urbanized sections. |
| (b) | Construction & the Contract for Construction |
| 1 | The traffic management for construction zones be managed by developing the BOQ items as part of the DPR, for enforcement with the construction, which also could not improve safety in some cases. |
| 2 | Temporary Traffic Management (TTM) arrangements must be through a Third Party Contractor specialised in traffic management with a tripartite agreement (with Civil Contractor and the Client). |
| 3 | The manual for traffic control/management during construction should be elaborated or road, culvert and bridges with more illustrated examples |
| 4 | Recent Finance Ministry Notification has abolished the Least Cost based selections, and therefore, all existing contracting systems (PPP/ DBFOT & EPC and all others) to be reviewed for incorporating stricter measures for ensuring legitimate road safety measures. |
| 5 | All types of contracts used in highway development are FIDIC-like only and needs substantive improvements/modifications to make them FIDIC contract in true sense. |
| 6 | In all highway/expressway developments ATMS development must be entrusted to legitimate expert agency under a PPP framework with long term concession with initial part CAPEX payment and rest in quarterly instalments with OPEX. |
| (c) | Operations & Maintenance and O&M Contracts |
| 1 | CA and Contract Agreements for all road projects have to comply to the current/revised/latest standards of IRC/MoRTH at any point. |
| 2 | Schedule K to be checked/revised for more stringent compliance of quality of services and include 'iRAP star rating' to be done every 12/24 months to achieve 3-star or better roads as per Global Plan. |

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| 3 | Provisions in all O&M contracts should be revised for adopting asset management principles with highly punitive clauses for high level of discipline in the professional service delivery. |
| (d) Special/Additional Requirements for Rural Roads and Hill Roads | |
| 1 | The rigor of planning and implementation for PMGSY roads, as was followed in case of MDB funding cases, should be followed in case of all PMFSY roads in all states to ensure all safety requirements. |
| 2 | PMGSY roads should have gateway effect and with all traffic calming measures planned and implemented right from the DPR stage. |
| 3 | For sustainable and safe rural connectivity the PMGSY roads are to be maintained with shoulders, side slopes, side drains and road safety appurtenances under a strict asset management policy. |
| 4 | All junctions involving PMGSY roads are to be implemented with safe system solution for controlled speed operation as 'platform junction'. |
| 5 | Road Safety Audit shall be conducted for hill roads at regular intervals for assessing all road safety components (signs, markings and all other safety devices) including the advance technology features for maintaining these top conditions for realising best safety. |
| 6 | Road side safety is of highest importance in hill roads which is to be ensured with maintained crash barriers. In addition, the drainage system of hill roads shall be maintained strictly for enhanced safety. |
| (e) Updating of National Standards & Codes | |
| 1 | IRC/MoRTH guidelines to be revised from time to time based on the performance observed and with implementation details, e.g. in case of crash barrier along with the criteria for choice of the type at specific location, such as embankment, elevated structures, other hazards. |
| 2 | Existing standards/codes (from IRC, MoRTH, BIS) should be updated in a time-bound manner and all contradictions and inconsistencies should be eliminated aiming for safe and forgiving infrastructure. |
| 3 | Method of developing the codes/standards by voluntary committees to be abolished and these to be developed first through international consultant and then processed through technical committees of IRC/MoRTH and made as high quality branded product. |
| D. Vehicle Technologies for Road Safety & Policy Initiatives – E2 | |
| (a) Upgrading Vehicle Technologies and In-Vehicle Safety Devices | |
| 1 | <ul style="list-style-type: none"> Government should implement Bharat New Vehicle Safety Assessment Programme (BNVSAP), which is not limited to Passenger Cars only. Set up Post Crash Accident Data Collection and Analysis Centres across the country for inputs to improve vehicle technology. Introduce various active safety features like ADAS suiting to Indian traffic conditions, in line with UNECE regulations. Implement UNECE regulations within 4 years of their introduction. |
| 2 | Adopt a road map for advancing the standards for all in-use vehicle fleet as per the Global Performance Target (5 th target) compliant to current national standards within next 3 years. |
| 3 | It should be made mandatory to provide seat belts and airbags in all categories of commercial vehicles, for the driver as well as all passengers. |
| 4 | Government should make it mandatory for Other Body Building industries (so called MSMEs), just as in case of OEMs, to comply as per the national standard (bus/truck body codes: 52). |
| 5 | Bus bodies (with large rear overhang) built on truck chassis where suspension is only by leaf springs in most cases are likely to have serious injuries to passengers seating in this region of the bus when going over rough roads and speed breakers, etc. Therefore, all passenger carriers (buses) must have air suspension in the rear axles. |
| (b) Enforcement of Vehicle Safety Measures for the In-Use Vehicle Fleet | |
| 1 | Carry out a Statewide enforcement programme through RTOs for the following: <ul style="list-style-type: none"> FUPD, RUPD and SUPD for all commercial vehicles. |

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| | <ul style="list-style-type: none"> • Retro-reflective conspicuity tapes on all sides of commercial vehicles. • Retro-reflective tapes/reflectors for bicycles, tractor-trolleys and animal-drawn vehicles. • Brake lights, indicator lights and rear-view mirrors of all vehicles • Fitment and use of front/rear Seat Belts in vehicles • Mandatory wearing of helmet by all two wheeler riders |
| 2 | Adopt a road map for retrofitment of ABS to in-use fleet of two-wheelers (through respective manufacturers only) within a period of two years. |
| 3 | Adopt a policy for making mandatory legal provision for installation of alcolock in all new motor vehicles and retrofit in all in-use vehicles in a time-bound manner. |
| 4 | The heavy commercial vehicles are to be fitted with electronic devices (camera/sensor for drowsiness and Tachometer for journey-log) for safety of such vehicle operations as per national law/rules. |
| (c) | Vehicle Inspection & Maintenance Regime (Fitness Certification) |
| 1 | Central Control and Monitoring Agency is required for regular audit of the Fitness Certification Centres that have come up in large numbers in various states for the Commercial Vehicles as per Govt. Notification. |
| 2 | Certification regime for passenger vehicles is required to be introduced through authorised service centres of the vehicle manufacturers, for which a minimum required test matrix is to be designed and implemented, which to be made mandatory for insurance. |
| (d) | Scrapping Policy of Old and Unused (Unserviceable) Vehicles |
| 1 | A detailed matrix of parameters to be checked as part of the “end of life” tests for suspension, side slip, noise, body structural integrity, drivability, manoeuvrability, brakes, speedometer, headlights, etc be made for implementation of the scrapping policy. |
| E. Road Safety Education & Awareness Campaign - E3 | |
| (a) | Road Safety Education in Schools/Educational Institutes |
| 1 | Comprehensive road safety intervention for school children including parents to be implemented in a sustained manner |
| 2 | School curriculum to be implemented uniformly under all School Boards for developing culture of road safety in future citizens |
| 3 | Teacher training courses should include road safety, teachers to be taken in state level road safety committees, road safety awards are to be given at all levels. |
| 4 | College and higher education institutions also should deliver informal education on road safety to penetrate all levels for developing culture of road safety in all adults and adolescents. |
| (b) | Improving Skills/Behaviour in Driving Community |
| 1 | The driver/rider training must be with comprehensive mobility objective and not for operating the vehicle, and encourage with information about benefits of safer behaviours. |
| 2 | Driver licensing should follow a formal training from proper training institute; ITSs can be developed as competent driver training centres (DTCs) across the country. |
| 3 | A formal scientific training should be mandatory for rider training motorised two-wheelers through standard classroom, simulator and practical training. |
| 4 | Automated tracks for driver testing should be mandatory for entire country and there should be test for drivers on actual road as well. |
| 5 | Driver training and testing should be through more systematically developed training and testing courses based on M.V. Act and CMVR. Qualified and accredited trainer and simulators only should be used for driver/rider training. |
| 6 | The drivers of all commercial vehicles (heavy vehicles), and especially buses carrying passengers should undergo very rigorous training and testing; and additionally they are to be trained for First-Aid emergency care. |

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| (c) | <i>Road Safety Campaign and Awareness Programme with Community Participation</i> |
| 1 | Standardized module of the road safety campaign and awareness programs should be developed by Road Safety Board for NGOs to deliver with proper quality. All campaign should be with enforcements. |
| 2 | Sporadic campaign is not effective; sustained effort is required with appropriate design with vehicle service requirements, compliance yo traffic rules and benefits – identifying target audience and systematic evaluation of the results. |
| 3 | All road development projects (new/upgradation) should include provision for community road safety awareness drive with their participation from the design and construction stages. |
| 4 | To enhance road safety, community education programmes is a must through civil society; also transfer some of the state's role in this regard to the civil society with specific objectives and targets. |
| (d) | <i>Media Involvement in Road Safety Campaign</i> |
| 1 | Effective media efforts should be duly recognised at the National level; promote media cooperation and participation; celebrate and publicise the success stories. |
| 2 | Road users' behaviour, habits, and attitudes can be impacted only through constant promotion of participation in safe behaviour through media and especially social media also, giving real-time traffic/safety information to avoid harm to the life and health. |
| F. Enforcement in Road Traffic - E4 | |
| (a) | <i>Adopt Technology based Enforcement Systems</i> |
| 1 | 24x7 enforcement using technology for compelling behavioural change in the road users; automatic enforcement system with incident detection camera and sensors can be used for 100% enforcement. |
| 2 | Advanced Traffic Management System (ATMS) should be a mandatory part of the scope of road development; it provides real-time data on operations giving details of all incidents and violations. |
| 3 | Adopt modern technologies for all traffic enforcement functions in the cities; all traffic management and enforcement functions are to be automatized by technology; also use social media to connect road users continuously with feedbacks. |
| (b) | <i>Separate Cadre for Traffic Police & Highway Police</i> |
| 1 | A dedicated cadre of Highway Police Patrol System (HPPS) is to be created like CISF for highways and expressway traffic enforcement; entire NH and SH network including expressways enforcement to be covered in a time bound manner. |
| 2 | Traffic police team has to be skilled with rigorous training on Road Traffic Act and Law including the accident data collection with fulfil the true purpose of such accident data. |
| (c) | <i>Technical Skill Required in Police/Transport Department for Enforcement</i> |
| 1 | Establish Traffic Engineering or Road Safety Cell in each police district and for RTOs for using modern tools and techniques for enforcement. |
| 2 | Transport Department in the States to be modernised with defined functions with specialised and skilled manpower for vehicle inspection, driver licensing, and all other functions assigned. |
| (d) | <i>Stricter & Objective Enforcement to be Followed</i> |
| 1 | Enforcement must be deterrent against violations; serious grievous violations should have imprisonment as per Law; Control, monitor and enforce 70% of the road network using modern technology. |
| (e) | <i>Support of Legal System for Enforcement</i> |
| 1 | Enact Road Traffic Act to define responsibility in each category of road user, failure of which to be punishable offence; IPC and Cr.P.C. are not actually for traffic violations. |

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| Sl. No. | Road Safety Issue & Action Plan |
| G. Emergency Response for Trauma Care and Strengthening Health Facilities along Highways - E-5 | |
| (a) | <i>Strong Leadership and Improved Trauma Care Management</i> |
| 1 | <ul style="list-style-type: none"> • MoHFW along with other Govt. Agencies/Hospitals to prepare SOP/Guidelines for Trauma Care and Policy/Procedure to follow in the treatment protocol. • Nodal agency like JPN Trauma Centre should be created to assign tasks to various government agencies and the Leader should be a doctor or person with medical background. • Medical protocol/guideline should be developed for certification units of trauma training with uniform contents for certification. • Trauma Registry to be created for developing Trauma Quality Improvement database for evaluating the effectiveness of trauma care systems. • National Injury Surveillance, Trauma Registry & Capacity Building Centre (NISC) established by DGHS, MoHFW should be linked to all Trauma Care Facilities in the country. • A sustainable funding model should be adopted for research and data management on trauma care. • Scope of trauma care facilities should include the treatment of the victims of accidents involving Chemicals and Hazardous Goods Transportation. |
| (b) | <i>Development of Trauma Care Facility Network</i> |
| 1 | <ul style="list-style-type: none"> • Network of Level-I, II, and III Trauma Care Centres (TCC) are to be established on priority in the districts along the NH and SH network of 300,000 km in the country. • All the district hospitals along NH and SH be upgraded with 24 hr Emergency Care facilities as well as all other requirements of Level-II or III facilities along with one TCC within 50km from any point on the highway network. • All AIIMS in the country should have Level-1 TCC, and eventually minimum one in each of 36 states and UTs in the country. |
| 2 | <ul style="list-style-type: none"> • Audit to be done for significant medical facilities (government and private) along the high-speed highways and expressways on priority about in-hospital trauma care resources following the WHO/GOI guidelines for state govts. to develop them. • Build capacity of pre-hospital, hospital and rehabilitation care/services for avoiding ding permanent disabilities, and establish a basic package of emergency care services for each level of the health care system. • Ensure 24-hour access of the accident victims to operative and critical care services and implement cashless treatment for 48 hours in main trauma care centres. |
| 3 | <ul style="list-style-type: none"> • NMC Recognized Medical Colleges Hospitals should have Trauma and Emergency Surgery Department (for catering to trauma and non-trauma surgical emergencies) with a running 24x7 emergency. • Management of trauma and surgical emergency differ from non-trauma patients, and a dedicated trauma emergency care will reduce the mortality and disability. • Private hospitals should train the General Surgeons in Trauma & Acute Care Surgery, and trained trauma surgeons and nurses across the country will save lives. |
| 4 | <ul style="list-style-type: none"> • Advanced Trauma Life Support (ATLS) course, Advanced Trauma Care for Nurses (ATCN) course, Pre-Hospital Trauma Life Support (PHTLS) course, Rural Trauma Team Development Course (RTTDC), Ultrasound Trauma Life Support (UTLS) courses, Basic Emergency Care Course (BECC), etc should be carried out regularly to create required trained manpower. • Long term training for in-service doctors and nurses should also be encouraged for updating with latest know-how in Trauma Surgery and Critical Care. |

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| (c) Development of a System of Pre-hospital Care | |
| 1 | <ul style="list-style-type: none"> • Provide basic (EMS) training to bystanders (able-bodied community volunteers from general public, and private commercial establishments and professional drivers of commercial vehicles. • Publicise Good Samaritan Law to encourage general public to assist the accident victims within golden hour. • Establish unique emergency telephone number applicable all over the country. |
| 2 | <ul style="list-style-type: none"> • Basic Life Support (BLS) or Advance Life Support (ALS) ambulance should be available as per National Ambulance Code and motorbike ambulances should be promoted, especially in inaccessible areas. Also Emergency Trauma Care App should be used for connecting to trauma care centres. • Ambulances be audited annually to assess the equipment and medicines and the paramedic staff. |
| (d) Training of Community on Trauma Care for Pre-hospital Care | |
| 1 | <ul style="list-style-type: none"> • Able bodied citizens volunteered from the communities and commercial establishments are to be trained for first aid trauma care as the first responders. • Basic driver training course must include First-Aid Trauma Care content designed for uniform adoption across the country. There should be mandatory such training for commercial vehicle drivers. • The personnel from Road Contractors/Concessionaires are also to be trained, and in all these involvement of insurance companies to be considered. |
| (e) Education & Campaign for General Public | |
| 1 | <ul style="list-style-type: none"> • There has to be sustained campaign through all possible print and visual media for general public with importance of first-aid trauma care and the golden hour for the accident victims. • Confidence of general public to be built with good publicity of “Good Samaritan Law” including through training of police and medical professionals as well as volunteers from the community. |
| 2 | <ul style="list-style-type: none"> • Develop multilingual central government portal for public to access information on trauma care facilities as well as bystanders’ training, with message “You can help others and Others can help you”. • All petrol and gas stations to showcase the accident statistics on real time with advices on safer road use behaviours. • Promote a common countrywide single Emergency Response Number like Police, Fire, etc.. • Short videos/films to be shown in cinema halls, hospitals, metros, railway stations, social media, etc. to create awareness. |
| 3 | <ul style="list-style-type: none"> • Officials and personnel of road sector industries are to be trained on first-aid trauma care as possible first responders. • All contracts of road projects should have 1% of the project cost for education/campaign of road users and communities along the project road and no COD to be issued till this task is completed. |
| (f) Legal Backing for Trauma Care Services (& Support for Victims) | |
| 1 | <ul style="list-style-type: none"> • Every state to enact “Emergency Medical Services Act”, similar to the one of Gujarat (done in 2007), for correct responsibility and accountability of the departments. • Special courts to be set up with Retired Judges for settling the pending accident cases and current ones expeditiously to provide relief to the victims and/or their families. • Government in association with corporates and insurance agencies should implement cashless treatment for 48 hours for the accident victims all highways/expressways. Aayushman Bharat scheme also should include this cashless facilities. |

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| Sl. No. | Road Safety Issue & Action Plan |
| (g) | <i>Post-Crash Rehabilitation of Victims & System Correction</i> |
| 1 | Establish rehabilitation centres across the whole country; at least 1 to 2 in each state or UT; and these are to be equipped with trained medical professionals and other technicians for training the new/modified life skills to the victims. |
| 2 | <ul style="list-style-type: none"> • Government should establish at least 15-20 centres of excellence for multidisciplinary crash investigation for identifying root causes of accidents for fixing responsibilities, and insurance laws to be changed to make responsible party to pay all costs. • Serious and fatal injury accidents to be analysed systematically for developing the prevention strategies; as well as for appropriate judicial response for victims and their families. • Ensure credible independent coordination mechanism for post-crash investigation, and share the data to all relevant stakeholders across the sectors. |



P. K. Sikdar

Chairman, Editorial Board

**Preface**

A country of rapidly growing population and expanding economy, India is witnessing a significant increase in the number of vehicles on the road. While this has brought about many benefits, such as increased mobility and economic growth, it has also led to a rise in road accidents, injuries, and fatalities. In fact, India has the dubious distinction in the world with the highest rate of road accidents and 11% of global road fatalities (an average of 422 deaths every day).

To address this issue, the Government of India is continually taking several steps to improve road safety and promote sustainable mobility. This includes the implementation of stricter traffic laws and regulations, the promotion of public transport including metro rail transportation and openness to new technologies to enhance road safety. Further, this involves promoting the use of clean and efficient modes of transportation, such as electric vehicles, bicycles, and walking. By reducing the reliance on fossil fuels and promoting sustainable modes of transportation, India can reduce its carbon footprint and contribute to global efforts to combat climate change. Overall, the promotion of safe roads and sustainable mobility is essential for the well-being of both individuals and the environment in India. Through continued efforts and investments in this area, India can improve the quality of life for its citizens, reduce the number of road accidents and fatalities, and contribute to a more sustainable future.

The theme of this Yearbook from the International Road Federation's India Chapter is on Safe Roads and Sustainable Mobility. As we worked towards creating the Yearbook, I wanted to take a moment to thank each and every one of you, who contributed through articles and member profiles. Some of you supported this publication through your contributions in terms of various advertisements of the organizations. Our goal with this Yearbook is to raise awareness about the importance of safe roads and sustainable mobility, and to provide valuable information and resources for individuals, organizations, and governments who are working towards these goals. The Articles contained herein are on wide ranging topics, and are the creations from long experiences of selected experts in this domain. I believe the contents will make the publication informative, engaging and impactful.

I take this opportunity to place on record my sincere appreciation for the support extended by my colleagues in the Editorial Board, Lt. Gen. Harpal Singh (Retd) and Mr. Akhilesh Srivastava. Their suggestions of improvisations helped in putting this debut Yearbook 2023.

This Yearbook is our humble offering to the mission of road safety and we will continually strive to enhance and enrich the same in the years to come. I hope that the readers will enjoy reading this Yearbook and find some useful takeaways.

With my best regards,

P. K. Sikdar

K. K. Kapila

President (Emeritus), IRF Geneva &
Founder President, IRF India Chapter



It is my distinct pleasure to introduce to you the International Road Federation – India Chapter's (IRF-IC) Yearbook 2023, a comprehensive compendium that encapsulates our consistent endeavors in the road safety domain. It contains articles from passionate professionals and profiles of our esteemed members from India. As the President (Emeritus) of IRF Geneva and Founder President of IRF India, I am honored to present this year's edition, showcasing collective efforts in promoting safe roads and sustainable mobility.

Founded in 1948, the IRF has been at the forefront of advocating for better road infrastructure, traffic management, and transportation policies. Our mission is to promote the development and maintenance of safe, efficient, and sustainable road networks, contributing to economic growth, social progress, and environmental preservation. Enjoying a Consultative Status in UN's ECOSOC, IRF serves as a global platform for knowledge exchange, collaboration, and capacity building in the field of road transportation.

Active in India from 2006 and incorporated as a Registered Society in early 2011, IRF-India Chapter (IRF-IC) from the start of this decade has dedicated itself to improving Road Safety. It undertook a flagship initiative in the form of formulation of a National Action Plan for Road Safety. Based on the 5Es of Road Safety as Engineering of Roads, Engineering of Vehicles and Policy Corrections, Education and Mass Awareness, Enforcement and Emergency Care. The National Road Safety Action Plan aims at reducing number of road traffic accidents and resulting injuries and fatalities. IRF-IC is spearheading the 5E programme in the country to create safer, more efficient and resilient road networks.

Recognizing the grave toll that road accidents exact on societies, we collaborate with Governments and key stakeholders to develop comprehensive strategies aimed at curbing road fatalities. By combining policy measures, technological advancements, educational campaigns, and robust enforcement, we expect to provide safer roads to save precious lives.

Furthermore, Membership in the IRF is a testament to our organization's commitment to advancing road safety and mobility. We have a diverse and influential membership base comprising Governments, Private sector entities, Academia, Research Institutions, and Civil Society organizations. This diverse mix of stakeholders, I believe will enable us to drive innovations and implement effective solutions, to address the challenges faced by road users in the country.

IRF recognizes that road accidents not only cause immense physical and emotional trauma to victims, but also impact their families and communities. Through our corporate membership program, we are planning to collaborate with leading companies to support initiatives that provide rehabilitation and assistance to accident victims and their families. Our collective efforts I am confident will substantially alleviate the sufferings caused by road accidents and help affected individuals to rebuild their lives.

Additionally, the IRF is committed to forging roads where fatalities are minimized, if not entirely eliminated. As part of our endeavors, we have adopted Jodhpur city as a pilot project to achieve zero fatalities by 2024 through 5E interventions. By implementing a comprehensive road safety plan, enhancing infrastructure, raising awareness, and improving emergency response systems, we are working towards creating a safer environment for all road users.

In the pages of this Yearbook, you will find insightful research, and innovative practices relating to road safety and mobility. I extend my heartfelt appreciation to all our members, partners, and stakeholders for their unwavering support and dedication. Together, we can make a tangible difference and build a future where road travel is not only efficient but also secure for everyone.

I hope you find this edition of the IRF-IC Yearbook informative and inspiring, and I encourage you to join us in our mission to transform the world's roads into safer and more sustainable.

K. K. Kapila



Lt. Gen. Harpal Singh (Retd.)

former E-in-C, Indian Armed Forces
President, IRF India Chapter



I am delighted to share my thoughts as President of the International Road Federation's India Chapter (IRF-IC) in this Yearbook. Being brought out for the first time, we have made an attempt to collate experiences, achievements, ground realities, ideas and suggestions of Professionals who have been passionately pursuing the cause of Road Safety. It is my privilege to present this publication, which showcases a collective and invaluable knowledgebase relevant to the stakeholders.

As a not-for-profit membership-based organization, the India Chapter of IRF Geneva, our Federation has been at the forefront of advocating enhanced road infrastructure, efficient traffic management, effective transportation policies, facilitating mass awareness and capacity building of First Responders across the country. Our mission is to create a safe, efficient, and sustainable road network in India, through comprehensive strategies and collaborative efforts.

At the core of our approach lies the ground level 5E Programme, which focuses on five key areas of road safety, namely the Engineering of Roads, Engineering of Vehicles and Policy Interventions, Education and Mass Awareness, Enforcement and Emergency Care. By integrating these key elements, we aim to transform road infrastructure and practices to enhance safe mobility.

Through innovative engineering solutions, educational campaigns, robust enforcement measures, and improved emergency care systems, we strive to create a road environment that prioritizes the well-being of all users. We had undertaken validation of 5Es programme and their efficacy, titled "Demonstration Safe Corridor" in the 7 States of Karnataka, Kerala, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu and Uttar Pradesh – the States recording highest road traffic accidents and fatalities in year 2019. This Programme is nearing completion after which we will be monitoring for improvement.

Our pursuit of road safety led us to train over 10,000 Bystanders, Volunteers, Drivers, staff of our members as well as in Maruti Suzuki's ITDRs in Delhi and Haryana in First Aid Trauma Care and helping them to act as First Responders and skilled Good Samaritans. Our considerable efforts were invested in road safety audits in accident prone stretches in Haryana, correction of blackspots at various junctions in Delhi, focusing on targeted interventions to enhance road safety.

Looking ahead, IRF-India is dedicated to the School Zone Safety programme, recognizing the importance of protecting our children during their journeys to and from school. IRF-IC has also developed a School Zone Safety Portal that will bring visibility about the School Zone Road Safety status in the public domain, a particular school is to improve its safety requirements.

We are proud to collaborate with like-minded organizations, including our members, partners, and stakeholders, who share our vision for safer roads and sustainable mobility. Together, we work towards creating a road network that prioritizes safety, efficiency, and sustainability.

I invite you to explore the pages of the IRF-India Yearbook, where you will find, insightful research, and innovative practices that exemplify our commitment to road safety and mobility. Together, let us continue our journey towards safer roads and a brighter future for all.

Lt. Gen. Harpal Singh



PLANNING OF FORGIVING ROADS FOR ENHANCING ROAD SAFETY

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1. INTRODUCTION

Analyses of fatal road accidents (1) in the European Union revealed that single-vehicle is involved in accidents to the extent of 45%, which are primarily classified as run-off-road accidents, where the vehicle leaves the road and enters the roadside. It may be stated that occurrence of road accidents with lighting columns and other robust support structures constitutes slightly less than 10 % of the total number of road deaths. A statistical analysis (2) of the data shows that Poland's main roadside hazard is trees and the severity of vehicles striking a tree in a run-off-road crash. Collisions with roadside hazards (3) were the immediate cause of 39 per cent of all car occupant deaths during those years.. During the year 2021, a total number of 4,12,432 road accidents was recorded in India, where 1,53,972 lives were lost along with causing injuries to 3,84,448 persons. India tops in the ranking with highest number of fatalities, which is about 11% share in the world. The magnitude of run-off accidents (6) has registered a growth of 7.0 percent between 2020-2021, where the persons killed and injured were of the order of 9150 and 19077 respectively in the total accidents of 19478 in 2021. This kind of accidents is increasingly becoming a major concern in the society, where the design of forgiving roads can save these valuable lives.

2. CONCEPT OF FORGIVING ROADS

In order to address the run-off accidents, a number of countries are working on the concept of 'forgiving roadside', which is designed to avoid accidents of errant vehicles with potential hazards or to minimize consequences of crash. The concept of Forgiving Highways (wider and straighter) would minimise crashes on non-freeways emerged from the 1966 National Highway Safety hearings. Many a times, there is dichotomy between adopting **self-explaining roads as against forgiving roads**. The forgiving roadside is to minimize the consequences of an accident caused by driving errors, vehicle malfunctions, or poor roadway conditions, while self-explaining road is designed to prevent driving errors. Forgiving roads address at the provision on roadside safety treatments that help bring errant vehicles back into the lane to reduce injury or fatal run-off-road accidents. If the vehicle meets with a road element, the next stage of action would be to minimize the severity of the crash. In other words, the roadside should be planned and designed to forgive the driver, his/her error by minimizing the severity of run-off-road accidents. Even the placement of Rolled-In Continuous Shoulder rumble (4) has a positive effect on the reduction of road accidents to the extent of 13 % as per the study on the Safety Evaluation of Rumble Strips Installed on Freeways, by FHWA in 1999, a before-after field study on 55 locations.

3. APPROACHES TO DESIGN OF FORGIVING ROADS

Conference of European Directors of Roads (CEDR) (3) had identified the design of forgiving roads as one of the top priorities in its Strategic Plan 2009–2013. In recent years, many studies have been conducted with a view to evolving guidelines to design forgiving roadsides worldwide, and several national standards have been produced. However, different approaches are often proposed. Most of the times, trees are by far the largest component for road crashes. Additionally, considerable numbers of lives are lost in collisions with lighting columns and other road equipment as mentioned above. Impact tests after the occurrence of road accidents after hitting a fixed object, a structure can be ranked into performance classes for:

- energy absorption level;
- impact speed; and
- vehicle occupant safety level.

Manufacturers of lighting columns and other support structures for road equipment have invested in the development of passively safe products since the year 2000. In 2010, passively safe lighting columns generally became the standard choice. Since then, accidents with passively safe structures have demonstrated several times that the system really works. Not all locations are suitable for the installation of a passively safe support. It is therefore imperative to design on the concept that people will make mistakes on the road leading the occurrences of crashes but the risks involved due to design of roads will have minimal effects on his causality/ injury.

4. A CONCEPT OF CLEAR ZONE

In most countries, the major strategy is to ensure a clear zone (also known as a 'safety zone') of a certain width allowing drivers to regain control over their errant vehicles and return to the lane or stop with the removal of obstacles envisaged during the planning phase for a new road in particular. They should be free of obstacles and have a flat and gently graded ground. In 2004, CETE Normandie-Centre and CEESAR conducted a study on the influence of roadside conditions, and surface on run-off-road accidents in rural areas (3), It inferred that a recovery zone is an important impetus to reduce the occurrence in the accidents. It is observed that when one is travelling off the road the vehicle was still controllable in 56 % of the cases. Provision of clear zone width is a function of the posted speed, shoulder, recoverable and non-recoverable side slope, and traffic volume. However, some guidelines also include curve radii in their calculations.

However there is a lack of standards concerning the so-called limited severity zone (the area beyond the shoulder). When a crash barrier is to be installed, certain things need to be considered in relation to the width of the barrier, the containment level as well as the potential effect on the occupants of the vehicle.

5. MEASURES IN THE ABSENCE OF CLEAR ZONE

When it is difficult to provide clear safety zone as well as to stop vehicles from colliding with obstacles, the final option is to shield these obstacles using road restraint systems (RSS). RSS in the form of Road Safety fences is increasingly becoming important as safety devices. It is used as a longitudinal protective system to reduce the severity of accidents resulting from vehicles leaving the carriageway. They can be divided into main groups: Edge barriers (or guard rails) and Crash Barrier. Edge barrier, also known as Roadside Barrier is generally placed at the edge of the road whereas crash barrier or median barrier is installed in the median of a divided road. The majority of longitudinal safety fences available commercially can be classified as i) Metal Beam, ii) Rigid Concrete, and iii) flexible cable. The metal steel beam is widely used as safety fence in most of the countries in the world. The advantage of metal crash barrier is to reduce the impact by primary redirection and deceleration force created by the friction between body of the vehicle and steel beam as opposed to rigid concrete barrier, where redirection is accomplished by the vehicle's wheels and not by the body of the vehicle. Upon hitting the concrete crash barrier, energy absorption at shallow impact angles results from compression of the suspension system. However, the standard does not give advice on which RRS to use in specific situations.

6. NEED FOR UNIFORM GUIDELINES

There is currently a lack of a uniform guideline for the selection of the appropriate road restraint systems. The use of safety barriers and other restraint systems comes under the purview of national regulations and standards with which the designer must ensure to comply with. Future uniform guidelines should also address the curb-barrier combinations as well as safe motorcycle restraint systems. Standards concerning this topic are currently under development in the European countries. The large number of possible approaches to treatments to make a road forgiving shows the great potential of this system for increasing road safety. Coordinated approach emanating from policy makers, administrators, engineers, researchers and designers may help road operators and authorities in their decisions to plan for safe roads. Common road planning procedures together with Road

Safety Audits or Road Safety Inspections on existing roads must include the specific view on forgiving roadsides.

7. DESIGN OF FORGIVING ROADS

In the light of the above, the Forgiving Road with and without roadside elements or crash barriers should explore all possibilities to address how to plan and design the road network system with safety and efficiency by considering the following:

- Width of clear zone
- Appropriate slope for recoverable and non-recoverable zone
- Types of Crash Barriers
- Barrier terminals,
- Shoulder rumble strips,
- Forgiving support structures for road equipment, and
- Shoulder width.

In addition to these, a large number of possible treatments to make a road forgiving demonstrate the great potential of this system for increasing road safety. While evolving a mechanism for safe and efficient road with the concept of forgiving road, it would take into account various parameters such as i) design criteria, ii) assessment of effectiveness road side infrastructures including crash barriers, iii) case studies/examples along with its best practices. Examples of Forgiving Roads are shown in Fig 1 and Fig 2.



FIG 1 Forgiving roads without crash barrier



FIG 2 Forgiving roads with crash barrier



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When analyzing Appendix D of chapter 7 of UK Traffic Signs Manual and Annexure VI of IRC 67-2012^[5], a clear difference in the Legibility Index Assumption is there between the UK and Indian standards. Also, on comparing the Appendix E of Chapter 7 of UK traffic sign manual with the Table 11.1 of IRC 67-2012, the UK traffic sign manual is based on approach/operating speed whereas IRC 67 is based on design speed and the direction sign categorization is not based on mounting format in UK Traffic Sign Manual.

UK Traffic Signs Manual states that for a destination name to be visible from 60m, the font size (small letter - “x” height) should be 100 mm which when converted to feet and inches will be 50 feet and 1 inch thus giving a LI value of 50. IRC takes the same assumption but with the Capital letter - “X” height. That means, if the destination name is to be read from 60m, the capital letter height should be 100 mm, thus equating to a **LI assumption of 50 but with capital letter height.**

Referring to the updates happening with the LI assumptions globally because of the increase in number of ageing drivers, specifically the Manual on Uniform Traffic Control Devices (MUTCD) 2009 edition^[6], now adopting a LI of 30 as to the previous LI assumption of LI 40 in 2003 edition. The IRC 67-2022 also considers an update in LI value from LI 50 (assumed in the previous revision i.e. IRC 67-12) to LI 45. Due to the absence of any studies on LI standards in India or research papers showing the increase in ageing drivers in India, the legibility index revision assumption is still limited to LI 45. Thus, for a destination name to be visible from 60m, the letter height (capital letter- X) should be 110 mm.

But as suggested by the MUTCD 2003 edition as well as in “Code of Practice of Signages (Chapter 4) for Urban Roads”^[7] prepared by the Transportation Research and Injury Prevention Programme (TRIPP) for the Institute of Urban Transport (IUT), Ministry of Urban Development, due to the increasing average age of motorists, 40 feet per inch shall be used as the Legibility Index assumption. This LI assumption needs to be verified after proper site data collection through sample surveys or through “in lab” simulations with users of various age categories and having various vision ranges along with secondary data on revalidation about the percentage increase in ageing drivers.

On reviewing multiple studies^{[8],[9],[10]} done mostly in the United States, it is understood that the Legibility Index assumption itself is a complex topic with various determinant factors like the fonts used, age of the driver, the type and color of the retro reflective sheeting, etc. Currently the assumption of LI 30 as per the MUTCD 2009 edition, corresponding to 20/40 vision, will be able to accommodate a greater proportion of aging drivers under a wider range of viewing conditions.

In India, driving license is issued by the Regional Transport Offices of each state and the procedure is regulated by the Motor Vehicle Act (MVA) 1988, amended in 2019. Also, there is gross underreporting of visual disability at the time of primary application for driving license or renewal. Several studies in India conclusively show that the active licensed drivers have significant visual morbidity that would predispose them to the risk of road traffic accidents^[11]. When the Visual Standards criteria for driving^[12] for multiple RTOs in India is analyzed, it is understood that the worse eye corrected visual acuity of 6/12 or better is required for getting a license for driving Category II vehicle (Transport vehicles- Heavy Motor Vehicles, Commercial Passenger carrying vehicles) and binocularly, with glass correction, the candidate should be able to read 6/12 or better to get a license for Category 1 vehicles (Motorcycles and Light Motor Vehicles). This is equivalent to the above requirement of 20/40 vision as in MUTCD standards and hence the same legibility index assumption of LI 30 shall be followed for ensuring that people having lower vision capabilities are also benefited with the Direction Signs.

Total Legibility Distance Calculation

The total legibility distance calculation including the reading distance and the cutoff distance is extensively tabulated for both mounting patterns (shoulder mounted / overhead mounted signs) and for various design speeds. But the increase in the reading time (ranging from 4 to

6 seconds) and subsequently increasing the reading distance for gantry mounted signs in Table VI.3 of Annexure VI of IRC 67 needs further analysis. Also, the cutoff distance calculation for shoulder mounted signs currently is based on the most common lane configuration seen for the design speed values. Considering the above two facts, more research is required for finalizing the total legibility distance by calculating the reading and cutoff distance more realistically as per the requirements. Ideally an equation shall be developed for calculating the total legibility distance based on the design speed, number of words, and offset distance.

Other Categories of Direction Signs

Currently the font size calculation for the other categories of direction signs like Flag Type direction signs/ Place Identification signs and Reassurance Direction signs are combined in one column in IRC 67 Table 12.1. This may also be verified or backed up based on the number of destination names and the mounting pattern, especially the reassurance sign which will be having three destinations just like the advance direction sign.

Scope for Further Research in Font Size Determination

With multiple high speed corridors coming up in the country as part of the infrastructure development and as per the improved life expectancy rates that we are seeing globally, there is an urgent requirement for further research either through actual field experiments or through lab simulated studies including people from various age groups and vision capabilities subjected to various types of direction information signs under multiple site conditions for establishing a proper clarity on font size estimation for Indian roads by establishing the following parameters.

- Finalize the correct legibility index assumptions for font size determination
- What LI to be adopted for Indian scenario considering the increase in ageing driver population - LI 45 or LI 40 or LI 30
- Calculation of Reading Distance and Cutoff Distance as per actual field data
- Developing a more comprehensive equation for deriving the font size or creating a matrix for font size considering the various design speeds, mounting format and number of words
- Whether font size of reassurance sign to be calculated like shoulder mounted advance direction sign or gantry mounted direction signs and whether the font size of the flag type direction sign or place identification sign to be calculated based on the number of destination names.

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BitChem Asphalt Technologies Limited

INTRODUCTION

BitChem is a road technology company which is India's *1st Technology Development Board – under Department of Science & Technology, Government of India funded project in road sector.*

This project is set up with State-of-the art manufacturing facility from Denmark to be scaled up for future demand. We have presence across three locations in India:

1. State-of-the-art Laboratory and Automated Plant establishment set up at Sampla, Near Toll Plaza, Haryana to cater to the Northern and Central Regions of the Nation.
2. State-of-the-art Laboratory and Automated Plant in Durgapur, West Bengal to cater to maximum locations of our country and SAARC countries on Eastern Coast of India.
3. State-of-the-art manufacturing unit with in house R&D Facility situated at 9th Mile, Ri-Bhoi Meghalaya near Guwahati which caters to the needs of the entire NER Market.

Bitchem is India's leading company in Coldmix[®] Technology promoting Green Roads. We deal in Tailormade Coldmix[®] Binder, Bitumen Emulsion, Bitumen and Modified Bitumen. BitChem has successfully executed 9500+ kms of green roads with its over 10 years Proven Technology throughout the Nation covering the length and breadth of the Nation – *from Jammu in the North to Ooty in the South* working closely with PMGSY in building a New India. Bitchem has also ventured into Highways sector and supplying Emulsion and Bitumen in multiple ongoing *NHAI and NHIDCL Projects across PAN India.*

Our Product range includes –

1. Bitumen VG-10, BIS Certified for VG-30 & VG-40 (vide license no. - CM/L -5500126404) & Other Grades.
2. Our fine quality high performance BitChem Bitumen Emulsion BIS Certified (vide license no. - CM/L - 5100165786) which captures the specification of IS: 8887-2018 for RS1, RS2, SS2 (RAP) & MS and ASTM D-2397 for SS1 (ASTM), CSS1 for use in spray applications such as Prime Coat, Tack Coat, Fog Seal etc.
3. Tailor made Patented Cold Mix Binder
4. PMB
5. CRMB
6. Micro surfacing
7. LDO
8. Anti-Stripping Agent

Milestones of BitChem :

- In 2016, BitChem represented North-East India at Make in India, Mumbai.
- In 2016, BitChem was selected as Home-Grown Innovation by TDB Team to join in Hon'ble Prime Minister Shri Narendra Modi's Delegation to Kenya.
- In 2017, BitChem has been presented CSIR Technology Award 2017 for Sustainable Cold-Mix Technology by the Hon'ble President of India, Shri Ram Nath Kovind.
- In 2018, BitChem was selected as India's 1st venture in road sector for funding by Technology Development Board, Department of Science & Technology, Government of India to set up a state-of-the-art automatic Industrial facility in Durgapur, West Bengal.
- In 2021, Govt. of India grants patent to BitChem for its Green Invention "TAILOR MADE COLD BINDER" vide Patent No. – 376242 for a period of 20 years effective from June 30, 2017.
- In 2022, BitChem is awarded the 2nd Runners Up Position in GITA (Global Innovation and Technology Alliance) Awards 2021 under Small Category.

INFRASTRUCTURAL DEVELOPMENT STRATEGIES FOR PROMOTING SAFER SCHOOL ZONES

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Road Safety is a global manmade health issue. Like any other health issue, it requires specific medicine for each group of individuals. The groups of the individual may vary in age, and appropriate remedies required. In India, students commute to school using a variety of modes including buses, metros, shared vans, shared autos, electric rickshaws, cycle rickshaws, bicycles, as well as drop-off by cars, motorized two-wheelers, and walking.

It is important to ensure children's safety in all modes of transport. A number of guidelines including IRC:SP:32 are available providing safety measures for all these modes. Parents and caregivers who walk or cycle the children to school must be given higher priority than those who commute by cars and motorized two-wheelers.

To avoid conflict points near entrance gate of school, gap in median and service road openings shall not be provided within 50 m from either side of the entrance gate. Vehicular traffic should be discouraged to halt or park in this area, especially the stretch in front of the entrance gate, unless there is a space designated to do so. Such parking restriction shall be marked by posting appropriate signage.



Vehicular and Pedestrian Movement around Schools Gates

Safety around school entry/exit gates to be ensured through proper traffic calming measures. To minimize number of conflicts near school entrance area, it is preferred to have pick-up/ drop-off zone inside the school premises especially for all children under the age group of 7 years. In case of space unavailability, multiple zones for pick-up/ drop-off needs to be identified by school management. This area needs to be conspicuously demarcated with signages/markings. This marking is required even if pick-up/ drop-off area is part of the parking area.



**Pick and Drop Facility for Private Vehicles
(The kerb stone is a deterrent)**

If location and circulation permit, moving of through traffic can be blocked for certain hours during the school opening and closing hours and the space can be provided to buses/ autos/ para transit and cars for people with disabilities. Elaborate Traffic Management Plans (TMP) can address specific safety challenges around schools, especially during opening/closing time of schools.

Further, in school zone area with wide roads refuge islands are recommended as it provides a safe place for young children and pedestrians while crossing wide streets, which ordinarily pedestrians could not have crossed in one go due to factors such as the speed of the pedestrian, number of lanes, signal timings, etc. A typical use of the refuge island is to provide a safe space for pedestrians to wait while crossing a street. Red and White crossing gives a unique identity to these markings in School Zone area.

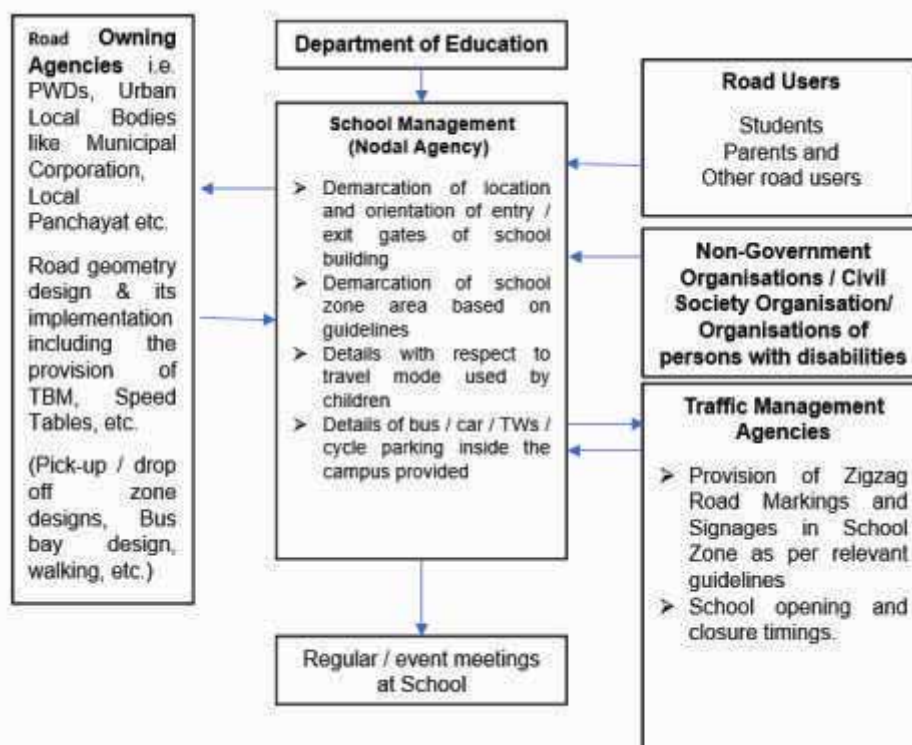


Refuge Island with safe space for pedestrians

As in (IRC:SP:32), school zones can be classified into three zones including school proximal zone (SPZ), school access zone (SAZ), and transition zone. **The school proximal zone (SPZ)** is the area around the school within which most students of that school will be present on roads, as they commute between home and school either by walking, cycling or public transport. **The school access zone (SAZ)** is the road (s) leading to every entrance of a school, extending 100 m on either side of the school entrance (s). **The Transition zone (TZ)** is the predefined length of roads leading to an SPZ. Since the speed limits prescribed in the

SPZ will be lower than the design speeds of different road classifications, TZ should provide motorists enough time and distance to reduce their speeds to the prescribed speed limits in SPZ.

The formation of school zone-level committee has been suggested in revised IRC:SP:32 to ensure the safety of school children. This committee comprises the member(s) from each agency including school management, like road-owning agencies, traffic management agencies, NGOs, all categories of road users including parents and children as depicted below:



Formation of Committee for Safe Commuting within School Zone

School zone is the area where more children are expected to be moving with/without an adult. Safety of these children are the responsibility of every stakeholder including every road user driving through this area. Any case of fatality of injury of a child in a road crash in the school zone is the failure of all engineering, education, enforcement, and emergency services.

Adoption of provisions of available documents related to school zone safety includes recommendations that can be easily implemented, provided there is the will to do so. Recording of crashes in school zones can be further strengthened by provision of audit expected in line with different guidelines. Awareness regarding safer commute to schools is likely to encourage all stakeholders to participate in school safety programs wholeheartedly.



A SUCCESS STORY – DEVELOPMENT OF EXPRESSWAY NETWORK IN UTTAR PRADESH

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At present, 4067.27 Km of expressways network is operational in the country. The longest expressway is Mumbai to Nagpur (520 Km). The widest expressway is Delhi to Dasna (UP Border) 28km in length and 14 lanes wide. In 2002-03 only 160 Km of expressways were operational in the country, and in 2013-14 a network of 1004 Km of expressways were operational. Up to 2020-21 only 2002 Km of expressways were operational. The country saw a leap to double the length in recent years, i.e., up to March-2023 4067 Km expressways became operational.

Uttar Pradesh is on top with 1396 Km of operational expressways at present. Maharashtra with 685.3 Km operational expressways is second. As per data available, 9521.76 Km of expressways are under construction either by Central Government or by State Government. The length of proposed expressways under Bharatmala and other schemes is more than 15000 Km.

The success story of expressway construction in Uttar Pradesh (UP) started with setting up of Uttar Pradesh Expressway Industrial Development Authority by GoUP under Industrial Area Development Act 1976.

1. The Agra – Lucknow Expressway (302 Km long), six lane wide (expendable to 8 lanes) access controlled, was developed on EPC mode by UPEIDA to reduce traffic congestion and to reduce pollution and carbon foot print. The construction activities were done on a fast pace and expressway was made operational in record time of 30 months. A 3.2 Km long air strip has also been built for war-like emergencies on the expressway. The expressway is connected to Yamuna Expressway through the Agra ring road and provides an express link between Delhi, Noida and Lucknow.
2. Earlier Noida to Greater Noida six lane expressway (24.5 Km length) was developed by Noida Development Authority and made operational in 2002 to promote industry, relief congestion of Delhi – Agra (NH), promotion of residential/ commercial hub on outskirts of Delhi.
3. Yamuna Expressway 165 Km long, six lane (expendable to 8) access controlled was conceived in 2001 to promote tourism (Agra, Mathura and Vrindavan) and de-congest Delhi-Agra (NH). The project was re-activated in 2007 and made operational in 2012. It was developed on PPP mode by M/s JP Infratech Limited with a concession period of 36 years.
4. UPEIDA started feasibility study for Purvanchal Expressway (341 Km) from Lucknow to Haidaria in 2016 for overall development of Purvanchal districts and provide better connectivity to Bihar border from Lucknow. Foundation stone was laid by Hon'ble PM Sh. Narendra Modi in Sep-2018 and after completion of project, it got inaugurated by Hon'ble PM Sh. Narendra Modi in Nov-2021. Despite Corona epidemic the project was completed in time.
5. Further getting nod from Hon'ble CM Sh. Yogi Adityanath, UPEIDA conceived third project, i.e. Bundelkhand Expressway, to promote tourism and development of most backward area of UP. The 296.07 Km long, four lane (expendable to six) was taken up for feasibility study in 2018. The construction of expressway on EPC mode was started in Jan-2020. Foundation stone was laid by Hon'ble PM Sh. Narendra Modi and project was made operational in Jul-2022 despite Corona epidemic. The project was inaugurated by Hon'ble PM Sh. Narendra Modi and during inauguration PM praised CM and his team to turn Uttar Pradesh as Expressway Pradesh.

6. Simultaneously Gorakhpur link expressway, 91 Km long, four lane (expendable to six) was taken up by UPEIDA. The project is going to be completed in Dec-2023.
7. Under the guidance of Hon'ble Chief Minister Sh. Yogi Adityanath, UPEIDA did feasibility study in 2020 for longest expressway in Uttar Pradesh, Ganga expressway from Meerut to Paryagraj for development and industrial growth of state. The project is 594 Km long, six lane (expendable to eight) to be implemented on PPP mode. The project got awarded for concession in March-2022 and work started in Dec-2022 after laying of foundation stone by Hon'ble PM Sh. Narendra Modi. The construction work is going on full swing and likely to be completed by Dec-2024.
8. Land acquisition for Balia link expressway (35 Km) was done by UPEIDA in record time and handed over to NHAI for construction.
9. Development of Chitrakoot link expressway, extension of Ganga expressway upto Haridwar and upto Varanasi are being considered by UPEIDA for implementation now.
10. NHAI also completed and made operational Eastern Peripheral Expressway (135 Km) six lane (expendable to eight) and Delhi-Meerut expressway (96 Km) having fourteen lane/ eight lane/ six lanes in different stretches. The major part of both the expressways lies in Uttar Pradesh.

UPIEDA is a newly established organization headed by Chief Executive Officer with a lean and laborious employee base, on contract, or on deputation from PWD/Revenue. Few are deployed on a retainership basis or by a service provider. Following cells are working for tackling problems and speedy implementation of projects.

1. Technical cell with 1 Chief Engineer, 2 Superintending Engineers, 4 Executive Engineers and 8 Assistant Engineers. PIUs were opened at different locations contract wise, headed by Executive Engineer.
2. Land acquisition cell with 1 advisor, 4 SDMs, 8 Tehsildars and other revenue personals.
3. OSD for environment and forest issues (retired DFO).
4. OSD for utility shifting and re-location.
5. Finance cell headed by finance controller.
6. Legal cell.
7. Procurement cell.

The major factor for success in speedy construction of expressways was proper planning of different construction activities and its monitoring on day to day basis by UPEIDA officers. The contractors deployed requisite manpower and machinery in consonance with the targets that were set for different activities for each single day. The authority facilitated the contractors by taking up issues that threatened to impede the progress of work with concerning government departments. The authority ensured timely payment to contractors to enhance the cash flow. The contractor on their part put in all efforts in timely procurement of material, manpower, machines, heavy equipment and other resources that were critical to the progress of projects.

A mobile application was developed to provide real time progress of all expressway projects.

UPEIDA's strategy to ensure success for its projects is initiated by aggressively pursuing the process of purchasing/ acquiring desired land in full ROW on mutual consent with land owner/ farmers and ensuring that purchase/ acquisition of major chunk of ROW land is completed by the time bids are received. Shifting of other impediment/ utilities were taken care in advance to get 90% hindrance free land to contractor on appointed date.

MoEF and forest clearance obtained before appointed date and tree felling/ re-location done by forest department as per schedule time. Approval of GADs from railway/irrigation were taken in time to avoid any delay. Regular pursuance with railway engineer during execution, launching, casting of slab, other works made the task result oriented. Regular pursuance

with power grid, power corporation for shifting of towers and electrical lines as per the scheduled construction program of contractor resulted timely completion.

Procurement of feasibility consultant, DPR consultant, EPC Contractor, Authority Engineer, Project Management Consultant cum External Technical Auditor, Safety Consultant etc. done by procurement cell in time.

All safety measures for safety of road users have been provided as per latest IRC code, way side amenities, petrol pump, kiosk etc. provided for road users. ATMS has been installed for smooth and safe traffic operations on all expressways.

During execution, any problem related to project got solved in time. All quality controls were ensured with three tier system, i.e. by EPC, by Authority Engineer and by external technical Auditor on day-to-day basis.





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LESSONS LEARNED FROM THE ROAD TRAFFIC CRASH CHARACTERISTICS OF A RURAL INTERCITY HIGHWAY AND AN EXPRESSWAY IN INDIA

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Introduction

As per the World Health Organization (WHO), road traffic crashes (RTCs) are one of the leading causes of death and disability across the globe (WHO, 2018). In low and middle income countries (LMICs), the share of total fatalities on roads is approximately 93% of the total fatalities worldwide. A recent report in 2020 by the World Bank suggests that RTCs, in poor and developing countries, result in more than 19.63 million deaths and serious injuries (World Bank, 2019) and the cost to economies due to RTCs is a whopping 1.7 trillion dollars and over 6.5% of gross domestic product (GDP). In India, RTCs were one of the top 10 causes of death in 2017 (ICMR et al., 2017). As per recent official data, in 2020, approximately 1,31,714 people were killed in RTCs in India (MoRTH, 2022b).

India has the second largest road network in the world, amounting to a road network in India, of about 63.71 lakh km in March 2019 (MoRTH, 2021). They support economic activity apart from providing mobility and accessibility to the masses. NHs play a vital role in providing medium and long-distance inter-city passenger and freight traffic across the country, which accounted for 35% of the total number of persons killed on roads, constituting only 2% of the entire road network in India (MoRTH, 2017). This study aimed to identify the most common crash pattern in the selected rural intercity national highway stretch and an expressway stretch.

Road Infrastructure

Road transport is essentially the prominent mode of transport in India and earned a great affinity among users concerning other transport modes due to ease of accessibility, flexibility of operations, door-to-door service, and reliability. Road transport services accounted for 3.10 percent of the country's gross value addition (GVA) (MoRTH, 2022a). Further, recent decades have observed the unprecedented growth of road infrastructure in the country and in 2018 the network length of NHs was 126,350 km. NHAI has planned to develop 2,638 km of expressways, out of which 237 km have already been completed and 1344 km are currently under implementation. On the other hand, the total number of registered motor vehicles in India as of 2019 is 295 million and growing at a CAGR of 9.91 percent. Along with the road network development and fast growth in motorization, there has been increase in the incidences of crash rates over the years, which has been shown in a study to be the highest for NHs with 0.67 deaths per km annually (Naqvi and Tiwari, 2015). Thus, the number of persons killed was more in rural areas (61.6%) compared to urban areas (38.4%) in 2016 and the vulnerable road users (VRUs) are found to be most unsafe on the rural highways of India. Although blackspot rectification programme is going on for several years, the first step is the network screening for understanding the crash patterns for further planning and formulating ameliorating the road safety concerns.

Methodology

A six-lane national highway stretch (NH-44) of 175 km length with fatal crash data for three years and the Yamuna Expressway with 165 km length with similar fatal crash data for six years were considered in this study. Exploratory data analysis (EDA) techniques were used, where EDA means looking at data to see what it says. The fatal crash data consist of crash event information, spatial variables, temporal variables, vehicles involved in the crash information and other information (refer Table 1).

Table 1: Summary of the crash data variables

| | |
|----------------------------|--|
| Crash event variables | Collision type; the number of serious injuries; the number of minor injuries; the number of fatalities; cause of the crash |
| Spatial variables | Chainage of the crash location; distance and direction concerning the local police station |
| Temporal variables | Day, date, time, month, and year of the crash |
| Vehicles related variables | Vehicle types involved in a crash; striking vehicles and impacted vehicles; vehicle registration number |
| Other variables | FIR number; Police state name; District name; IPC sections |

Results and Discussion

The NH 44 highway stretch had 720 fatal crashes from 2016 to 2018 with 824 fatalities. Out of the total 1712 segments, 466 had fatal crashes, and 33% of the segments had multiple crashes, and in all such crashes pedestrian-hit were highest followed by rear-end collisions, which were 29% of all fatal crashes. The plausible reasons for high pedestrian deaths on NH 44 could be the presence of villages and settlements along the highway. The road users involved in the fatal crashes in terms of distribution of the impacting vehicles and those involved as the occupant of the impacted vehicles, pedestrians, and cyclists on NH 44 are shown in Figure 1.

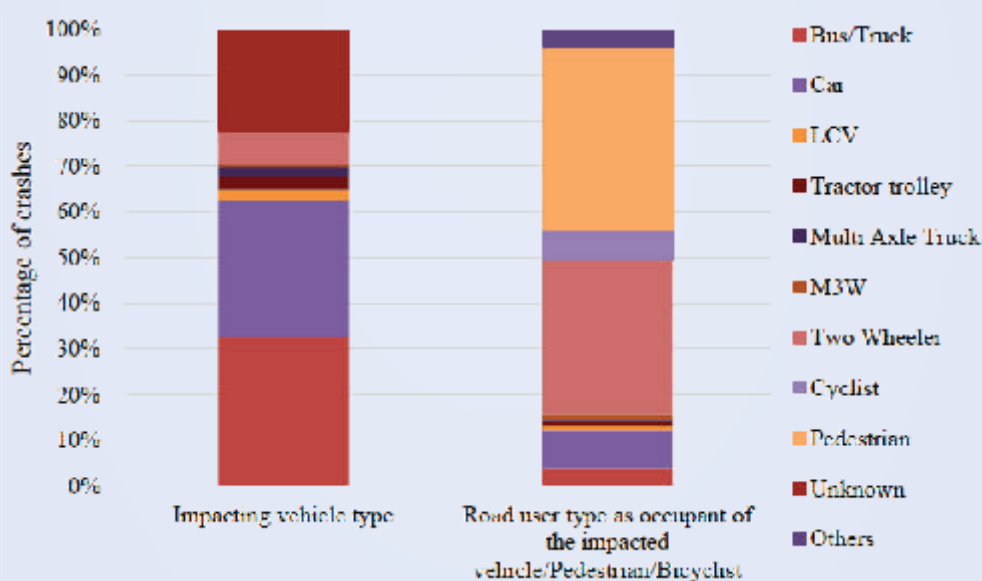


Figure 1: Distribution of the impacting vehicle type and road users involved in the fatal crashes on NH 44

Further, Figure 2 shows that the impacting vehicle types are similar in the case of all three considered crash types (in total fatal, rear-end fatal and hit-pedestrian crashes) on the NH 44. The results show that pedestrian and MTW fatality is high, while in the case of rear-end fatal crashes, MTWs fatalities are excessively high compared to the other road users on the selected NH 44 stretch. Thus, the results show that VRUs are at higher risk, especially pedestrians, on the studied intercity six-lane highway.

Similarly, fatal crashes of Yamuna Expressway from August 2012 to October 2018 were analysed, where there were 560 fatal crashes resulting in 738 fatalities, in which rear-end fatal crashes had the highest share, with a total of 270 fatal rear-end crashes resulting in 364 fatalities. Figure 3 shows that share of rear-end crashes (49%) was highest in the total fatal crashes, followed by hit median (12%) and hit pedestrian crashes (10%) in case of the

Though fatal crashes did not show any temporal variation, the share of night time fatal crashes was slightly higher than daytime crashes.

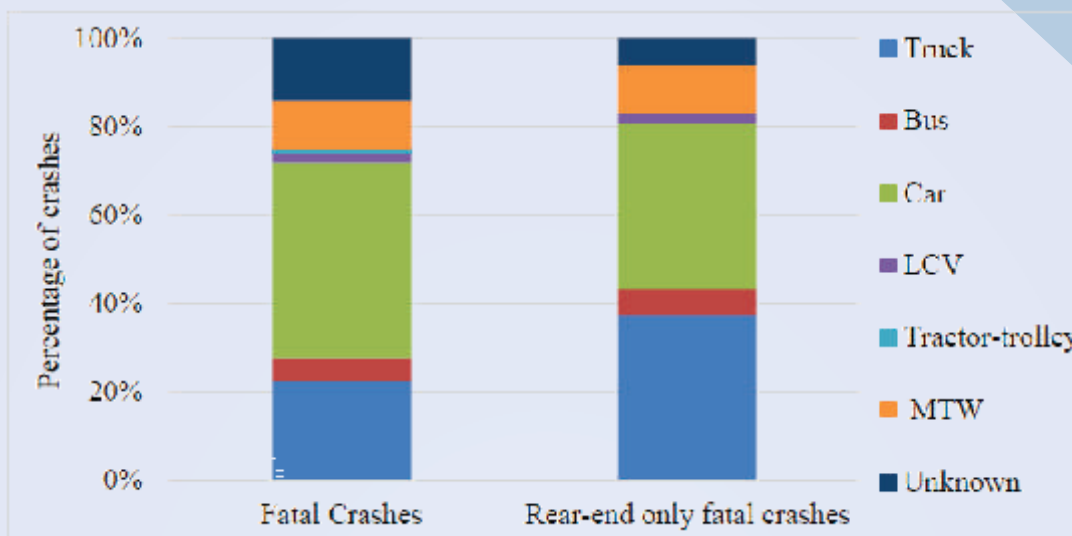


Figure 4: Distribution of the impacting vehicle types involved in total fatal and rear-end-only fatal crashes

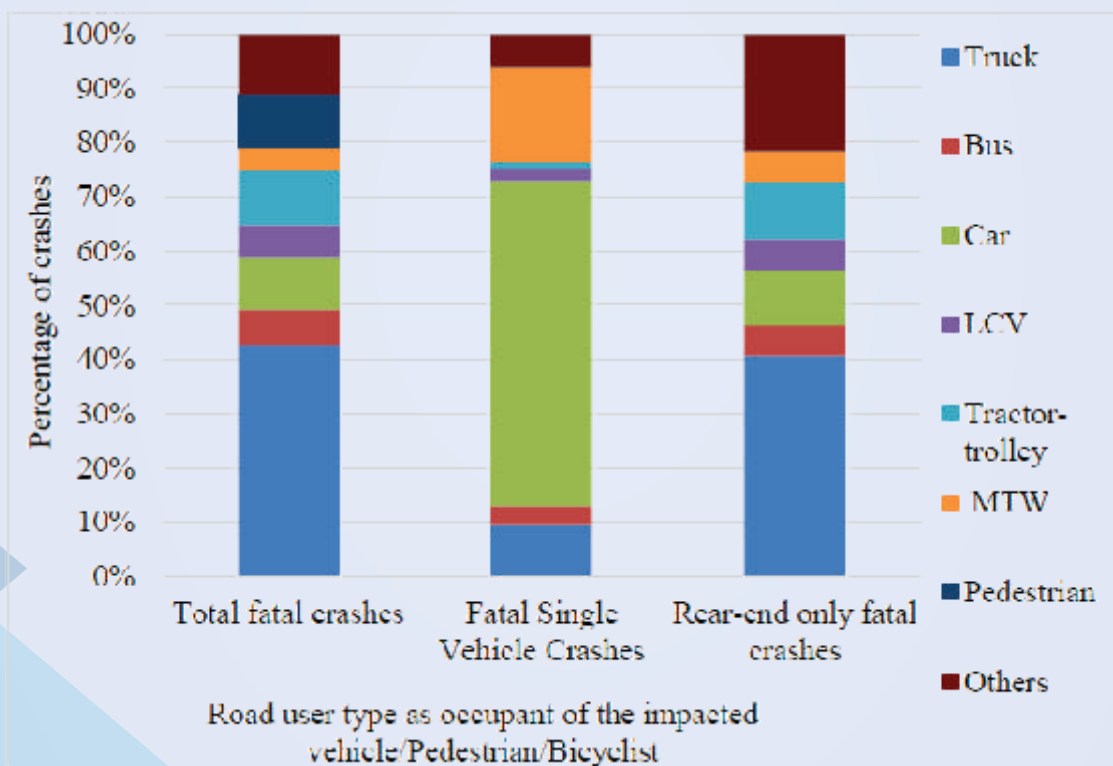


Figure 5: Comparison of the road users involved in the Yamuna Expressway

Conclusions

In the analysis of two highways, trucks and cars in rear-end crashes have been found to be significant in the total fatal crashes and fatalities, while on NH-44 pedestrian fatalities had the highest share. Further, VRUs, especially MTWs are at a higher risk on these highways and night time fatal crashes have a higher share. Providing driver warning system by rumble strips including the shoulder rumble strips. Vehicles stopped or parked on shoulders were the reasons for rear-end fatal crashes. The results may guide policy interventions for enhancing road safety on highways.

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IRAP CAN BE A GAME CHANGER IN ROAD SAFETY

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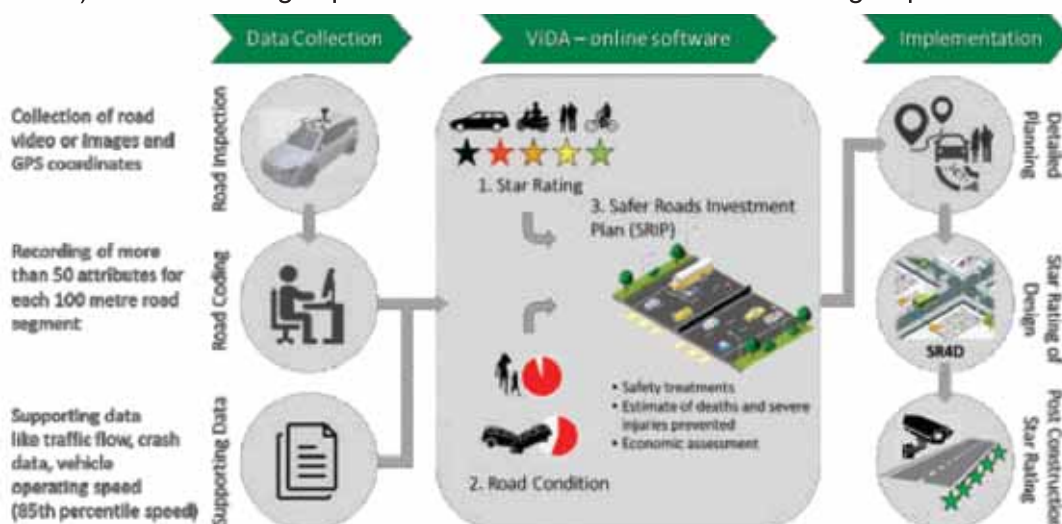
Introduction – iRAP and IndiaRAP

The International Road Assessment Programme iRAP is one of the key global advocates for road infrastructure safety and serves as the umbrella program for Road Assessment Programs (RAPs) worldwide, including IndiaRAP. In 2006, following the suggestion of the World Bank, RAP techniques specifically tailored for use in LMICs were developed. iRAP has developed a suite of software tools, including a Star Rating used for road safety impact assessment of existing roads and road designs.

IndiaRAP is the locally owned and led, globally supported road assessment programme tackling vital public health issue of road crashes. It has a vision for an India free of high-risk roads. The Indian Road Assessment Programme, IndiaRAP, was officially launched on 14th November 2017 at the IRF World Road Meeting (WRM) in Delhi. The local program is a result of collaboration between iRAP and the Asian Institute of Transport Development (AITD), generously supported by FedEx (2017-2020). IndiaRAP works with governments, development banks, mobility clubs, NGOs, research organizations and road safety stakeholders to support making India’s roads safer – 3-star or better. It draws on local technical expertise and research from key national stakeholders including the Indian Road Congress, MoRTH, NHAI, IIT, CRRI and IAHE in addition to state-level partners. Please visit www.indiarap.org for more information about the program.

What is Star Rating

Star Ratings are an objective measure of the level of safety which is ‘built-in’ to the road through more than 50 road attributes that influence the risk for vehicle occupants, motorcyclists, bicyclists, and pedestrians. The methodology involves a road inspection (video and GPS data) of an existing road, followed by extracting road attributes for each 100m road segment. This data, including the operating speed and traffic flow information, is processed to generate Star Ratings (1 star being the most unsafe, to 5 stars being the safest). The star rating is produced for each of the four road user groups.



Road safety assessments in India

To-date, more than 29,000km of NHs, SHs and urban roads have been assessed in India. The assessments included State Highway improvement projects in various states funded by World Bank and Asian Development Bank; the Delhi-Mumbai and Mumbai-Chennai National Highways arm of GQ in partnership with NHAI and funded by GRSF; over 200km urban

roads in Mumbai under the BIGRS program; Delhi-Panipat and Panipat-Chandigarh NH with NHAI; NHs assessed for road concessionaires; and SHs assessed in partnership with IIT Kharagpur in the state of West Bengal. A range of data inputs and project set-up variables were modified, and the model was calibrated with road network level crash data to ensure the IndiaRAP Star Ratings and Investment Plans reflect local conditions, practice and experience.

Star Ratings as a road safety management tool

In the state of Himachal Pradesh, the HPRIDCL under a World Bank funded project is developing action plan to reduce road crash fatalities and serious injuries over the state road network. The plan addresses various aspects of road safety such as strengthening enforcement, road user awareness, strengthening emergency response, improving road infrastructure, and capacity building of all stakeholders. Over 7,000km of NHs and MDRs (state roads) are being assessed under this program. The assessment will provide Star Rating and the Investment Plan showing key road safety treatments with tentative cost-benefit analysis that will be utilized to prepare a prioritized action plan for implementing safety treatments. The State Govt., among other recommendations to improve safety, will implement the safety treatments over a period of 10-20 years with prioritization based on crash history and cost-benefit analysis.

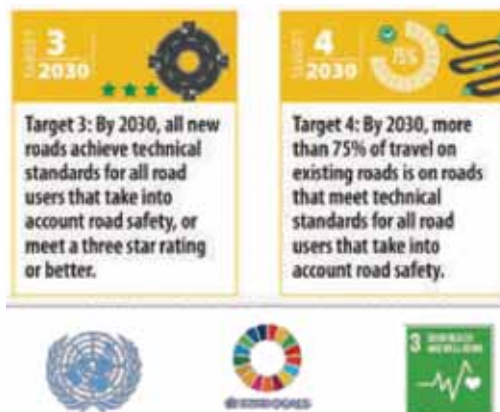
In the Karnataka State Highway Improvement Project-III funded by ADB, over 17,000km of state roads are being Star Rated along with road safety audit. This large scale assessment will help to identify high-risk (1-2 star) road sections and prioritize over 1,000km road network for implementation of safety treatments.

The Star Rating is being used as a proactive road infrastructure assessment tool that enables easy comparison and benchmarking of the safety performance of large road networks in relatively short time. Unlike traditional road safety tools that rely on historical crash data, it incorporates predictive analysis. It considers factors like road design, traffic flow, vehicle operating speed and infrastructure features to identify road sections where the likelihood and severity of crashes is high. This enables the prioritization of safety interventions based on potential risks. By identifying and prioritizing cost-effective safety improvements, iRAP helps optimize the allocation of resources. It assists decision-makers in targeting investments in road infrastructure modifications that provide the greatest safety benefits, thereby maximizing the return on investment. It is worth noting that iRAP Star Rating is not meant to replace other road safety tools like road safety audits, inspections, or blackspot investigations. Instead, it complements them by providing a systematic and predictive approach to assess and improve road infrastructure safety.

Decade of Action for Road Safety

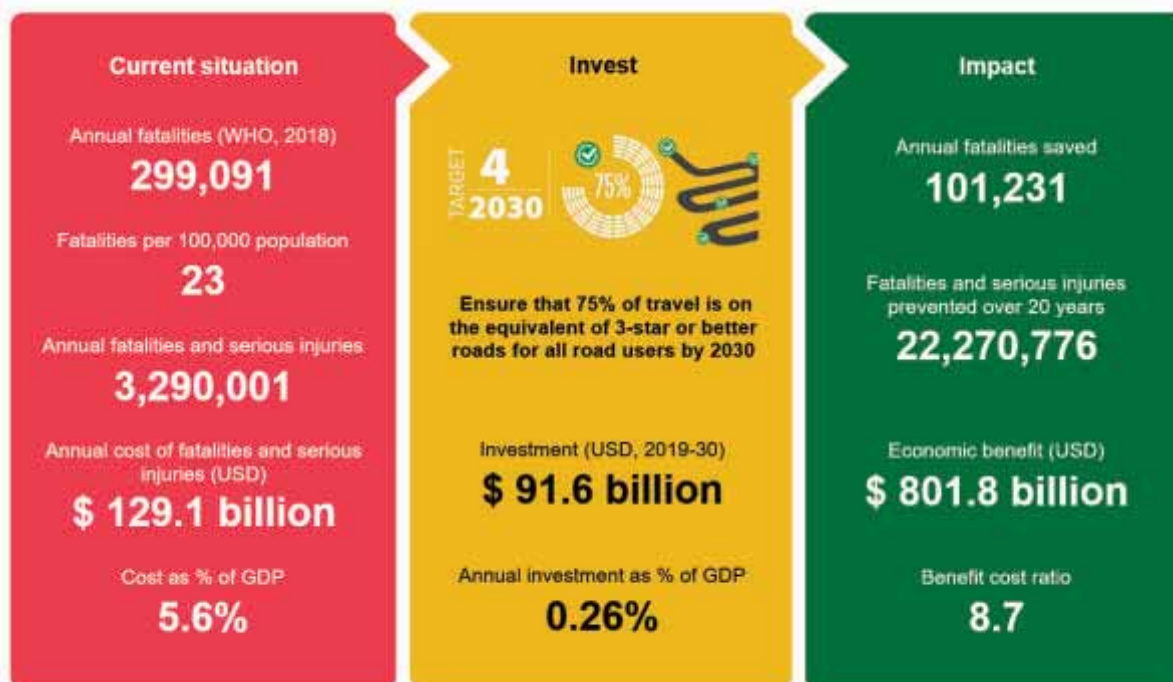
In September 2020, the UN General Assembly adopted resolution for “Improving global road safety”, proclaiming the Decade of Action for Road Safety 2021-2030, with the ambitious target of preventing at least 50% of road traffic deaths and injuries by 2030. The Global Plan emphasizes the importance of a holistic approach to road safety, and calling on continued improvements in the design of roads and vehicles; enhancement of laws and law enforcement; and provision of timely life-saving emergency care for the injured. The global road safety action plan outlines the “what to do, how to do it and who to do it” to achieve the **12 Global Road Safety Performance Targets**, calling on governments and partners to implement the Safe Systems Approach in the creation and implementation of strategies and programmes for road safety, sustainable mobility and urban design.

Safe road infrastructure is a key focus of the Plan, alongside safe road use, safe vehicles, multimodal transport and land-use planning, and post-crash response. The Target-3 and 4 relates to road infrastructure improvement. Target-3 mentions ensuring all new roads are built to a 3-star or better standard for all road users, and Target-4 mentions more than 75% of travel is to be on the equivalent of 3-star or better roads for all road users by 2030. IndiaRAP is supporting India's achievement of the United Nations Sustainable Development Goals and the Global Road Safety Performance Targets.



Impact of achieving Target-4 for India

The iRAP Safety Insights Explorer provides vital information regarding the current safety situation, the level of investment required and its expected impact. The cost of road crashes in India is over 5% of GDP every year, and investing 0.26% of GDP to improve the infrastructure and implement speed management will provide huge economic benefits with the benefit-to-cost ratio of over 8-to-1.





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1. Preamble

Looking at the historical crash data in the city of Nagpur, it was observed that the number of road crashes between 2008 to 2020 was ranging between 1200 to 1500 every year, which roughly translates to 60 crashes per 1 lakh population. The fatality rate was found to be 10 victims per lakh of the population. Out of the above, pedestrians and two- wheelers (*including some minor proportion of bicyclists*) account for 85 % and 59 % of road crashes in urban and rural areas of the city respectively, which implies the fact that there is a lack of adequate infrastructure to ensure the safe commute for the above categories of vulnerable road users. The above number is somewhat on the higher side for a city like Nagpur, which demands for devising appropriate engineering solutions coupled with technological interventions. To address the above issues, ***iRASTE: Nagpur***, a pilot project was inaugurated under the august presence of the **Hon'ble Minister of Road Transport and Highways of India, Shri Nitin Gadkari** on 11th September 2021. This pilot project is aimed at reduction of at least 50 % fatalities / serious injuries by the end of 2023 through the implementation of a holistic Safe Systems Approach by addressing the three vectors namely, vehicle safety (*which encompasses driver safety*), infrastructure safety and mobility safety, which are outlined in the objectives and scope.

2. Objectives and Scope

- **Vehicle Safety:** Improve safety of public transport fleet leveraging AI. The buses of Nagpur Municipal Corporation (NMC) used as pilot fleet / probe vehicles to study the effectiveness of AI-based Collision Avoidance System (CAS). CAS installed in the above fleet generates the following alerts / warnings namely, Forward Collision Warning (FCW), Pedestrian Collision Warning (PCW), Headway Monitoring and Warning (HMW) and Lane Departure Warning (LDW).
- **Infrastructure safety:** Development of remedial measures *i.e. countermeasures* for the identified blackspots and continuous monitoring of road assets. In this regard, 37 black spots (*8 midblock locations and 29 intersections*) were identified based on the analysis of First Information Report (FIR) data for the road network in the Nagpur Metropolitan Region (NMR). Detailed Geometric Design Plan (GDP) have been conceived and submitted to the relevant stakeholders.
- **Mobility Safety:** Perform proactive identification of potential road crash prone locations *i.e. grey spots* using the above ADAS (CAS Warnings) and road geometric data, and develop grey spot models. Such proactively identified **grey spots** would prevent the development of potential blackspots in the foreseeable future as these are identified through continuous dynamic monitoring of road risks by integrating the CAS data and existing road geometry at any given location.

3. Methodology

A unique attempt is made to operate beyond traditional approaches to address road safety by leveraging the power of AI as the predictive insights generated to prevent road crashes. To address the same, for the first time, AI is acting as a force multiplier to transform road safety engineering by addressing the three vectors namely, driver safety, mobility aspects and infrastructure safety in an integrated manner which is shown in Figure 1. An illustration of CAS installed in a NMC buses along with typical live detection of motorized two wheeler spotted in the blind spot of the bus, during driving in the form of PCW, is depicted in Figure 2. Figure 3 presents the various alerts generated as part of Advanced Driver Assistance

System (ADAS). As illustrated above in Figure 2, both the video and audio warnings are generated as part of ADAS (as CAS warnings)

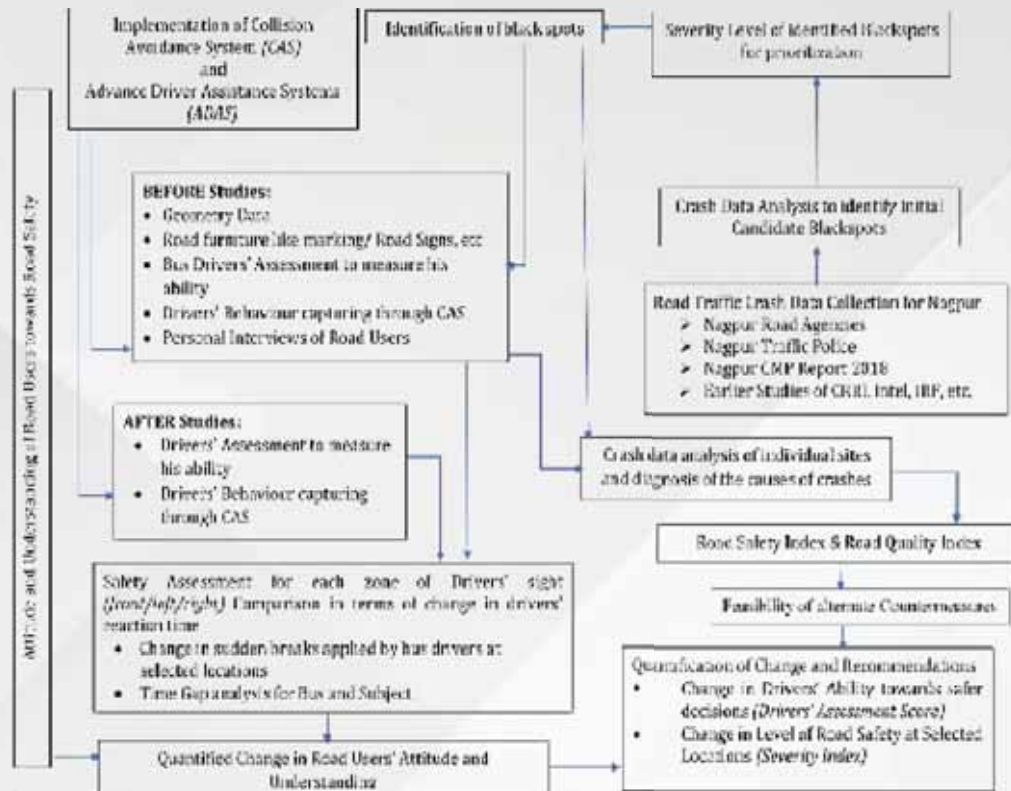


Figure 1: Study Methodology



Figure 2: CAS unit installed in a bus; Typical Illustration of PCW warning generated due to 2-wheeler



Figure 3: Illustration of various Alerts

4. Deliverables Achieved

It is evident from the above discussion that the vision of **iRASTE: Nagpur** project is to leverage AI with road safety engineering and thus create a meaningful impact in achieving targeted road safety goals. The interim results deduced till now under the *vehicle safety vector* are highly encouraging with 60 % drivers on an average demonstrating improvement in safe driving behavior based on CAS warnings and efforts are on to increase it to 90 % or more compliance. Similarly, *under the infrastructure vector* detailed Geometric Design Plan (GDP) have been conceived for all the 38 blackspot locations along with the conduct of the economic benefit analysis for 4 typical blackspots. On the other hand, the ability to leverage CAS data by integrating with the existing road geometry resulted in the development of grey spot models under the mobility vector. Eventually this has helped in the identification of the grey spots which is otherwise can be terms as the potential blackspots. Such continuous data on road risk are being used to deduce measures required at the top 20 identified grey spots so that these grey spots does not become blackspots in the future, and also evaluated on-ground impact of these safety interventions after implementation. The model developed to identify the grey spots developed (*till now*) is given below:

$$\text{Severity Index (SI)} = (0.144 \eta_{PC} + 0.144 \eta_{LD} + 0.144 \eta_{PC}) + \\ (1.438 \eta_{3arm} + 1.735 \eta_{4arm} + 1.779 \eta_{roadlen})$$

The grey spot model using CAS data can be reckoned as a more accurate and scalable approach than one-time manual surveys.

5. A Glimpse of Accomplishments

Vehicle Safety:

- 150 vehicles are equipped with CAS devices, 1100 drivers trained in defensive driving and ADAS.
- 60% of drivers in ADAS-enabled buses have shown sustained improvement in safe driving behavior.
- 20% reduction in road crashes observed in the lead operator.

Mobility Analysis:

- Identified 20 greyspots_(*potential future blackspots*) based on CAS data insights.
- Agreement with enforcement agency to validate these spots.

Infrastructure Safety:

- All 38 DPRs of blackspots submitted and planning a round table with all the Road Owning Agencies to move forward on implementation.
- Before and After videos for 2 spots, Economic Impact Assessments for 4 spots.

Road Safety Index / Road Quality Index:

- Defined and validated for two pilot corridors.

Awareness:

- Eye camp and spectacle distribution conducted for 600 NMC drivers.
- Completed pilot awareness programs at Greyspot and Blackspot.
- Initiated Sustained Social Media Campaign.

6. Present Endeavors

- Endeavour is to have at least 9 out of 10 drivers improve the driving behavior amongst the 1500 drivers targeted in the NMC Driver Fleet Roster which can directly help to enhance road safety on Nagpur roads.
- Comparison with published FIR Data for 'before' and 'after' CAS data involving buses.

- Execute on iRASTE Model Corridor to showcase impact of the multi-prong approach (*Greyspot Prediction+ Blackspot Rectification + Severity Index*) seeking the help of NMC and other associated road owning agencies.
- Exploring the possibility of Black Spot / Grey Spot Intervention Program on a Corridor.
- Blackspot Remedial Measures Implementation and Grey spot awareness campaigns.
- Engage with National Bodies to transform learnings / recommendations into Policy Guidelines.



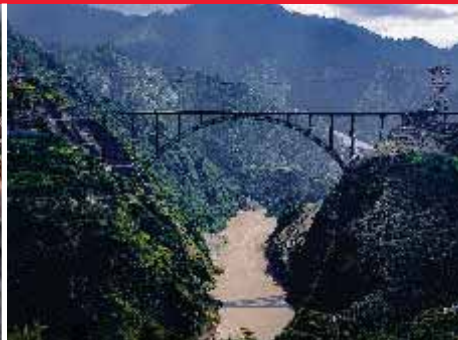
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South Surra Road Project, Kuwait

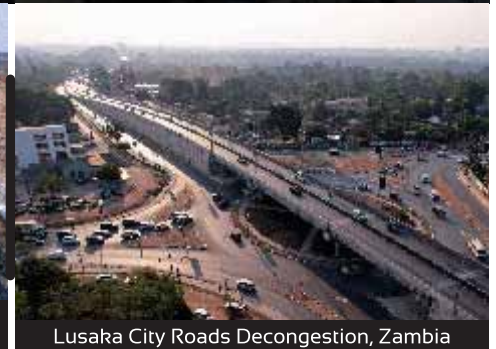
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Afcons Infrastructure Limited (Afcons) is a part of the Shapoorji Pallonji Group, one of India's leading engineering and construction conglomerates. Afcons has a diverse experience of on-time execution of over 350 infrastructure projects in more than 25 countries. Overseas, Afcons has delivered over 50 infrastructure projects across Africa, Asia, and the Middle East. The company has successfully executed landmark infrastructure projects in areas of Roads & Highways, Bridges, Rail, Metro, Tunnels, Ports, Industrial projects, LNG, Hydropower & Water Works, and Oil & Gas.

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Afcons is the only Indian contractor in Top 50 International Contractors in Transportation as per latest Engineering News-Record (ENR), USA, survey. With over 4500km of road network, over 150 bridges & flyovers, and in-house capability to design bespoke solutions, Afcons is one of the leading organisations in roads infrastructure.

HOW TECHNOLOGY CAN HELP REDUCE ROAD ACCIDENTS AND MEASURE DRIVER PERFORMANCE

Amit S. Kumar
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1. Introduction

One of the most serious problems that India is facing today is road accidents. It is estimated that 1.55 lakh people were killed in 2021 in road accidents, and further 4 lakh were injured. This issue is only getting worse as the road infrastructure continues to get better and number of vehicles on the roads continues to increase.

With less than 80 thousand traffic policemen for a population of more than 30 crore vehicles, it is highly impossible for government and traffic authorities to manually enforce traffic rules and put up a curb on road accidents.

2. What do road accidents cost India?

Over the past year, India has experienced a staggering loss of over 400 citizens per day due to road crashes, with no clear way to quantify the extent of its impact. The economic repercussions are equally significant, with damages to infrastructure, businesses, and the ecosystem costing more than 1% of the GDP.

Beyond the loss of human life, reducing road crashes could also result in substantial savings in healthcare, cargo, and vehicle repair costs, which currently run into billions of dollars. Such savings could be directed towards other investments or government initiatives.

3. What are the major factors driving road accidents?

The occurrence of road crashes and fatalities are influenced by various factors such as road infrastructure, vehicle safety, driver behaviour, and emergency facilities. While policy makers, government, agencies, and OEMs are working towards making the infrastructure and medical ecosystem better, it is reported that 80% of the road-fatalities are the victims of dangerous driving or human-error. It is estimated that India could potentially save 1.2 lakh lives in a year if drivers were more attentive and followed traffic rules.

Some of the common errors that contribute to road accidents include:

- i) **Lack of awareness about traffic rules:** There is a significant gap in the education and enforcement of traffic rules among drivers in India.
- ii) **Over-speeding:** The likelihood and severity of a crash increase with the speed of the vehicle. While over-speeding is a legal offence, reducing speed limits dynamically in busy roads or in unusual weather conditions is necessary.
- iii) **Distracted driving:** The usage of mobile phones while driving is a major cause of accidents, while drunk driving and other distractions are persistent issues.
- iv) **Non-use of restraints:** Seatbelts, helmets and airbags can significantly reduce the risk of death. However, most commercial and traditional vehicles do not have these features or they are not used as recommended.

Given the limited resources with enforcement agencies and the complexity of the ecosystem in India, it is crucial for the country to explore smarter ways to address the issue of road safety.

4. How can technology help reduce road accidents?

Over the past few years, technology has played a key role in enhancing various aspects of our lives, and road safety is not an exception for technology adoption. Here are a few key notable technologies that can be utilized to enhance road safety:

- i) **Driver Monitoring Technology:** Driver monitoring technology has become a reliable ally for drivers on the road, thanks to the advancements in Artificial Intelligence (AI), Machine

Learning (ML), and Cloud Computing. These vision-based technologies have the ability to monitor the outside environment of the road as well as the driver's behaviour, enabling them to detect and respond to changes on the road real-time. The technology encompasses a wide range of features such as object and vehicle detection, speed limit sign recognition, traffic light monitoring, detecting high acceleration, and hard braking, driver fatigue and distraction, seat-belt compliance, and other factors that cause accidents.

For organizations involved in transportation of goods, logistics, or even employee transportation, investing in this technology is crucial. The best part is that it does not require the replacement of existing vehicles or modifications. It is a simple add-on solution that can be installed in any vehicle and provides a significant portion of the benefits that would otherwise only be expected from futuristic autonomous vehicles.

- ii) **Advanced Driver Assistance Systems (ADAS):** ADAS are computer systems that are designed to help drivers recognize and respond to the hazards on the road. Features of these systems include lane departure warnings, pedestrian detection, and adaptive cruise control. The European Union has already mandated Intelligent Speed Assistance (ISA) in all new cars sold from July 2024 in an attempt to reduce road crashes.
- iii) **Intelligent Traffic Systems (ITS):** Intelligent Traffic Systems utilize sensors and cameras to observe traffic patterns and communicate this information to the drivers, enabling them to adjust their speed, avoid accidents, and anticipate changes in traffic flow. In a vision of the future, ITS could integrate with Vision-Based Driver Safety Systems to capture and store traffic violations for all vehicles throughout the country, streamlining enforcement efforts for authorities.
- iv) **Alcohol Interlock Systems:** Alcohol interlock systems detect the presence of alcohol in a driver's breath and prevent the vehicle from starting if the driver is above the legal limit. This can help reduce the risk of drunk-driving incidents.

5. How can technology measure and improve driver performance?

Similar to the credit scores, today's technology can measure the driving behaviour on the basis of the driving habits and provide a quantifiable score. Based on positive and negative driving events, these new-age systems capture every aspect of driving and provide powerful insights to the policy makers as well as fleet operating organizations to:

- i) award the safe drivers and encourage positive road behaviour
- ii) build automated coaching programs for the ones who need improvement
- iii) generate a dashboard of commercial vehicle organizations and map them as per their fleet's overall driving scores
- iv) automate rebate on insurance premiums based on driving scores
- v) build a system to renew or cancel driving licenses on the basis of the driving scores

Moreover, commercial entities can use these systems to gain insights into the effectiveness of their safety policies and procedures. By adopting such technologies, they can showcase their dedication to safe driving to their employees, customers, and other stakeholders.

Additionally, training can be automated to provide real-time feedback, personalized coaching, prioritize coaching based on severity, and offer automated reporting. Through the use of these technologies, we can ensure that drivers are better equipped to make informed decisions and stay safe while driving.

6. Conclusions

To successfully implement emerging technologies and mitigate mortality and morbidity, it is imperative that a collaborative effort is made across various stakeholders in the ecosystem. This includes government bodies, policy makers, industry associations, automotive manufacturers, corporate world, and individuals. Working together, these stakeholders can



collectively take steps to adopt and integrate new technologies into their processes and products.

Overall, it is clear that technology can go a long way to help reduce road accidents and improve driver performance. Utilizing advancements such as computer vision technologies, sensors, and driver-assistance devices can help drivers become more aware of their surroundings and stay safe on the roads.

Technology has the potential of creating safer roadways for today and a smarter roadways for tomorrow. This would allow more people to experience the joy of driving and travel around with confidence.





NETRADYNE - COMPANY PROFILE FOR IRF-IC YEARBOOK

Netradyne Technology India Pvt. Ltd

Our Mission: To transform road and driver safety by using advanced vision technology and change the way drivers interact with the road environment or traffic conditions around them, therefore, creating safer roadways for today and smarter roadways for tomorrow.

Projects Undertaken: Netradyne technology is being implemented in a number of organizations across various business sectors including oil & gas, FMCG, hazardous and valuable goods vehicles, logistics providers and more. The list includes CJ Darcl Logistics, BD Dhalla Transport, Transystem Logistics, Writer Safeguard, an international oil company, and many other modern service providers. Outside India, Netradyne technology is being leveraged by a few schools and employee transport organizations to improve road safety in the space of people transportation too.

Our Innovations: Netradyne's revolutionary product supports Education and Enforcement from the 5E program of IRF-IC with its vision-based Driveri® safety camera system. It uses cutting-edge technologies including Artificial Intelligence (AI), Machine Learning (ML), and Edge Computing to create new safe driving standards for the vehicles. The IoT device helps reduce unsafe driving incidents, and empowers drivers by providing awareness around risky driving behavior and rewarding safe decision-making. Driveri® also uses Edge Computing for real-time data analysis, insights, and coaching through audio alerts.

Competitive Landscape: Sophisticated AI technology is powered by 12 billion kms of driving data, that Netradyne's system has gathered already, makes Driveri® one of the most intelligent systems in the market. This delivers high precision and more accurate results for the driver and fleets to be safer.

- **Driveri®** uses patented advanced AI and Edge Computing to capture the complete driving time with accurate object detection and full visibility to the incidents.
- **GreenZone®** is the industry's first driver score built on positive driving, versus solely focusing on negative events, and is quickly becoming the industry standard in driver performance.

Milestones Achieved: Several of our customers have reported a reduction of 50% in their road-accidents within a few quarters of deployment, and this is the biggest achievement and testament of the difference that Netradyne is making in the economy as well as in society.

In addition, some of the milestones & reported results are:

- Reduction in driver-distraction and driver-drowsiness alerts by upto 80%, significantly contributing towards the reduction in road crashes
- Granted 18 patents already
- Recognition by Forbes as one of the top 50 AI companies
- Recognition from Startup Lanes as one of the top 20 AI companies
- Recognitions by CII-Institute of Logistics, Business World, etc

GLOBAL ROAD SAFETY THROUGH AI AND AUTONOMOUS VEHICLES: PERSPECTIVES FROM DEVELOPED AND DEVELOPING ECONOMIES

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0. The Global Picture

As per World Health Organization, road safety is a grave concern across the globe that claims 1.35 million lives annually. Various elements, such as the state of the infrastructure, the observance of traffic regulations, and the uptake of technology developments, contribute to a vast extent about the contrast seen between the road safety conditions in developed and developing countries. A thorough investigation will delve into these dissimilarities with a focus on the innovative possibilities of artificial intelligence (AI) and autonomous vehicles in the field of road safety. It will also be able to draw the attention of road safety researchers in India, about what best represents great potentials and also complications of this global problem.

1. Road Safety in Developed Countries

In developed economies, modern infrastructure, strict imposition of traffic regulations, advanced emergency services, and cutting-edge technologies create a more controlled and safe driving environment. The use of AI and autonomous driving in various countries is being examined to further improve traffic safety.

1.1 Harnessing AI for Road Safety

Artificial intelligence has seen its widespread adoption in developed countries for improving road traffic safety. The approach to road safety has entirely been transformed by its applications in Intelligent Traffic Management Systems (ITMS), road traffic analytics with video and predictive analysis and vehicle safety systems. AI-powered predictive analytics is a powerful tool for road safety improvements, which processes a substantial amount of data from multiple sources, including embedded road sensors, traffic cameras, and historical crash data. The ability to foresee possible dangers to different road users using patterns and correlations in this data enables authorities to take preventative actions. Envisaging potential crashes makes it a crucial element of proactive road safety efforts.

1.2 Advanced Driver Assistance Systems (ADAS)

In developed nations, Advanced Driver Assistance Systems (ADAS), which are supported by AI, are a standard feature of modern vehicles. Technologies like lane departure warning systems, blind-spot recognition, and automatic emergency braking improve the safety of both the passengers within the car and other drivers on the road. ADAS technologies are intended to warn drivers of potential dangers, and in certain cases, even take control of the vehicle to stop accidents. In order to lower the danger of serious crashes, automatic emergency braking systems, for instance, recognizes impending crashes and apply the brakes if the driver fails to do so.

1.3 The Emergence of Autonomous Vehicles

The apex of AI's contribution to improved road safety is autonomous vehicles. Enabled with sensors, cameras and sophisticated AI systems, these vehicles carefully follow traffic laws, can enhance the safety of drivers and other road users by eliminating human errors that cause traffic crashes. These advanced sensor systems in autonomous vehicles provide greater spatial awareness and quicker response times than human drivers. They quickly respond to fluctuating traffic conditions and unforeseen risks, significantly boosting road safety.

1.4 Challenges in Developed Countries

Despite significant advancements in road safety brought about by AI and driverless vehicles, significant issues still exist in developed countries. Among these, the safety of Vulnerable Road Users (VRUs) like cyclists, motorcyclists, and pedestrians still remains a matter of great concern. In complex situations, autonomous vehicles must recognize these people and respond accordingly. The detection and response capabilities of modern sensors and AI algorithms can be enhanced, but greater comprehension and prediction of VRU actions require substantial improvement. The potential for increased cyber threats along with the prevalence of autonomous vehicles, underlines the requirement for strong cyber security and safeguards. All road users, including VRUs, are at increasing risk from distracted driving behaviour (DDB), which frequently results from smartphone use. Mitigating this risk is essential as we head toward a future, where autonomous vehicles predominate. It is a challenging endeavour that necessitates ongoing research, technological development, and strict regulatory frameworks to ensure everyone's safety, including that of VRUs, in a traffic ecosystem that is rapidly changing.

2. Road Safety in Developing Countries

A different set of complications prevail in the developing countries. Their problems with road safety are frequently caused by underdeveloped infrastructure, slack enforcement of traffic laws, and subpar post-crash treatment. This situation is aggravated by highly heterogeneous traffic conditions and non-lane-based driving behaviour. However, there is enormous potential for AI and autonomous technology to improve traffic safety in these countries.

2.1 AI in Traffic Management and Infrastructure Development

Road safety in developing nations can be significantly improved with the use of AI-powered traffic management systems. By constantly adjusting signal timings based on current traffic demand, these systems can ease congestion and guarantee a smoother flow of traffic. This can greatly lower the number of collisions caused by enraged and aggressive driving. AI can also help create safer and more efficient infrastructure in a logical manner. The design and prioritization of road construction projects can be influenced by AI by examining patterns in traffic volume, crash sites, and road conditions. This may result in more effective and secure road networks.

2.2 Promoting Safer Driving Practices with AI

AI can be used to encourage safer driving habits. Telematics systems, for example, may track and evaluate driver behaviour, giving drivers feedback in real time and promoting safer driving practices. Unique smartphone-based technology, when used at Regional Transport Offices, can monitor drivers and their driving with the aim of improving driver training and testing, and at the same time help evaluate drivers during their driving test. These systems can help create a safer driving environment.

2.3 Autonomous Vehicles: A Vision for the Future

The introduction of autonomous vehicles has the potential to significantly reduce the frequency of traffic crashes by maintaining constant speeds by improving standardized infrastructure along travel routes, and removing the risk associated with human errors like distracted or impaired driving. However, there are several challenges on the way to the success of autonomous vehicles in developing nations. The issues that need to be resolved include rapid urbanization, design deficiencies in the road network, poor road maintenance, unpredictable conduct of drivers and other road users, and the lack of comprehensive digital mapping data. This journey will require careful planning, substantial commitment, and persistent effort to navigate.

3. Spotlight on India

India, a country that is fast developing, offers a special backdrop for road safety. The road safety environment in India is complicated due to its crowded cities, chaotic traffic, varied topography, and high rate of traffic crashes. While complete autonomy may still be some

time off, Indian vehicles are increasingly featuring semi-autonomous technologies. By lowering the possibility of collisions caused by driver's errors, these systems, such as autonomous emergency braking, lane-keeping assist, and adaptive cruise control, can considerably improve road safety. Fully autonomous vehicles have the potential to drastically change Indian road safety in the long run. These vehicles could significantly improve road safety by reducing accidents caused by human error and streamlining traffic in India's congested cities. However, there are significant challenges we need to go through. These include creating high-quality digital maps for precise navigation and modifying autonomous vehicle technology to manage India's frequently dynamic and unpredictable traffic circumstances. Efforts by the government to generate detailed digital maps of the nation, such as Bharat Maps, are positive steps in the right direction, although much more work is needed to ensure the safe functioning and operation of autonomous vehicles.

4. Global Collaboration for Safer Roads

It is impossible to exaggerate the value of cross-border cooperation and knowledge sharing in the field of transportation safety. Developed nations, who are pioneers in the development of AI and autonomous vehicle technology, can offer knowledge and experience. On the other hand, developing nations can share their experience about handling road safety problems while facing resource limitations and adapting to cutting-edge technology for various problematic road conditions. Road safety solutions that are more effective and inclusive will result from these technology adoptions. Such global knowledge sharing is greatly facilitated by international platforms like the Global Road Safety & Innovation Forum of the International Road Federation (IRF). They bring together professionals, decision-makers, and practitioners from all over the world to explore new trends, exchange experiences, and work together to solve problems related to road safety.

In summary, identifying the perfect way to improve safety is a difficult task that calls for the fusion of multiple correction and adoption in aspects like infrastructure, law enforcement, technology, and cross-national cooperation. We can significantly advance with global transport developments toward being safer, more effective, and more sustainable by utilizing AI and autonomy in vehicle operations. However, in order to do this, we need careful preparation, creative thinking, and international cooperation, leaving no nation behind on this fundamental path towards achieving universal road safety.



Avery Dennison Launches Anti -Dew Protective Overlay Film

Avery Dennison is a leading manufacturer of retroreflective sheeting, films, and digital print solutions. Our mission is to improve road safety around the world with high-quality products and solutions for every environment. With nearly 100 years of experience, we are experts in this field and are continuing to address road safety challenges around the world. A top priority for retroreflective sheeting is legibility and retroreflective performance.

Traffic signs provide guidance and warning for drivers, and because of their importance, they must be legible to drivers in all weather conditions, day and night. There are several temporary weather problems, especially in coastal and mountainous areas of India, such as increased moisture that appears on cold signs in the form of dew. Studies have shown that dew can temporarily reduce the retroreflective performance of a sign by up to 87% [1]. Since dew droplet deposition is typically not uniform across the sign face, it creates dark patches that affect the sign's legibility. Driving at night already poses significant safety challenges, so for drivers, when signs are not legible because of dew, this risk increases exponentially.

To add protection to the sign, and prevent the effects of dew, a technologically advanced protective overlay can be applied to the surface.

Protective Film Technology

The Anti-Dew film, OL-1200, has a hydrophilic surface that attracts and reduces the contact angle of the water. As the dew droplets are flattened on the surface, they will join together, forming a thin sheet of water that spreads across it. When this happens, light can enter and return, with minimal scattering, ensuring that the sign functions night and day. This results in the traffic sign maintaining a consistent appearance and retroreflective performance.

If the sign face does not have an anti-dew overlay, the dew droplets will affect the retroreflective performance of the sheeting by scattering the light rather than sending it back to the light source and driver.

Image Caption: Avery Dennison OL-1200 is ideal for protecting signs from dew formation



The Anti-Graffiti film, OL-1000, has a hydrophobic surface that repels liquid that comes in contact with it. This prevents paint, markers and stickers from adhering permanently to the sign face. This film includes many benefits, including graffiti cleanability and extended durability, but it does not prevent the negative effects caused by dew caused due to its hydrophobic properties.

Image Caption: Avery Dennison OL-1000 is ideal for protecting signs from vandalism



Industry Leading Durability

The entire line of premium clear protective overlays from Avery Dennison provides UV protection to shield the signs from the sun's harmful rays, and OL-1200 is no different with up to 12 years of UV protection and 10 years of anti-dew performance. Whereas many other anti-dew overlays currently sold across the industry lose their anti-dew properties quickly, long before the UV protection warranty ends.

Better Performing Traffic Signs

Digitally printed traffic signs are a smarter choice for the environment. At Avery Dennison, we value products and solutions that focus on the long-term health of our business, planet, and communities. We develop products with sustainability in mind, from the materials we use, to how they're constructed or recycled at end-of-life. Longer-lasting, higher-performing traffic signs are a better choice for motorists and the environment.

Avery Dennison continues to innovate with retroreflective products engineered to improve road safety. Visit reflectives.averydennison.com to learn more about the industry-leading technology available from Avery Dennison.

References

[1] Eric D. Hildebrand, "Reductions in Traffic Sign Retroreflectivity Caused by Frost and Dew," *Transportation Research Record 1844* Paper No. 03-3931 (2003): 79-84.

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DRIVER BEHAVIOR IMPROVEMENT WITH COLLISION AVOIDANCE SYSTEMS



1. Introduction

Advanced Driver-Assistance System (ADAS) is a technology that comprises of multiple components for improving vehicle and driver safety. One of these is Collision Avoidance System (CAS), which monitors the speed of a vehicle and the presence of other vehicles or pedestrians ahead, to provide timely alerts to drivers about possible, imminent collisions. These timely and critical alerts provide safety to the driver and others on the road.

2. Objective

This study was designed to review road-safety from the aspect of driving behaviour with collision avoidance systems (CAS¹) in India and had an objective to analyze the impact of CAS on driver behaviour change. CAS comprises of a camera mounted on the windshield of a vehicle looking at the road in front, and an AI-powered compute system analyzing images from the camera in real time. The CAS system provided both audio and visual signals warning about possible collision events on the road. The collision alerts given in real-time to the driver were also sent to a cloud server for storage and data analysis.

3. Methodology

In this project, 20 vehicles from a private transport organization were used. These vehicles were part of a fleet carrying about 30 passengers daily in Hyderabad. These 20 vehicles (10 of Tata Marcopolo and 10 of Eicher) were fitted with the collision avoidance system (CAS) for the study. The drivers in the fleet were attached to the vehicles, and hence the number of drivers in this study was also 20. This allowed a long-term observation of driving behavior change in the drivers. The vehicles operated primarily on trips between 04:30 AM and 12:00 midnight on the roads on weekdays (Monday – Friday), and some other regular trips over the weekend (Saturday, Sunday). The entire road network in the project (a distance of about 300 KMs) driven multiple times, over 190 days (6+ months) led to data collection from 566,510 KMs.

The data collection period was divided into control period and observation periods. During the control



| Data | Event | Description |
|--|---|--|
| Spatial | Location (GPS coordinates) | Latitude and longitude of the alert |
| Temporal | Date and time | Date and time of the alert |
| Alerts from Collision Avoidance System (CAS) | Front collision warning (FCW) | Alert for a potential collision with another vehicle in the lane, in front of the driven vehicle |
| | Head-way monitoring warning (HMMW) | Alert when the distance to another vehicle in the lane, is less than a safe distance to the driven vehicle, at current speed |
| | Lane Departure Warning ¹ (LDW) | Alert when the driven vehicle moves out of a lane, without using a lane-change indicator |
| | Pedestrian collision warning (PCW) | Alert for a potential collision with a pedestrian, in front of the driven vehicle |

Figure 3.1 Roads travelled by the vehicles in Hyderabad and the various collision alerts used for data analysis in the project.

¹ Mobileye 8 Connect - <https://www.mobileye.com/uk/fleets/products/mobileye-8-connect/>

period, the visible and audio alerts from the CAS were configured not to be given in-cabin to the driver but all alerts (events) were sent to the cloud server. In the observation period (C), the configuration was set back to normal function, and so visible and audible CAS alerts were given in-cabin to the driver. The experiment period was split into multiple observation periods (M1-M4), for analysis. After the control period and before starting the observation period, the drivers were given an in-person training on safe driving practices and awareness about the collision alert system installed in their vehicles.

4. Analysis and Results

Figure 4.1(a) shows an aggregated level of change in the drivers as a percentage number of drivers who changed (improved, with decrease in alerts). The change is zero for the control period, as the baseline performance was being established as a reference to compare later. Figure 4.1(b) shows a detailed view on the amount of aggregate reduction in drivers across the project phases in the group changed behaviour. Among all the collision alerts, the highest reduction is with forward collisions which directly helps in preventing accidents.

From the analysis and results on the impact of CAS on driver behaviour, the following observations are made:

- (i) use of a collision alert system (CAS) leads to an evident change in driver behaviour,
- (ii) on an average, 54% of drivers changed driving behaviour to become safer than earlier,
- (iii) overall highest reduction in alerts of 67% was observed on lane-departure warnings (LDW),
- (iv) among the drivers who changed behaviour, average alerts reduction was 34%, and
- (v) over time, possibly a fatigue develops over time among most drivers and a refresher training helps in remembering the benefits of CAS alerts, and hence safer driving behaviour.

A short refresher training to drivers once in three (or six) months helps to reinforce the learning and it leads to a better, safer driving behaviour among drivers. In addition to a refresher, some rewards or

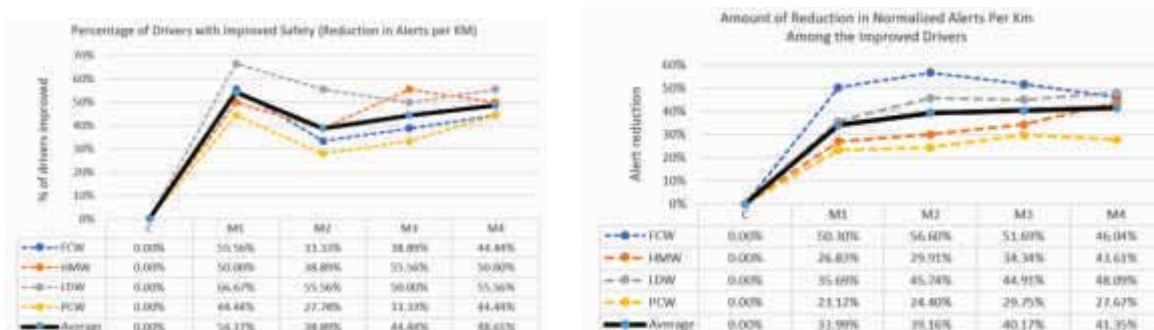


Figure 4.1 (a) Aggregate change in percentage of drivers whose driving behaviour improved (i.e. a reduction in normalized alerts to distance). Over 50% of the drivers improved their driving in M1 phase after the first training. (b) Aggregate reduction in the normalized alerts per KM, only among the drivers who improved in the population. Among all the collision alerts, the highest reduction is with forward collisions which directly helps in preventing accidents.

incentives or penalty mechanism for the drivers may be considered for a quicker change in behaviour.

Acknowledgements

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- Kohima Bypass Two Lane Tunnel (500M) & 10 km Highway, Nagaland.
- Ramban - Banihal Tunnel (800M) & Cut&Cover, Jammu.
- Jammu Ring Road 2 Twin Tube Tunnel (1440M) Project Recently Awarded.
- Shimla Bypass Twin Tube Tunnel (3400M) JV, Himachal Pradesh.
- Kiratpur - Nerchowk Two Lane Tunnel (4270M), Himachal Pradesh.
- Kiratpur - Nerchowk Uni-Directional 2nd Tube T-1 Tunnel (1800M), Himachal Pradesh.
- Pathankot - Mandi Twin Tube Tunnel (1150M), Himachal Pradesh.
- Rudraprayag Tunnel (900.3M) and Major Bridge (200M), Uttarakhand

COMPLETED PROJECTS

- Two Lane Dat Kali Tunnel (340m), Dehradun Uttarakhand.
- Two Lane Chamba Bypass Tunnel (440m), Uttarakhand.
- Specialized slope treatment and augment of the existing road (approx. 1.175 km) on Gholteer Landslide.
- Patalganga Cut & Cover 2-lane Bi-directional Tunnel (NH-07), Joshimath, Uttarakhand
- Treatment of Landslide Hazard Zone of Saknidhar, Devprayag Sinking Zone and Srinagar river bank protection work, Uttarakhand.
- Agrakhal to Chamba Road & Bridge Project on NH-94 (30.82km), Uttarakhand.
- Hathipahar Landslide Project from Ch. 471.400 to 473.675m on NH-07, Uttarakhand.
- Construction & Upgradation of Rishikesh Dharasu Road from Ch. km 65.000 to km 76.000 on NH-34, Uttarakhand.
- Construction of Road, Bridge & Slope Protection Works from Ch. 100.300 to km 101.060 on NH-34, Uttarakhand.

And Many More.....

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ROAD SAFETY- INDIAN CONTEXT

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India is an automotive behemoth with approximately 29.5 crore vehicles running on roads. With an estimated two crore vehicles added every year and an expanding middle class, the vehicle parc (also called vehicle population) is bound to increase exponentially.

With the ever-increasing vehicle population, road safety remains a key concern for the country. India, while accounting for ~1% of the global vehicle population accounts for ~11% of the deaths due to road accidents. According to Road Accidents in India 2021 report, published by the Ministry of Road Transport & Highways, during the year 2021, a total of 4,12,432 road accidents occurred in the country leading to 1,53,972 fatalities and causing injuries to 3,84,448 persons.

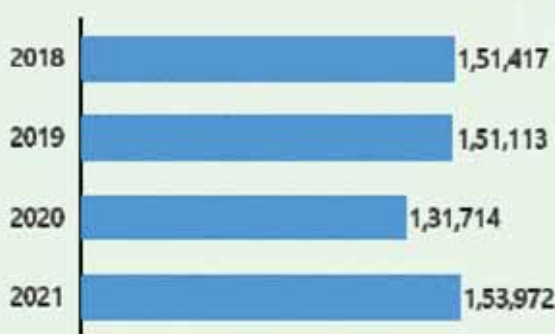


FIG 1 Road accident deaths in India (values in numbers)

Most common causes of road accidents in the country include over-speeding, driving on the wrong side, drunken driving, use of mobile phone and jumping red lights. Lack of awareness of road safety rules, poor road conditions, inadequate infrastructure, and lack of enforcement of traffic laws are major contributors to India's high number of accidents.

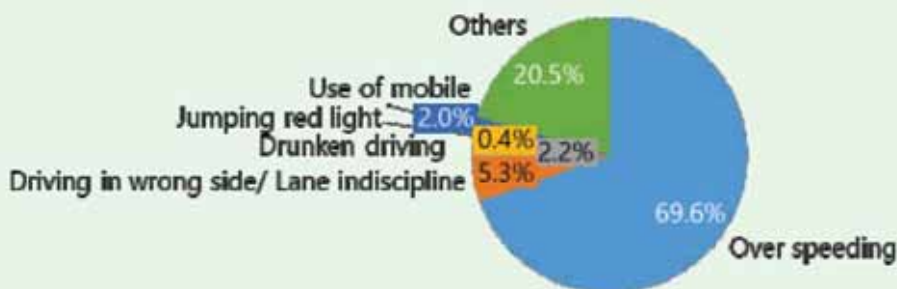


FIG 2 Leading causes of fatalities in India

Almost 60% of the road accident fatalities in India are of pedestrians and two wheeler riders. Also, 67% of the total deaths in road accidents are in the 18-45 year age group. Besides the obvious human loss and trauma related to the citizens involved in road accidents, it directly affect the country's GDP.

Given the negative impact of road accidents on the society and high number of road accident fatalities in India, there is an urgent need to focus on improving the same. A key approach that is followed globally and is also being utilized in India, is to focus on the 4Es of road safety, namely Education, Engineering (vehicle and roads), Enforcement and Emergency care.

Stakeholder actions across the 4Es

The Government and key stakeholders including the automotive companies have recognized the need for a concerted effort across all the 4Es (Education & Awareness, Engineering (Vehicle & Road), Enforcement and Emergency care) to lead to an overall improvement in the road safety scenario in the country. The Government has been taking multiple steps to improve the road safety scenario in the country by implementing a multi-pronged strategy based on the 4Es. Looking at the key initiatives across the 4Es taken by the Government and the support provided by Indian automotive sector, it is seen that a multitude of initiatives have been taken.

Engineering

Engineering focuses on aspects related to road as well as vehicle engineering. To improve the quality of roads, the Government has focused on regular road safety audits, use of safety barriers and guardrails and blackspot identification and rectification. It has also taken steps to improve pedestrian safety by creating underpasses and subways. On vehicle engineering, while government has taken steps such as mandating crash testing and mandatory fitment of in-vehicle safety technologies such as airbags, ABS/CBS etc., the Indian automotive industry has been proactive in improving the vehicle safety. Indian OEMs have continuously upgraded the engineering standards of the vehicles in harmonization with the UNECE standards and Indian vehicles now include road user safety features in line with the international standards.

Enforcement

Enforcement of road safety rules plays a crucial role in reducing road accidents. The Government, through the Motor Vehicle Act (Amendment) 2019, has enforced stricter penalties for traffic violations. Vehicle can be impounded and license suspended for over speeding and drunk driving. The use of technology is also being promoted and several cities throughout the country have started deployment of Intelligent traffic management system. Automotive OEMs have also taken steps to support the government in the implementation of projects such as installation of speed cameras; for example, in Delhi it has been undertaken to improve enforcement.

Emergency care

Emergency care immediately after the accident can prove to be the difference between life and death. Recognizing its importance, the Government has taken key steps such as the “Good Samaritan Law”, provision for cashless treatment and penalties for not giving way to ambulances.

Education & Awareness

In the area of Education, government initiatives have focused on road safety messages on different media platforms, capacity building for government staff including traffic police, health department, PWD and transport department. A key tool employed here is the observance of Road Safety week every year to increase awareness. Funding is also provided to NGOs, Universities and educational institutions to run campaigns to increase road safety awareness. Indian automotive industry has also focused on education and to improve road safety scenario in the country. Automakers have also launched multiple initiatives across India like Driver Refresher Training Programs, Institute of Driver Training and Research, Free Eye Check-Ups, Road Safety & Traffic Awareness Campaign, Self-discipline Programs and Helmet distribution programs. These initiatives usually impart knowledge directly to the consumers and enable safety for vehicular and road users.

SIAM approach to Road Safety

SIAM recognizes the importance of a holistic approach to road safety, which focuses on all the 4Es to improve the road safety scenario in the country. Thus in order to ensure a more structured approach and to channelize initiatives in the area of Road Safety, SIAM has developed the “**Surakshit Safar**” strategy.

The strategy identifies the 4Es of Education & Awareness, Engineering (Vehicle & Road), Enforcement and Emergency care as the key levers across which actions have to be channelled, and also focuses on the importance of data in driving effective interventions across these key levers.



FIG 3 SIAM Surakshit Safar Strategy

SIAM also recognizes that amongst the 4Es, Education & Awareness is a critical pillar as the success of other Es also depends on the education and awareness of road users. Thus, SIAM has always been on the forefront of spreading education about road safety. As part of the Surakshit Safar strategy, SIAM also organized a road safety pavilion in recently concluded Auto Expo 2023. As a part of the pavilion, a Road Safety Training & Experience Zone was developed to educate visitors on 360 degree aspects of road safety. The pavilion was a huge success and received crowds from various facets of society and industry namely students, vehicle users, specially-abled road users, automotive manufacturers, component manufacturers, road furniture manufacturers, emergency care givers, state institution employees and enforcers.

Going forward through the **Surakshit Safar** strategy, SIAM is focused on taking a 360-degree approach to improving awareness across road users. SIAM plans to initiate a program on road safety awareness with Kendriya Vidyalayas, as it believes that educating children at a young age about road safety will help in inculcating better road safety practices in the next generations. SIAM and its members will continue focus on customer awareness programs through roadshows, workshops, state level interactions as well as effective utilization of digital media platforms.



FIG 4 360 degree approach to improving Road Safety Education & Awareness

Conclusion

Given the state of road safety in the country, it is imperative for all stakeholders to work together and take urgent steps towards improving road safety. SIAM believes that a holistic approach to road safety focused on all four levers as envisioned in the SIAM **Surakshit Safar** strategy will be critical to achieving the government's vision for safer mobility. Also it is imperative that these actions are underpinned by effective data analytics to ensure that limited resources are channelled to the most effective measures for reducing accidents. Multiple examples from across the globe including countries such as Sweden and Germany, prove that effective use of technology is a key enabler to achieve desired improvements in road safety. Finally, all safety measures in the vehicles and enforcement measures will prove successful only if road users are well educated and aware about road safety rules.



ROAD SAFETY SITUATION IN INDIA

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After liberalisation of economy, industrial growth got fuelled, however, it was only in few states across the country. This was the main reason for localised economic development in tier 1 cities leading to excessive one-way migration from tier 2 and tier 3 cities. India is a vast country where language and dialects spoken changes after every 70-80 kilometres. Why am I referring to this –

- It relates to the regional behaviour and people's responses in different situations.
- The developed cities started facing mixed behaviour with no enforcement. This led to roads becoming a place where different behaviours try to dominate each other, and all rules being overlooked.
- The economic impact was also felt in tier 2 and tier 3 cities, where there was less or no income for households.

Considering all these situations, the roads became death traps with no one trying to compromise.

This situation was further complicated when roads became a place to show who is bigger with respect to power, money, status, or political influence. This gave rise to what is commonly referred to as VIP culture, wherein people feel proud to violate traffic rules. The situation got worse when certain enforcement agencies started to overlook these violations, which increased corruption.

As the situation got worse, the government took notes and started taking countermeasures by launching 4E concept, one of those Es is Education. However, the pride of these VIP culture people was too big and even after all the added measures, the rules were being violated at an alarming rate.

Until late 90s, driver training was an unorganized sector, but with Auto-makers coming in this field, the driver training quality started improving slowly but steadily. This was just the beginning, and during last 20 years a lot of change has come in this domain, like creating of benchmarks in training infrastructure and quality of education. However, more work is needed as the road safety data is still not up to the expected standards.

The 2nd E in the 4E concept is Enforcement. In my opinion, we need to enforce all road safety rules and hold the violators accountable. If this happens, then initially I do foresee an increase in corruption, but this is where education plays a pivotal role. A driving license is not a right but must be earned by acquiring a skill.

I hope that in coming years, economic and industrial growth takes place uniformly across the country, which will help in education and outreach in tier 2 and tier 3 cities, which will lead to road safety.





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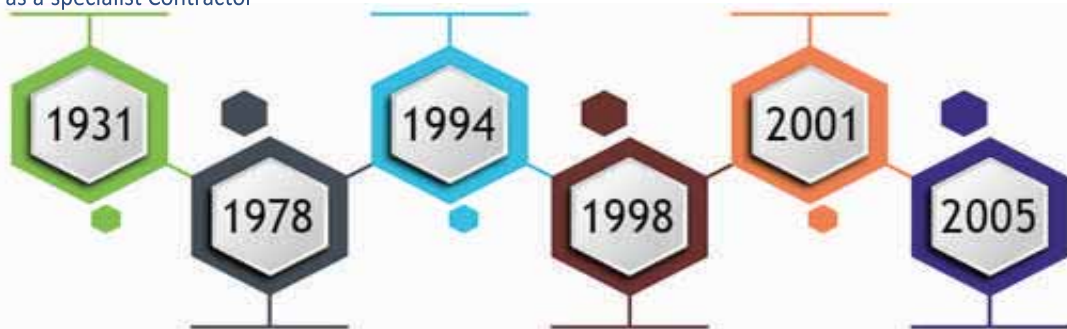
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BEYOND THE ROAD: APPLYING CRIMINOLOGY THEORIES TO ENHANCE TRAFFIC MANAGEMENT AND ROAD SAFETY THROUGH EVIDENCE-BASED POLICING (EBP)

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INTRODUCTION

As traffic police officers and enforcement agents, it is essential to have a comprehensive awareness of the causes of traffic violations and accidents. Notwithstanding the importance of traditional traffic safety measures such as road engineering and vehicle safety standards, it is also vital to examine the social and psychological elements that influence driver behaviour. Criminology provides an abundance of theories and concepts that might throw light on the core causes of traffic violations and provide successful tactics for their reduction. In this article, some of the most prevalent criminology theories, such as the Broken Windows theory, are analysed to evaluate how they may be used to regulate and enforce traffic. By research on a reasonably logical framework of criminology into a comprehensive approach to traffic safety, one can work to make the roads safer for everyone.

RELEVANCE OF CRIMINOLOGY THEORIES IN TRAFFIC MANAGEMENT & ROAD SAFETY

The author opposes criminalisation of traffic accidents. Applying criminology to road safety doesn't mean punishing drivers. Instead, causes of traffic accident are examined. A proactive, evidence-based approach to traffic safety can help law enforcer, policymakers and researchers to create a transportation system that is safer, more effective, and more sustainable for everyone. The Safe System Approach applies the following important criminology theories to traffic management.

1. **Broken Windows Theory:** According to this theory, a neighbourhood's disorder causes more serious crime. Targeting small traffic violations, like unauthorised parking or driving with a broken taillight, is one way to implement the Broken Windows theory in traffic management and stop more major infractions from happening.
2. **The Rational Choice Theory:** This theory states that individuals make decisions based on logical evaluations of the risks and advantages of their activities. This theory can be used to traffic management by increasing the perceived risks associated with traffic violations through targeted enforcement and public education initiatives.
3. **The Social Disorganization Theory:** According to the Social Disorganization Theory, crime is a result of the disintegration of social institutions and the disorder of communities. This theory can be applied to traffic management by focusing on high-crime areas and addressing social factors that contribute to risky driving, such as poverty and lack of access to public transportation.
4. **Labeling Theory:** This theory suggests that individuals who are labelled as criminals or deviants are more likely to engage in criminal behaviour in the future. This theory can be applied to traffic management through the use of positive reinforcement and education programmes to promote safe driving and reduce the stigma associated with traffic offences.
5. **Routine Activity Theory:** According to this theory, crime occurs when three conditions are met: a motivated offender, a suitable target, and the absence of a capable guardian. This theory can be applied to traffic management by increasing the number of law enforcement officers on the roads to deter risky driving behaviour.
6. **Strain Theory:** This theory posits that criminal behaviour is a result of the stress that arises when individuals are unable to attain their goals through legal means. This theory can be applied to traffic management by addressing social factors that contribute to risky driving, such as restricted access to employment and transportation.

7. **Social Learning Theory:** This theory proposes that criminal behaviour is learned through observation and imitation of others. This theory can be applied to traffic management by utilising positive role models, such as law enforcement officers and safe driving advocates, to encourage safe driving and reduce the likelihood of traffic violations.
8. **General Strain Theory:** Individuals who experience strain or stress, such as economic hardship or personal trauma, are more likely to engage in criminal behaviour, according to this theory. This theory could be applied to traffic management by addressing sources of driving-related stress, such as long commutes and traffic congestion.
9. **Social Control Theory:** This theory proposes that individuals are less likely to engage in criminal behaviour if they feel connected to their communities and have strong relationships with their families and peers. This theory could be applied to traffic management by promoting community participation in road safety initiatives and encouraging safe driving behaviour through positive peer pressure.
10. **Self-Control Theory:** According to this theory, individuals who lack self-control are more likely to engage in criminal behaviour. This theory could be applied to traffic management by promoting self-control through education programmes and other interventions aimed at reducing impulsivity and risky driving behaviour.

SYSTEM APPROACH AND CRIMINOLOGY THEORIES IN ROAD SAFETY

The system approach to road safety and traffic management emphasises that the majority of traffic violations result from a complex interaction among the road environment, vehicles, and road users. It recognises that motorists are not solely accountable for traffic violations.

By applying the system approach and concepts from criminology to road safety and traffic management, traffic violations can be identified and avoided. This may involve enhancing the road design and infrastructure, educating drivers, and enforcing traffic laws to deter violations. The system approach and criminological theories offer complementary perspectives on the complex issue of traffic violations, informing evidence-based measures to prevent them and encourage responsible driving.

CONCLUSION

As traffic police officers and enforcement agents, it is essential to have a thorough grasp of the causes of traffic violations and accidents. By utilising insights from criminology, we can get a greater knowledge of the social and psychological aspects that influence driver behaviour and develop tactics for reducing traffic violations. This article describes how the principles of several criminology theories may be used to traffic management and enforcement. Everyone can profit from the efforts to make the roads safer by adopting a multidimensional and multidisciplinary approach to the present practises.

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A CONCEPT FOR NATIONAL HIGHWAY SAFETY POLICE FORCE (HSPF) IN INDIA

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Background

The primary road network of National and State Highways has been experiencing systematic expansion since the turn of the century in terms of their mobility quotient. Similarly, the expressway network is also expanding in many States at a fast pace. While the expressways are totally access controlled, National and State Highways are without control on access even when these are four- and six-lane highways with a design speed of 100 km/h. With the fast expansion of the primary network, the safety and security of road users have also deteriorated during the last two decades. The data published by the Ministry of Road Transport & Highways for road accidents in India shows an alarming trend of road fatalities and injuries. While an accident is a multi-factor event, where one or more road users have failed to cope with the road environment, the safety of highways and expressways is determined by the safe infrastructure and safe road user behavior.

The safety performance of the primary network measured in terms of road accidents and fatalities over the last decade shows a grim picture of nearly 15 lakh persons losing their lives due to road accidents and another 4-5 million injured, many of whom may have been disabled for life. Most importantly, two-thirds of total fatalities and injuries in the country are due to road accidents on the primary network, while this network is expected to be with the highest safety standards. The analysis of published data shows that a very high proportion of all accidents in the primary network are caused by undisciplined traffic, primarily linked to the absence of enforcement. The poor road use behaviours on high-speed multi-lane highways without access control have led to rampant violations like overspeeding, contra-flow movement, drunken driving, unsafe use of the infrastructure by unauthorised tempering for access/convenience created by the local population, etc, which have caused a large number of serious accidents. Each primary network link has a concessionaire/contractor to collect tolls and maintain them, and the enforcement responsibility of state police is available only when there is an accident. The contractor does not have any enforcement right and responsibility, and there is no regular highway police force for managing and enforcing normal traffic rules on a continuous basis.

Enforcement is an important element of road safety to control the behaviors of road users in compliance to road safety rules. Human error in judgment will continue to cause accidents, but those caused by behavioural traits of road users are to be eliminated by corrections through stricter enforcement. For modifying road user behaviors in defiance to road/traffic rules, the only method is by 24x7 enforcement, which is not possible only by deploying traffic police. This is possible by the adoption of technologies (sensors and cameras installed along the corridor) available globally and supported by the responsible team of a security force.

Initiative Required from Central Governments

In the past, Home Ministry and Central Road Authority jointly mulled the idea of Highway Police Force for managing the enforcement functions along the National Highway network. It is a uniform need for the countrywide primary road network (National and State Highways including Expressways), where there is no enforcement system existing (though specific law and order problems are attended by state police). The responsible state police system is not able to handle it continuously (due to lack of resources). Further, because of the federal structure of the country, even if some states will be willing to extend the services of their police force, others will not have resources to meet this requirement. Moreover, constitutionally the police functions for enforcement of traffic rules is a State subject, and no enforcement is possible from any central body or authority although the National Highways are constructed and managed by Road Authorities at the Centre. Therefore, the only logical

way is to create a centralised safety/security force for the very purpose by creating a special cadre (to be administered from central government – Home Ministry). This is to be just similar to the cadre like CISF, CRPF, BSF, RPF, and several others, all of whom are uniformly deployed across all states in the country as per the need. All these existing forces work with direct linkages with the state police system for the authorisation of enforcement functions.

The experience of the present non-uniform quality of police services in all the states does not encourage to propose the deployment of state police to the primary road network (highways and expressways) for routine enforcement responsibility. An exception was observed in Maharashtra about 5-7 years back when Highway Police (Patrol) Posts were created along NH-4 (Now NH-48) with assigned manpower from the state police force. But in each case of such a Police Post was found to be without facilities (like the needed equipment and vehicles) to perform the enforcement functions 24x7. Therefore, this initiative of the state of Maharashtra was not effective in any manner as seen on the ground.

Structure, Function, and Formation

The cadre of a police force for the specific purpose should be using a minimum staff of the State Police and all others being contractual employees. The expenses of such a Highway Safety Police Force (HSPF) should be paid by the Highway Authorities responsible for the primary network. The tasks of the Highway Police shall be the basic enforcement functions around the clock to ensure efficient traffic movement with a high level of safety and security for road users. Some of these responsibilities shall be,

- (a) Enforcement on Over Speeding (Speed Limit Violations)
- (b) Enforcement against Overloading
- (c) Enforcement against drunken driving
- (d) Enforcement against Contra-Flow Movement
- (e) Enforcement of Helmet and Seat Belt
- (f) Enforcement against Unauthorised Access to Highway (non-traffic violations)
- (g) Enforcement against all types of encroachments (non-traffic violations)
- (h) Assistance to Concessionaire/Operator in case of Emergency Response
- (i) Accident site management (traffic diversion and control, etc) and clearance of accident debris with the help of the Concessionaire/Operator of the highway
- (j) Accident data collection for Highway accidents
- (k) Education and Awareness drive for road users

The formation of such a Highway Safety Police Force shall be largely through deployment of retired army personnel upto the age of 65 and other able-bodied private persons. There will be minimum staff involvement from State police on deputation for authorization of the enforcement team. The operational jurisdiction of the Police Range shall be set up for each district or 2-3 districts to establish the overall command from the SP of the district (or one of the districts). The functional responsibility being enforcement only for the National and State Highways, the manpower required will be limited, unlike the normal State Police with many other functional responsibilities. Such a team of HSPF shall be assisted by the Concessionaire or the O&M Contractor of the highway, supplementing in the provision of vehicles and other facilities created as part of the concession/contract. In addition, the Highway Police unit shall be required to be provided with the following facilities to perform their functions flawlessly on a round-the-clock basis.

- (a) Patrol Vehicles
- (b) Motorcycles
- (c) Breathalysers
- (d) Radar Guns (Speed Measurement Equipment)

- (e) Traffic Cones, Plastic/Iron Barricades, etc
- (f) Electronic Batons (Red/Green)
- (g) Torch Lights, etc
- (h) Head/Body Strap Camera
- (i) Portable PA Equipment (for Communication)

As part of the normal Concession or the O&M Contract, there will be the following facilities already in the system as per their contractual obligation, for monitoring and management of traffic and handling emergencies, which also can be used by the Highway Safety Police Force, as required from time to time.

- (a) The VID Camera Network
- (b) Central Control Room
- (c) Communication Network
- (d) Communication through VMS
- (e) Ambulance equipped with paramedics and medical facilities
- (f) Recovery Van (Crane)

Recruitment & Training

All members of the team, whether retired army personnel or directly recruited contract employees (like private security guards employed by various organizations), shall have minimum education up to Class XII standard and preferably graduate. Physical fitness of all such staff shall be the normal requirement of fitness for the police forces in the States. All such staff shall undergo a two-month basic training on traffic management and enforcement at the designated police training institutions of the States to prepare them for the duties and responsibilities of the HSPF. HSPF staff will be expected to perform Highway safety and enforcement-related duties and responsibilities of State Police, although they will not have all other duties and responsibilities State Police Constable is expected to discharge. Therefore, the proposed salary structure and nomenclature of HSPF staff shall be distinct from State Police. For every 10 contract employees, there will be one supervisor, who shall be required to undergo at least one in-service refresher course every year, on Highway Safety Issues and best practices, and he will train his team in turn. All members of HSPF including supervisors shall undergo training for one week (on induction to police cadre) conducted by BPR&D at CDTI. All these training modules for HSPF on traffic management and enforcement will be designed with appropriate SOPs.

Authorization for Control and Enforcement

As per the Control of National Highways (Land & Traffic) Act of 2002 and The Highway Administration Rules of 2004, certain powers of enforcement vis-à-vis control and regulation of traffic, etc may be delegated to a certain rank of HSPF. Similarly, the enabling provisions of the M. V. Act and other related laws will also be delegated to HSPF by appropriate authorisation. While the medico-legal, crime, and law & order cases shall be the responsibility of the State Police, the safety management and security of road infrastructure shall be the responsibility of HSPF. Clear SOPs shall be prepared for this coordinated role of HSPF and the State Police, and these will be updated regularly. Thus, the regulation of traffic and enforcement responsibilities of State Police will be delegated to HSPF through a charter of duties and responsibilities, whereas the actual enforcement action on violators shall be carried out by State Police. For public acceptance and smooth functioning of the HSPF appropriate media publicity shall have to be carried out with clear emphasis on the delegation of enforcement and traffic control functions of highways to the specialised Force.

Implementation and Benefits

It will be worthwhile to experiment with this idea by implementing it as pilots for two corridors, for example, (i) Delhi to Jaipur (310 km) in the north, and (ii) Chennai to Bengaluru (335 km)

in the south. This will clearly bring out the issues in coordination and the effectiveness of the enforcement through the specially trained contractual manpower. Also, this will bring out the comparisons of organizational issues and others related to work cultures in the North and South. Like all other special forces in the country, HSPF also should be under Home Ministry, and the estimated cost for all such Highway Safety Police Force units shall be allocated or earmarked yearly by the Central Agency.

At present time, more than one-third of all road fatalities and accidents are occurring on the National Highway network, and these two pilots will be able to bring out clearly the benefits accrued over a period of one to two years' time. All the primary networks of roads in the country (collectively only 320,000 km) are responsible for the grim picture of road safety in the country. India loses more than Rs. 10 lakh crores every year through road accidents, which need to be ameliorated by the implementation of HSPF for all high-speed highways (NH and SH) including expressways. It is expected that the two pilot implementations suggested above will demonstrate the systematic reduction of road accidents and fatalities on a primary network by the deployment of HSPF.



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ROAD SAFETY IN LOW-MIDDLE-INCOME COUNTRIES: MACRO SCALE OVERVIEW, TRENDS AND CHALLENGES

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Road traffic crashes have become major global public health burden in all societies around the world, predominantly in low-middle income countries (LMICS). According to Global Health Observatory, every year more than a million people are killed in road traffic crashes, and around 20-50 million get injured, some of whom are left disabled for rest of life. Although, there has been a decreasing trend in traffic-related injuries and fatalities in developed world during the past two decades, but this decrease has not been as substantial as anticipated, and LMICs have still seen an increase. This is despite of several advancements in motor vehicle safety standards, road infrastructural design standards, road safety policies. Undoubtedly, roadway transportation still poses a substantial risk to road users in many regions around the world. It is clearly evident that LMICs have been experiencing a disproportionate burden of road fatalities, especially in African and Southeast Asian countries (Bener et al., 2003; Nantulya and Reich, 2003; Bhalla and Shotten, 2019).

An individual residing in low-middle income countries experience more than three times higher likelihood of mortality due to road crashes as compared to an individual in a high-income country (HIC). LMICs account a substantial proportion of the global population, comprising approximately 85 per cent. However, they possess only 60 per cent of registered motor vehicles and despite this disparity these countries experience a disproportionate burden of road traffic fatalities, accounting for nearly 93% of such incidents (World Health Organisation, 2018). It is noteworthy that over 50 per cent of HICs have experienced reductions in number of road traffic deaths (RTCs) between 2013 to 2016, only 23.5 per cent of middle-income countries and no low-income country have managed to reduce fatalities on their roads. In nutshell, it can be concluded that the counties with different income levels are experiencing different trends to mitigate the RTCs, and furthermore, data clearly outline the difference in road safety practices and road user propensity towards safety protocols and cultures across the countries with varying income levels.

In context of research, the preponderance of road safety knowledge has been emerging from institutes of HICs. Given the notable disparities in driving culture, regulations, and traffic law enforcement between LMICs and HICs, it is imperative that road safety research in LMICs is intensified beyond current levels. It is necessary to generate the requisite indigenous knowledge and develop initiatives that cater their safety requirements and enhance their practices. Some global initiatives like the Global Road Safety Partnership (GRSP), the World Bank's Global Road Safety Facility (GRSF), and the Bloomberg Philanthropies Initiative for Global Road Safety, which are coordinated through the Global Plan for the Decade of Action for Road Safety 2021–2030, have sought to address such issues. These current global initiatives have primarily concentrated on the pragmatic implementation of policies and standards to improve road safety in the low-middle income countries.

There are certain challenges to carry out research in low-middle income countries. These challenges include under reporting and reliability issues with available data, as well as the low-quality of reported crash data are the prime concerns in front of researchers in LMICs. Furthermore, the transfer of road safety education practices from developed to developing countries can be difficult due to variations in education systems, teaching methods, traffic regulations and risk exposure. Road safety education and awareness campaigns in high-income settings are often based on changing people's attitudes. Change someone's attitude, and they will change their behaviour. This may not, however, work across all cultural contexts. For example, previous research has suggested the link between attitudes and behaviours (in a road safety context) to be weaker in Sub-Saharan African countries than in

high-income European countries (Nordfjærn et al., 2014). Helmet use, for both bicycles and motorcycles, is low throughout LICs. A study in Malawi observed no bicyclists wearing helmets over a four-day study period (Tulu et al., 2015). In Kenya, the low prevalence of motorcycle helmet use remained unchanged, with around 30% of motorcycle riders correctly using helmets following the introduction of a traffic amendment bill in 2012 (Stewart et al., 2013). The old vehicle fleet in LICs does not meet some of the basic safety standards set in developed countries, increasing the propensity for crashes. This may be exacerbated by vehicle modification, poor maintenance standards, inappropriate use (e.g., overloading) and lack of safety enforcement. To our knowledge, scientific studies investigating the safety implications of exporting old vehicles from rich countries to LICs are non-existent. An important conclusion, when comparing the clusters of general and LMICs road safety research, is that the sophistication in the road safety research of LMICs has been limited. There are only a limited number of themes and approaches that have been taken. For example, issues such as distraction and drowsiness are virtually non-existent in the research of LMICs. However, to excel the road safety research in LMICs, some global agencies have taken some initiatives like Road Traffic Injuries Research Network and the UNECE programmes in developing countries, in partnership with ECLAC (Latin America and Caribbean Region) and ESCAP (Asia and the Pacific region). These initiatives have aimed to reduce the burden of road crashes in developing countries by identifying and promoting effective, evidenced-based interventions and supporting research capacity building in road safety research in LMICs (Hyder, A.A et al., 2016; Khademi and Choupani, 2018).

It can be concluded that road safety is an intrinsically multi-faceted issue, which requires the implementation of various approaches and the involvement of numerous stakeholders. The programmes that achieved the huge success at global level are those that have incorporated comprehensive systems of legislation, regulation and enforcement. These programmes have also integrated strong data collection and management systems, economic evaluation systems to guide investment decisions, significant technical and enforcement capacity, and a substantial knowledge base of the social, medical, and behavioural implications of road safety interventions. Regarding policy recommendations, enhancing the data quality in LMICs would be an initial step towards making improvements, given the inadequate resources and insufficient capacity for data management in these regions. This could be achieved by investing in capacity building and developing modern data collection strategies for high quality research. The authorities should take into account a major issue of raising public awareness regarding importance of accurate data and the reporting of road crashes, in order to carry out efficient, high-quality research to suggest and implement evidence-based and scientific countermeasures so that an individual can feel safe on road.

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ROAD SAFETY & SAFE MOBILITY

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INTRODUCTION

I know what it is to face death closely at 14,000 ft. at Spiti in Himachal.

I know what it is to not getting medical treatment for 4 days.

I know how it feels to gasp for breath when I had a bone fragments stuck in my thoracic region.

I know how it feels to get inside an operation theatre on the 6th day after my accident.

I know what THE PAIN of delayed treatment.

I know how it feels after an accident, when there is a question mark on my motorcycle career!

I know exactly how it feels when any one meets with an accident.

And I know what pain a family goes through when a family member is seriously injured thousands of kilometers away where there are no medical facilities and medical backup.

A life threatening motor cycle accident was an eye opener for me as I took upon Road Safety as a challenge to improve it.

While I was recovering from injuries of the road crash, I realized a notable discrepancy in all the spheres of road safety.

My key focus areas of work in my own capacity, where I found huge gap in ‘Emergency Care System & Road Safety Education’

Safer roads and mobility are critical for a sustainable and prosperous society. Emergency care and road safety education are two crucial factors that can help create safer roads and mobility. In India, both emergency care and road safety education require significant improvements. This article will focus on these two aspects and explore their importance in creating safer roads and mobility.

EMERGENCY CARE SYSTEM

Emergency care is critical in the immediate aftermath of a road accident. Prompt medical attention can save lives and reduce the severity of injuries. However, the ground reality of emergency care in many parts of the world is far from ideal, especially in developing countries. In India, for example, the emergency care system is inadequate, and accident victims often do not receive timely medical attention. This situation is even worse in remote areas such as mountain roads, where access to medical facilities is limited.

Improving emergency care in India requires several measures. First, there is a need for more ambulances and trained medical personnel to respond to accidents promptly. Second, medical facilities in remote areas need to be upgraded to provide better care to accident victims. Third, there should be a well-coordinated system of emergency care that involves multiple stakeholders, including the government, hospitals, and NGOs.

The government has a crucial role to play in improving emergency care. It should invest in upgrading medical facilities and provide adequate funding for emergency services. Hospitals and medical personnel should also receive training on how to handle accident victims and provide timely and appropriate care. NGOs can play a vital role in raising awareness about the importance of emergency care and supporting the government's efforts.

While we as a fast developing nation can take inspiration from other countries to improve the standards of emergency care after a road accident. Here are a few examples:

- **Prompt Response:** Countries like the United States and Japan have highly efficient emergency medical services (EMS) systems that can respond to road accidents quickly. India can learn from these countries and develop an efficient EMS system with well-equipped ambulances and trained paramedics who can respond quickly to road accidents.
- **Advanced Medical Equipment:** Countries like Germany and Australia have equipped their ambulances with advanced medical equipment such as defibrillators, advanced cardiac life support (ACLS) kits, and portable ventilators. India can learn from these countries and equip its ambulances with advanced medical equipment to ensure that accident victims receive timely and effective medical care.
- **Pre-hospital Care:** Countries like the United Kingdom have implemented successful pre-hospital care systems that involve administering treatment at the site of the accident itself. India can learn from this approach between government agencies and private organizations. India can leverage these partnerships to develop an efficient EMS system that can reach a wider audience.

Overall, by adopting best practices from other countries and developing an efficient EMS system with well-equipped ambulances, trained paramedics, and advanced medical equipment, India can improve the standards of emergency care after a road accident and reduce the number of fatalities and disabilities resulting from road accidents. Also implement pre-hospital care systems that involve trained paramedics administering critical care at the accident site.

Helicopter Emergency Medical Services (HEMS): Countries like Australia, the United States, and Canada have implemented successful HEMS systems that can quickly transport accident victims to hospitals. India can learn from these countries and develop a HEMS system that can transport accident victims quickly, especially in remote areas.

Public-Private Partnerships: Many countries have successfully implemented EMS systems through partnerships.

ROAD SAFETY EDUCATION SYSTEM

Road safety education is another critical aspect of creating safer roads and mobility. It involves educating people about safe driving practices, traffic rules and regulations, and the importance of wearing seatbelts and helmets. Road safety education can help create a culture of safety, where people are aware of the risks and take precautions to minimize them. In India, road safety education is still in its infancy.

The ground reality of awareness on road safety education at the grassroots level in India is mixed. While there are efforts being made to educate the public about road safety, there are still several challenges that need to be addressed. Here are some of the key factors that affect awareness of road education at ground zero in India:

- **Limited Awareness:** A significant proportion of the Indian population, especially in rural areas, may have limited awareness of road safety rules and regulations. Many people may not be aware of the importance of wearing helmets or seat belts, following traffic rules, or the dangers of driving under the influence of alcohol or drugs.
- **Poor Infrastructure:** In many areas, there is a lack of basic infrastructure such as pedestrian walkways, crossings, and traffic signals. This can make it difficult for people to follow traffic rules and put them at risk of accidents.
- **Enforcement Challenges:** Even when people are aware of road safety rules, there may be challenges in enforcing them. Many areas in India lack proper enforcement mechanisms and face challenges in enforcing traffic rules.
- **Attitudes and Behaviors:** Changing people's attitudes and behaviors towards road safety can be challenging, especially when there is a lack of awareness and infrastructure.

Many people may view traffic rules as suggestions rather than requirements, or may prioritize convenience over safety.

- **Education and Training:** There is a need for greater investment in education and training programs to improve awareness of road safety rules and regulations. This can include initiatives such as awareness campaigns, school programs, and driver training courses.

Overall, the ground reality of awareness on road safety education at ground zero in India is mixed, with efforts being made to improve awareness and infrastructure, but significant challenges remain. It will require sustained investment and coordinated efforts from government agencies, NGOs, and civil society to improve road safety education and reduce accidents on Indian roads.

India can learn several lessons from other countries to improve the standards of road safety education. Here are a few examples:

- **Early Education:** Many countries with successful road safety education programs, such as Sweden and the Netherlands, start educating children about road safety from a young age. India can adopt this approach and introduce road safety education as part of the school curriculum from an early age to inculcate safe road behavior.
- **Practical Training:** Countries like Germany and Japan provide practical driver training and require a minimum number of hours of training before obtaining a license. India can adopt this approach and ensure that driving schools provide comprehensive training to all learners, including practical driving training, to ensure that they are better equipped to handle real-world driving situations.
- **Public-Private Partnerships:** Many countries have successfully implemented road safety education programs through partnerships between government agencies and private organizations. India can leverage these partnerships to develop effective road safety education programs that can reach a wider audience.

A road accident can cause physical, emotional, and psychological trauma that can be difficult to overcome. In such cases, rehab centers provide a safe and supportive environment that enables victims to recover and resume their daily activities.

The importance of rehab centers for road trauma victims cannot be overstated. After a serious road accident, victims often require long-term care and treatment. This can include physical therapy to help with mobility and strength, as well as psychological therapy to address the emotional trauma that may result from the accident.

Being an accident survivor and working on the ground level I understand, feel and relate to the challenges my fellow Indians face on day to day.

IN CONCLUSION

Safer roads and mobility are critical for a sustainable and prosperous society. Emergency care and road safety education are two crucial factors that can help create safer roads and mobility. In India, both emergency care and road safety education require significant improvements. The government, hospitals, NGOs, and the public should work together to improve emergency care and road safety education. This requires a sustained effort over time, but the benefits are significant. By creating safer roads and mobility, we can save lives, reduce injuries, and create a better future for all.





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4. Highway in Jammu, J&K: 4 & 6-lane expressway on NH-244A
5. Ropeway Project in Varanasi, Uttar Pradesh: Length of 3.85kms, under NHLML, Govt. of India
6. Port at Mulapeta, Andhra Pradesh: EPC of contract under A.P. Maritime Board
7. Five Fishing Harbours in Andhra Pradesh: under A.P. Maritime Board
8. CISF Project in Goa: 1.2 lakh sq.ft, Ground + 8 floors, Time Line of 5 months
9. Mumbai Metro Project, Maharashtra: Construction of Depot under MMRDA
10. Seigniorage Collection, Andhra Pradesh: under Govt of A.P., for 2 years

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TRAUMA CARE SCENARIO IN INDIA AND THE NEED FOR BYSTANDER TRAINING IN BASIC TRAUMA CARE

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Injuries are a serious growing problem and major public health issue all over the globe. The three leading causes of deaths globally from injuries – road traffic crashes, homicide and suicide – are all predicted to rise in rank compared to other causes of death, placing them among the top 20 leading causes of death in the world by 2030 (WHO Fact Sheet, 2021). India ranks at the top with highest number of road traffic fatalities with 11% share in the global deaths. A total of 4,37,396 road accidents were recorded across India in 2019, resulting in the death of 1,54,732 people and injuries to another 4,39,262, according to the latest National Crime Records Bureau (NCRB) data. The number of accidental deaths has increased by 2.3% at national level during 2019 as compared to 2018. In 2018, Tamil Nadu recorded highest number (63,920) of road accidents, while highest number of fatalities was in the state of Uttar Pradesh (UP) with 22,256 road deaths.

Various initiatives have been taken by the Government of India for prevention of road traffic injuries and for its reduction. One of such initiative which is drafted in the National Health Policy (NHP) 2015 in terms of preventive and promotive health is **Yatri Suraksha**. It states that “Deaths due to rail and road traffic accidents should decline through a combination of response and prevention measures that ensure road and rail safety.” This concept could be expanded to include injuries on account of other causes.

The NHP 2017 promises to increase the government health spending to 2.5% of the GDP by 2025 and raise life-expectancy from the current 67.5 years to 70 years by 2025. This policy was announced in March 2017 by the Government of India. Trauma systems in low and middle income countries (LMICs) are still in developing phase. With increase in industrialization and urbanization, the demand for formalized emergency medical services and trauma services (EMS and TS) has increased tremendously.

Trauma Systems in India

A trauma system is an organized, coordinated effort in a defined geographic area that delivers the full range of care to all injured patients and is integrated with the local public health system. The trauma system is derived from the seamless transition between each phase of care, integrating existing resources to achieve improved patient outcomes. Trauma systems in low and middle income countries (LMICs) are still in developing phase. With increase in industrialization and urbanization, the demand for formalized emergency medical services and trauma services (EMS and TS) has increased. A systematic review published on trauma system development in LMICs found that there is no single model of EMS and trauma services systems in LMICs. The implementation of these services requires coordination of pre-existing resources with cost-effective initiatives that involve local stakeholders. For development of robust trauma systems, it is important to strengthen the pre-hospital care and having uniform emergency number across the country.

The important reasons for increased mortality in LMICs like India are non-availability of trauma systems in a given geographical area, which include care from the injury site till rehabilitation. In a nutshell a trauma care system works towards **‘getting the right patient in the right time to the right health care facility for the right care’**. Trauma system in India is in the rudimentary state. There is gross disparity between the trauma services available in various parts of the country. The rural parts of our country have inefficient services for trauma care, due to the varied topography, financial constraints and lack of appropriate health infrastructure. The pre-hospital care is negligible in almost all the states of our country except few. The implementation of the ‘golden hour’ concept is still an unachieved goal. There is gross disparity between accessibility and affordability of trauma care and quality assurance. In such scenario research and trauma care education is very challenging.

At present, there is no systematic linkage system of information available from various entities involved in trauma response, like police, emergency services and hospitals. Also, a variation in the format of data collection is observed across the states, even different hospitals have different formats of recording data in trauma cases. It is essential to set up reliable data collection and analysis procedures to move from experiential to evidence based safety policies and strategies. Quality data on road traffic injuries can be maintained with adequate training and a data linking mechanism between the Police, Hospital, and Transport Departments. An integrated robust data platform needs to be established to guide all policies, programmes and interventions in the area of road safety.

The Critical Gaps

1. Provision of Essential Emergency Trauma Care Universally

a. Pre-hospital Care

Absent in many states, and in some states very primitive without the state of the art ambulances, trained manpower and proper organization in a definite geographical area. Some states have adopted the Universal Emergency Number 108 for Ambulance/ Police and Fire. The current systems are not backed by proper legislative and regulatory control over manpower training and organizational aspects.

b. In-Hospital Trauma Care

- i. Infrastructure: The secondary (CHC/ District Hospitals) and tertiary (University/ Teaching Hospitals) health care infrastructure presently cannot cater to the needs of multiple injured patients. There is a lack of well-equipped Emergency Departments across the country. The well-equipped EDs of private hospitals do not provide holistic care to all due to economic constraints of the injured patients.
- ii. Trained Manpower: There is lack of trained manpower that can effectively cater to the seriously injured patient at all the levels of health care (Primary, Secondary and Tertiary).
 1. Lack of trained doctors and nurses in emergency departments
 2. Absence of Trauma Surgeons/ trained surgical specialists in trauma
 3. Insufficient numbers of super specialists in various fields, taking care of an injured patient (neurosurgeons, trauma intensive care etc.)
 4. Insufficient number of rehabilitation professionals in hospitals

2. EMS Legislation

There is an urgent need for a legislation on Emergency Medical Services which lays down the minimum standards of Infrastructure, Manpower training and Processes of Care in all aspects of Trauma Care including Pre-hospital and In-hospital care. Such legislation already exists in the state of Gujarat.

3. Lack of Good Data Collection and Trauma Related Research

The injury related data management systems inside the hospitals are not present. There is lack of outcome based data from hospitals treating the trauma patients.

4. Facilities for Rehabilitation

Although some big hospitals have departments of Physical Rehabilitation (Physiotherapists/ Occupational therapists), dedicated PMR experts are not present to give a holistic rehabilitation including neuro-rehabilitation, psychological rehabilitation, etc.

5. Injury Prevention Related Activities

The hospitals are currently not mandated to engage in injury prevention related activities like public awareness campaigns and road user behaviour modifications.

The Need and Importance of Bystander Training

In the absence of robust trauma care systems, there is an urgent need of training bystanders in basic trauma and first-aid. Most often during a road traffic injury or incident the people who are first to arrive at the scene are the persons who are present on the spot, i.e. on the roads or highways. Even before the ambulance or the police can arrive these bystanders or lay-persons are the ones who would handle the trauma victims immediately after the incident. Most often this bystander group includes drivers of commercial vehicles, roadside vendors, Dhabawalas, Petrol/Gas station employees, etc. These are the people who would call the police or the ambulance services and provide the first relief for the accident victims till the time professional help arrives.

It is often said that the future outcome of an injured patient is written by the person who handles the injured victim first. Often it is seen that the wrong handling of trauma victims can lead to severe secondary damage to the body and result in irreparable and preventable loss of function. Hence handling of the trauma patients should be as per the guidelines laid down for by-stander care.

Many Non-governmental Organizations (NGOs) are currently providing such first-aid courses for the bystanders. The WHO along with the experts from All India Institute of Medical Sciences, New Delhi and other major institutions of the country have devised a first-aid course for the by-standers/ lay-persons. This is important for standardization of the first-aid modules and the training being imparted to the bystanders/ lay-people. The International Road Federation, India Chapter along with the faculty and staff of All India Institute of Medical Sciences, New Delhi had embarked on the project of training bystanders along some of the vulnerable stretches of highways identified in more than eight states of the country. This project had been a great success and more than 2000 bystanders were trained under this project. In a similar project the IRF has also joined hands with the Maruti Suzuki IDTRs for training the commercial drivers in trauma care and first-aid. This training is currently underway, and has got a lot of positive feedback from the stakeholders.

As trauma is a time sensitive disease, clearly the training of bystanders who are the real first responders to any Road Traffic Accident is not only urgently required but will also go a long way to reduce the mortality and morbidity following road traffic crashes.



THE 4TH E OF ROAD SAFETY – AND ITS VARYING TIMELINES

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On 1st July 2002, co-incidentally on National Doctor's Day the 1st highway accident helpline 98250 26000 covering large areas of an entire state (Gujarat) was initiated by the Vadodara based non-profit, Lifeline Foundation (www.emsindia.in). Following a life-threatening accident that myself and the other founding Trustees survived, India got its 4th E of Road Safety – Emergency Care. As the 2 decades of that pioneering nation changing work was celebrated, there is a lot to write about the changing face of the 4th E of Road Safety.

That optimistic outlook is however, dampened by the fact that 2 decades later, a literature search on the internet confirms that there is yet no official notification from either MoRTH or MoH&FW, Gol about the 4 E's of Road Safety. This despite the 4 Es being mentioned in the Sundar Committee, more than a decade ago.

The National Road Safety Policy as approved by the Union Cabinet on 15th March 2010 also does not spell out Emergency Care as the 4th E. It states: *The Government will strive to ensure that all persons involved in road accidents benefit from speedy and effective trauma care and management. The essential functions of such a service would include the provision of rescue operation and administration of first aid at the site of an accident and the transport of the victim from accident site to nearby hospital. Hospitals alongside the National Highways and State Highways would be adequately equipped to provide for trauma care and rehabilitation*¹.

The policy also does not talk of the term "Golden Hour". The Golden Hour in Road Safety is perhaps the most misused and misunderstood term. A survey by Lifeline Foundation of 3000 persons across India showed that various people, including administrative and medical decision makers in institutions, trainers of trauma care and bystanders, law enforcement officials at the bottom of the pyramid and paramedics are not aware of what needs to be achieved within the Golden Hour. Responses ranged only from providing first aid to the victim to an ambulance reaching the site.

So, what is this misunderstood Golden Hour? The R Adams Cowley Shock Trauma Center section of the University of Maryland Medical Center's website² quotes Cowley as saying, *"There is a golden hour between life and death. If you are critically injured you have less than 60 minutes to survive. You might not die right then; it may be three days or two weeks later — but something has happened in your body that is irreparable"*.

Before going to that, let me bring in another term – "platinum minutes"; different authors give different timelines with reference to the platinum minutes. Some say 10, some say 15 minutes. Dr V K Agarwal in his article on the Golden Hour of Medical Practice³ writes that *"Platinum 10 minutes refers to first 10 minutes after trauma and refers to the importance of starting first aid within 10 minutes to reduce the chances of death"*.

The concept of the Platinum 10 minutes in trauma care originated from the Advanced Trauma Life Support (ATLS) program developed by the American College of Surgeons Committee on Trauma. ATLS is an educational program designed to provide a standardized approach to initial assessment and management of trauma. This concept is not based on specific scientific evidence but is rather a pragmatic approach developed within the context of the ATLS program. The Platinum 10 minutes has gained recognition and adoption within the trauma care community to emphasize the need for prompt and efficient action during

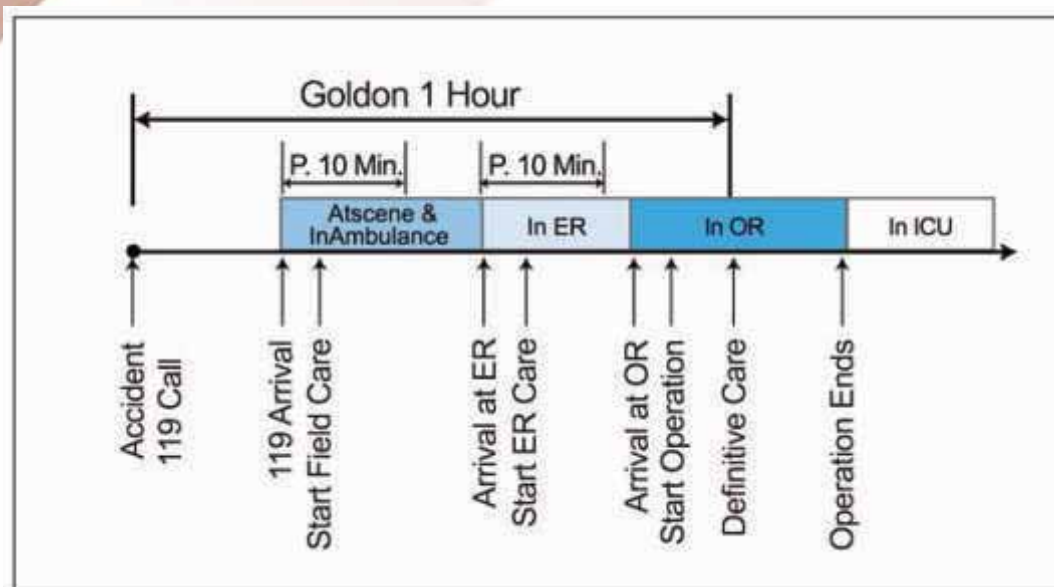
¹ <https://morth.nic.in/national-road-safety-policy-1>

² "Tribute to R Adams Cowley, M.D.," Archived 2005-12-24 at the Wayback Machine University of Maryland Medical Center, R Adams Cowley Shock Trauma Center, Accessed June 22, 2007.

³ <https://ima-india.org/windata/ccima/Legal/GoldenHoursinMedicalPractice.pdf>

early stages of trauma management, though it is not an officially recognized or standardized term within medical literature.

Both Golden Hour and Platinum 10 minutes underscore how important and time-sensitive is trauma care; however, they focus on different time frames and trauma management aspects. While the Golden Hour emphasizes the importance of early access to definitive care, the Platinum 10 minutes on the other hand clearly emphasizes the need for prompt and effective interventions within the first 10 minutes of trauma management. The Emergency Medical Service System (EMSS) of Korea best summarises the co-relation between the Platinum 10 minutes and the Golden Hour; it also recognises 2 different platinum 10 minute periods.



Coming back to the Golden Hour, there is yet no validation of it. Medicine is an evidence-based science and studies on the concept of Golden Hour are rare and not free of ambiguity. Hence the interpretation of what the Golden Hour is and what should be achieved within that time has never been the same across spectrum of experts.

But that does not justify the confusion around it. For example, , a blog on the NH website⁴ mentions that “*Golden Hour*’ refers to a time period lasting from a few minutes to several hours following a traumatic injury....”. Several hours!! The same blog also quotes, “*Over the years, it has been debated whether the ‘Golden Hour’ is actually 60 minutes*”. And that is true!

The debate is based on 3 points:

1. The time-sensitive nature of trauma care has led to discussions about expanding or modifying the time frame to better reflect the individual needs of patients.
2. Pre-hospital vs. Hospital Care: The Golden Hour is based on the significance of reaching a patient to definitive care centres. Debates exist regarding the balance between time spent on on-scene management and transportation, versus time spent at a designated trauma center. There is a strong school of thought that argues that effective pre-hospital care and triage significantly impacts patient outcomes, even if that means extending beyond what is the traditional Golden Hour time frame.
3. Critics argue that the evidence supporting the concept of the Golden Hour is not as robust as was initially believed.

Dr Brooke E Lerner of the Wisconsin University in her seminal research has shown that there is scant evidence of the Golden Hour. “*While the co-relation between time and outcome seems logical, strong evidences to support this belief are hard to find in previous studies*” (Lerner and Moscati, 2001, Rogers et al., 2015).

⁴ <https://www.narayanahealth.org/blog/severe-head-injury-and-the-importance-of-the-golden-hour/>

Two studies both by Sampalis et al. from Quebec in the 1990s (Sampalis et al., 1999, Sampalis et al., 1993) found significant correlations between reduced out-of hospital time and decreased mortality in severely injured patients. However, more recent literature usually offered inconclusive or even negative evidence for this concept (Di Bartolomeo et al., 2007, Kleber et al., 2013, Stiell et al., 2008). In 2010, Newgard et al. conducted one of the most comprehensive investigations of EMS intervals by including 3,656 trauma patients transported by 146 EMS agencies to 51 trauma centers, and no correlation could be found between EMS intervals and mortality among injured patients with physiologic abnormality (Newgard, et al., 2010). In 2015, they re-examined the “golden hour” for patients with shock and traumatic brain injury. Still, there was no association between time and outcome in this North American sample (Newgard, et al., 2015)⁵.

Dr Lerner states that, “*The concept that injured patients should arrive at surgery within 60 minutes of their injury was developed by Dr RA Cowley at the Shock and Trauma Centre. The intuitive nature of the Golden Hour concept and the prestige of Dr Cowley led to the widespread acceptance of the concept*”. She disputes the Golden Hour by stating clearly, “*scientific evidence behind the belief that arrival within 60 minutes reduces mortality, like much of modern EMS, is primarily based on findings from war-time experiences...after the Vietnam War. However, these findings may not be generalizable to the civilian populations since they are based mostly only young healthy males suffering penetrating injuries*”.

The US based EMS proponent, Dr Bryan Bledsoe, an outspoken critic of the golden hour has many times stressed on the point that peer-reviewed medical literature does not demonstrate the Golden Hour for saving critical patients⁶. On the other hand, there is also a large body of studies with compelling evidence that shows patients who arrive more quickly at hospitals from accident sites have a better chance of completely recovering from their injuries rather than those who received extended attention at the site of trauma itself⁷.

The notion of the Golden Hour has implications for resource allocation for the 4th E of Road Safety – Emergency Care in healthcare systems especially in a resource scarce country like India. Balancing the allocation of resources between pre-hospital care, local hospitals and trauma centers becomes a very sensitive issue, given the political compulsions of decision making in India. Thus, discrediting the ‘golden hour’ concept might have implications for trauma system funding and organisation.

It also has to be remembered that Dr R. Adams Cowley’s Golden Hour concept was first propounded in 1975 where he stated, “*the first hour after injury will largely determine a critically injured person’s chances for survival*”; this was in an era that was characterised by a lack of an organised trauma system and inadequate prehospital care. The result of this theory has been the preference for a ‘scoop and run’ method that has become a global standard in the USA, and now in India to prehospital care rather than “stay and play”. Trauma care systems have changed over time and yet the emphasis on resource allocation is driven by the 5-decade old Golden Hour concept, that has been proven to lack evidence. As Dr Bledsoe has stated, “*There are different critical periods for different injuries*”. The controversy surrounding the Golden Hour will not die down soon, but one thing is certain; it does not dismiss the critical importance of early and timely interventions in trauma care. That should never be forgotten.



⁵ The Golden Hour and field triage pattern for road trauma patients; Journal of Safety Research, December 2020; Wei Hu, Violet Freudenberg, Hongren Gong, Baoshan Huang

⁶ Bledsoe, Bryan E (2002). "The Golden Hour: Fact or Fiction". Emergency Medical Services. 31 (6): 105. PMID 12078402

⁷ The Scoop and Run Method of Pre-clinical Care for Trauma Victims; Shaurya Taran; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2997263/>



INDIAN HEAD INJURY FOUNDATION

INDIAN HEAD INJURY FOUNDATION

Profile of work : Indian Head Injury Foundation (IHIF) focuses on:

- Providing physical and online Charitable & High Quality Neuro Rehabilitation facility. Three Charitable Centres functional.
- Conduct of First Responder Courses in Primary Trauma Care.
- Conduct Neuro Critical Care & Neuro Rehab Workshops.
- Creating Patient Support Groups for Head & Spinal Injured victims.
- Training Families & Caregivers to provide Home Rehabilitation.
- Motivating through Peer Mentoring process of similarly placed patients.
- Conducting road safety awareness campaigns for adults and school children. Distributing children's helmets to be worn while on two-wheeler as pillion on gratis basis and supported by Corporates.
- Providing Assistive Gears to the needy like wheelchairs, crutches, etc.

Major Achievements:

- Conduct over 30,000 Supervised Rehabilitation sessions through our three Charitable Neuro Rehab Centres in Delhi, Patna and Jodhpur every year.
- Educated about 1,00,000 children and their parents on awareness on Road Safety and importance of wearing helmets for both drivers as well as for the pillions. Distributed over 58,000 high quality helmets to children from government/charitable school who ride as pillion with their parents. In addition, educated through workshops nearly 55,000 children in UP and Rajasthan.
- Awarded by British Medical Journal (BMJ) 2017 in the category of "Non Communicable Diseases". for widely spreading awareness among our populace in the area importance of Neuro Rehabilitation through IHIF's Charitable Rehab Centres. Also, for Head Injury Prevention through the use of safety devices like helmets and seatbelts. Focus was on children who ride as pillions on two wheelers. Over 20,000 children and parents have been educated and about 15000 high quality ISI children' helmets have been distributed through Corporate Support.
- Received Prince Michael International Road Safety Award 2020 for IHIF's programme "Children's Right to Safety on Roads". This top international award is for outstanding achievement and innovation in improving road safety standards globally and is well recognized the world over.
- Received Silver Salver of Appreciation by ICICI Lombard Gen Insurance Limited for IHIF's valuable contribution towards its Ride To Safety Campaign that educates school children on importance of wearing helmets for both rider as well as pillion and on following road traffic measures.
- Trained about 3300 people in Primary Trauma Care First Responder Training for Gurgaon Police, Delhi Traffic Police, Indian Coast Guard Personnel, Hotel Staff, Fire Brigade, Home Guards, auto and cab drivers, etc.
- Through various CSR and donation from philanthropists, donated 495 assistive devices like wheelchairs, calipers, crutches, etc. to various TBI victims, and other patients from the weaker sections.
- Letter of Appreciation by Mr. K.C. Gupta, Additional Secretary of MoRTH in 2021.
- Letter of Appreciation by Hon' Minister Shri Nitin Gadkari supporting IHIF's efforts in road safety especially on low speed limits, received in 2022.

A CASE STUDY ON NATIONAL HIGHWAY: TO SAFEGUARD THE ROAD USER AND ROAD WORKMAN BY IMPLEMENTING THE 4 ES CONCEPTS TO REDUCE THE ROAD ACCIDENT

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Introduction

Road traffic accident (RTA) is defined as “An accident, which takes place on the road between two or more objects, resulting in one or more persons being killed or injured, and at least one moving vehicle was involved [1, 2]. Thus, RTA is collisions between automobiles and pedestrians; between road vehicles and animals; or between road vehicles and geographical or architectural obstacles. Road traffic accidents (RTAs) have turned out to be a huge worldwide public health problem causing loss of human life nearly 1.35 million people yearly and injuring about 20-50 times this number throughout the same period of time. This present case study is conducted to investigate and ameliorate the issues that cause road traffic accidents on NH-06 from Dhankuni to Kharagpur stretch. This study will also be concentrating on the relationships between road side, nature of the accidents, classification of accidents, causes, road features, road condition, intersection type and control, weather condition and type of vehicles involved, which reveals the need of certain treatments as well as a ranking of the accident (blackspot) locations along the stretch.

1. Road Accident Data Collection and Analysis

The data for this research were collected from Traffic Police Station and Incident Management Team. The accident records were collected from the year 2016-17 to 2021-22 (6 years). The purpose of the preliminary analysis of the traffic accident data is to determine the nature of accident problem. The total number of road accidents occurred along ADKTL stretch during the last six years was 999.

TABLE 1 Comparative chart of Road Accidents and Fatalities

| Year | 2016-2017 | 2017-2018 | 2018-2019 | 2019-2020 | 2020-2021 | 2021-2022 |
|----------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Accident | 426 | 173 | 132 | 113 | 77 | 78 |
| % of reduction | -- | 59% | 69% | 73% | 82% | 82% |
| Fatal Count | 65 | 48 | 43 | 48 | 35 | 35 |
| % of reduction | -- | 26% | 34% | 26% | 46% | 46% |

The road accident details shows that highest number observed was in year 2016-17 with 426 road accident cases with 65 deceased road users, followed by the year 2018-19 and year 2019-20 with 132 and 113 accident cases respectively. The lowest number of accidents is in the year 2020 - 21 with 77 cases with a total of 35 persons who lost their lives.

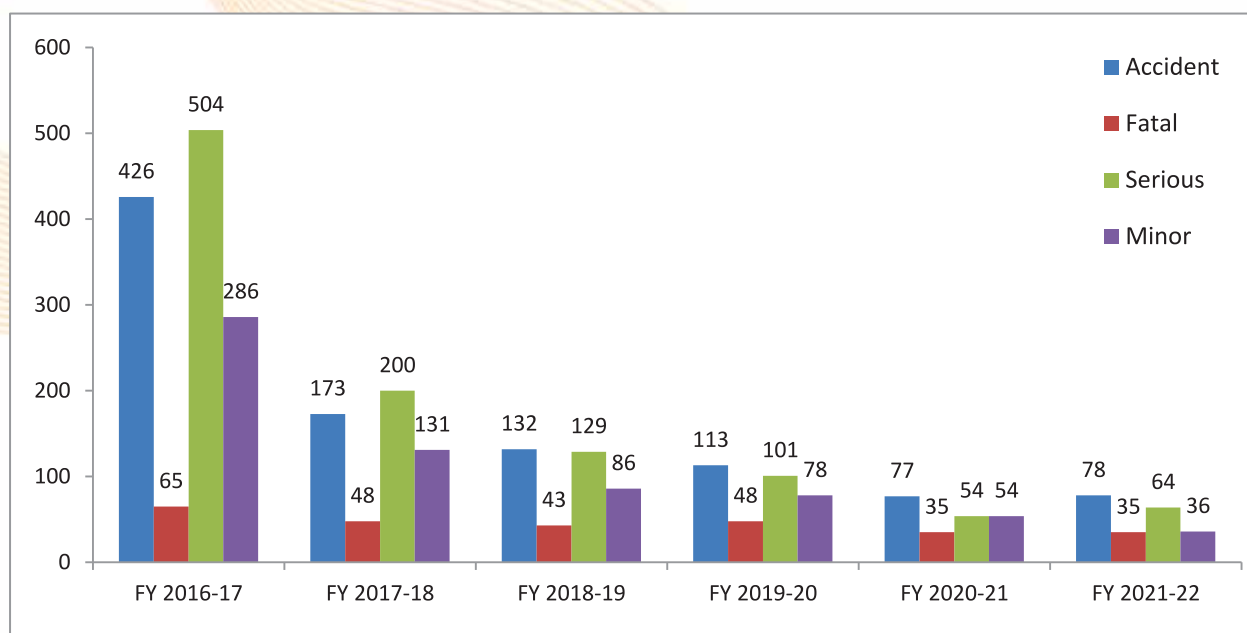


FIG 1 Analysis of type of injuries and its frequency at ADKTL -NH-16 during year 2016-17 to year 2021-22

As per Fig 1, accidents that have caused serious injuries accounts for 52%, while those that have caused fatalities and minor injuries accounts for 14% and 34% respectively. The road accidents were studied during last two years for the causes of accidents, time of accident, and geometry of road, nature of road and weather conditions.

1.1 Road accidents according to cause of the accident

The road accident data shows that most accidents, i.e. 68% of the accidents (i.e. 104 cases) are due to fault of the driver of motor vehicle. Driver of other vehicle including 99 accidents of cyclist, pedestrian and passengers, followed by 18% due to over speeding, which are 31 cases.

1.2 Road accident frequency according to the nature of accident

During the period 2017-18 to year 2021-22, the trend in nature of accidents shows the reduction of overturning accidents by 79%, head-on collision by 78% and rear-end collision by 64 %. Generally, due to over speeding and vehicle out of control leads to rear-end collisions, and these are also the cause of most number of fatal and serious injuries.

1.3 Road accidents analysis in relation to day and night time

In last five years (2017-18 to 2021-22), there was reduction of 25% road accidents in day time and 10% during night time.

1.4 Road accidents analysis in relation to number of vehicles in Passenger Count Unit (PCU)

During the year 2020 - 21 lowest accident per 10,000 PCU was observed as 0.018 during the last five years, and the highest recorded was in 2016-17, which was 0.126.

2. Implementation of 4E Initiatives to Reduce the Road Accident

ADKTL project team has taken following initiatives to reduce the accidents in last five years, and every year the monitoring is being done to see the effectiveness of these initiatives.

Implementation of 4E Initiatives

| Engineering | Enforcement | Education | Emergency Services |
|--|--|--|--|
| Removal of Sight Distances Restrictions and Sharp Curves Foot Over Bridge (FOB) Rumbler Strip with markings Cat—eyes at Curves Installation of Solar blinkers Better Highway lighting for Night Visibility Work zone safety measures while Working on Road Fountain / Greenery to avoid the monotonous Road and Aesthetic environment | Closing of Unauthorized Median Openings Removal of distracting hoardings Zigzag Barricading at Black Spots and Intersections Advance Warning Signs & Awareness posters for Black Spot Road Safety Awareness Trainings to school children in Nearby Areas | Road Safety Campaign for road users Medical checks- / Eye checks Road Safety Awareness for schools and colleges Distribution of pamphlets for awareness Interactions with Administrative authorities for road safety | Major Incidents controlled by Incident Management team Black Spot Identification and Investigation Internal Monitoring & Review on Pot holes, Road Furniture and Signages Removal of Encroachment and Unauthorized Parking Compulsory trainings by Incident Management team to local truck drivers |

2.1 Online Accident Reporting and Analysis Software - Ashoka Highway Research Center has prepared software for Road Accident Investigation on eleven parameters as per the guidelines of IRC: 53-2012. The required detailing of incident is getting captured in the software which further helps to analyze the data as per the cause of road accident.

2.2 Rumble Strip with markings and cat-eyes - The identified locations with cause of accident as the over speeding, are provided with the rumble strips to reduce the speed of the vehicles and to control the road accidents. In the year 2018-19, total of 37 locations are provided with rumble strips with clear markings and cat-eyes.

2.3 Advance Warning Signs and Road safety awareness posters - The blackspots are provided with clear warning sign before the location in advance to alert the road users about the accident prone locations on the road. In the year 2018-2019, a total of 68 signs and 165 awareness posters are provided in the stretch.

2.4 Provision of Foot Over Bridge (FOB) - As per recommendations of NHA I & Independent Engineer Arvee Associates, ADKTL O&M team has constructed two FOBs at the congestion area and accident blackspot locations, which are at Ch. 26+300 and Ch. 49+500 with aim to reduce the accidents of pedestrians.

2.5 Installation of Solar blinkers - Solar blinkers are provided at 85 locations on major junctions and identified blackspot locations to alert the road users in advance. The solar blinkers alert visually to the road users and instruct them to control the speed of vehicles.

2.6 Better Highway lighting for Night Visibility at Vehicular Under Pass & bridges - Lights are provided at underpass area, which help the road users and pedestrians to use the road/underpasses.

2.7. Blackspot Identification and Investigation - ADKTL team carried out blackspot identification and investigation study on regular basis and took the corrective measures as per the causes identified during the investigation. Investigation study helps to identify the main root causes of accident and suggest corrective measures in terms of geometry, road furniture, warning signs, VMS System, etc.

2.8. Internal Monitoring & Review on Pothole, Road Furniture and Signage - ADKTL has formed internal team to identify and rectify the potholes on the highway. Incident management team is taking daily observation of the road to check any pothole creation and immediately informed to road maintenance team for rectification. During year 2020-21, team has repaired 1793 potholes within 02 days of its reporting.

2.9. Closing of Unauthorized Median Opening - The unauthorized median openings, identified during the round and found to be responsible for any road accident, is immediately got closed by maintenance team on priority basis. In year 2020-21, team has closed total 54 unauthorized median openings.

2.10 Removal of Encroachment and Unauthorized Parking - Due to road side encroachments and unauthorized parking, road users face difficulties in using the road and it may lead to road accidents. Incident management team is actively involved in removal of encroachments and parking on road sides during the daily rounds (patrolling).

2.11. Removal of Hoardings - Road side and Median Hoardings are distracting the driver's attention and creating obstruction in the vision of road users, and hence as and when found on the stretch by the incident management team, those are removed. This is a routine activity and closely monitored by the IMT and maintenance teams. In year-2018-19, 78 big hoardings were removed.

2.12. Zigzag Barricading at Junctions - Zigzag barricading provided near to approach of junctions which helped to reduce the speed of the vehicle and alert the road users about the pedestrians crossing the roads. In the year 2018-19, total nine junction locations were provided with zig-zag barricading through police. This initiative carried out in collaboration with City Traffic Police Department.

2.13. Compulsory Trainings by Incident Management teams - On regular basis, compulsory trainings are provided to Local Truck Drivers at Dhabas about the traffic rules and regulations and road safety awareness. In the year 2021-22 such trainings are conducted at 15 locations and around 700 drivers are educated about the road safety.

2.14. Road Safety Awareness Trainings to Schools & Colleges in Nearby Areas - Road Safety awareness trainings are provided to nearby schools and colleges by the site team along with incident management team. During the awareness training campaign, school children are educated on road crossing rules and road safety signs. In the year 2018-19, around 76 schools were covered, where more than 6,000 students are educated on road safety.

2.15. Major Incident controlled by Incident Management team - A leaked LPG tanker was handled by the ADKTL patrolling team by evacuating around 2500 people in the area which may have blasted if not properly handled. The team alerted the area for the possible hazard and announced the precautionary measures which helped to successfully control the impact and saved the national loss.

2.16. Work zone safety measures while working on road - During road maintenance work, safety measures are taken for safety of workers working on road and the performance are monitored. Work zone barricading includes advance warning signs, zig zag barricading, buffer zone, transition zone, fully fenced work zone and termination zone. Road Work Barricading (RWB) and Tool Box talks (TBT) implemented at site for operation and maintenance activities before the state of the work.

2.17. Education for Road users / School and Colleges - Every year road safety campaign is organized with public participation and various activities are conducted on road safety awareness. Large number of activities were carried out during 2020-22 at the project site and site team was involved in all those participatory activities. Conducted six road safety campaign – "**Chai Pe Baat**" at Truck Terminals and 1940 truck drivers are benefited from the same.

3. Conclusions

In this study, it is found that ADKTL site management has efficiently managed to reduce the road accidents during the last five years through corrective measures taken on the causes of road accidents, like blackspot investigations, police zig zag barricading, speed breakers at junctions, advance alert signs at accident prone areas, awareness campaigns for drivers and nearby schools, safe work zone practices for working on road and on-time maintenance activities.

3.1. Engineering: ABL has identified the road engineering issues at road accident prone locations and put the control measures by taking pro-active measures

3.2. Education: The road safety education and campaign of the population of all age groups along the selected road corridor is one of the important actions required, especially when the corridor is being upgraded to a higher category of road or when it is a high speed, high capacity road.

3.3. Enforcement: Enforcement is an important element of road safety to control the behaviors of the road users in compliance to road safety rules. To strengthen the effort of Traffic Police for Speed Monitoring and drive against drunk driving violations, as ABL has provided Speed Gun and Alcohol Breath Analyser to the traffic police.

3.4. Emergency Service: The emergency care system available along a selected road is one of the critical requirements to minimize fatalities and disabilities due to road accidents/crashes. ABL assisted the police and accident victims to reach the medical facilities in shortest possible time.

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Ashoka Buildcon Limited

One of India's leading infrastructure developers is making its presence felt across 3 continents

Ashoka Buildcon Limited's footprint has expanded to 22 states in India

Overseas it is executing prestigious projects in Maldives, Guyana, Benin and Bangladesh, across Asia Africa and South America

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We are active in

- 1) Highways
- 2) Bridges
- 3) Power
- 4) Railways
- 5) Buildings EPC
- 6) City Gas Distribution
- 7) Smart Infrastructure

From a humble beginning in 1976, the company has risen to its present stature through its commitment to uphold Quality, Safety, Consistency and Environment Consciousness in all projects.

The company's strength is reflected in its ability to think and perform beyond the 'ordinary' so as to challenge the perceived boundaries in construction industry.

The result is an unmatched portfolio of extraordinary achievements that have helped the company build new-age infrastructure in India and overseas.

Ashoka is strengthened with a strong talent pool of technical and support staff and its strong fundamentals grant it the capability to execute projects of any scale.

Ashoka Buildcon Limited is listed on National Stock Exchange and Bombay Stock Exchange.

Leadership

Ashoka Buildcon Limited is led by Chairman Mr. Ashok Kataria and Managing Director Mr. Satish Parakh

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The company has its footprint across 22 states in the country and overseas it has presence in Maldives, Guyana, Benin and Bangladesh.

Records

The company has several records to its name including:

1998- Ashoka becomes India's First Construction company to be certified for ISO 9001:2000

1999- Construction of 90 meters cast insitu bridge in record time of 38 days

1999- East Coast Road (Chennai to Pondicherry) earns recognition as Model Road by MoRTH

2004- Construction of 203 km Indore Edlabad Highway – India's largest (then) BOT based highway project

2007- Ashoka becomes India's First Construction company to be certified for Integrated Management Systems

2010- Ashoka becomes India's First Infrastructure company to be certified for GHG

2011- Ashoka Buildcon Limited distributes power to Munger village which gets electrified for the first time ever.

2014- Construction of Rupnarayan Bridge 1, by push launching a 323 meters long 1700 ton heavy, steel girder assembly (First Time in India)

2014- Construction of Rupnarayan Bridge 2, by using pile foundation for the first time in construction of river Bridge

2017 – Guinness World Record for conducting largest Road Safety Class comprising of 2700 participants

2019 - Completed Eastern Peripheral Expressway (Package 4) 500 days ahead of schedule

2019 - Completed Railway Over during the construction of Eastern Peripheral expressway in record time of 100 days

2021 - Ashoka Buildcon limited completes India's First 8 lane extra dosed cable stayed bridge in record time of 33 months

2021- 3 records set during the construction of Bundelkhand Expressway Package 4

- nonstop 12,700 tonnes of Dense Bitumen Macadam in 61 hours
- nonstop laying of 19,756 tonnes of Bituminous Concrete in 93 hours
- completed the superstructure work of 12,000 sq. mts in 46 days

INDIA ROAD SAFETY ECOSYSTEM: HOW IS HUMSAFER'S CONTRIBUTION SUPPORTING IT

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Sigh!!! This is disheartening yet again; a sense of gloominess is felt while reading about major road accidents and the lives lost. Such news has become a common sight in recent times with approximately 1.35 million global deaths owing to road accidents occurring every year (WHO, 2018) a daily death count of approximately 3,700.

Incidentally, India accounts for 11% of global road accidental deaths with a daily death count of 415 people and ~151000 people each year.

These numbers raise an alarming concern on road safety ecosystem of India as it is the second largest road network globally with over 5.9 million kilometres (3.6 million miles) of roads.

Road transport accounts for approximately 60% of freight transportation in India by transporting 4.6 billion tonnes of freight annually costing 9.5 lakh crore and the nation allocating a 1.5% of their GDP to the road budget, i.e. an annual budget of 2.2 trillion is allocated for road infrastructure.

Various road safety initiatives across countries have been conducted by Governments, Social Bodies, and Communities given the increasing road accidents.

Road Safety Initiatives Worldwide

Vision Zero, iRAP (International Road Assessment Program), advanced traffic signal management, and speed enforcement technology are just a few examples of global initiatives aimed at enhancing road safety. These programs focus on various aspects, such as intersection redesign, roadside hazard management, and capacity building for local governments and road authorities.

India's Road Safety Initiatives

India has implemented several initiatives, including the National Road Safety Policy (NRSP), Road Accident Data Management System (RADMS), Motor Vehicles (Amendment) Act 2019, National Highway Authority of India (NHAI) initiatives, and the Indian Road Safety Campaign (IRSC). Despite these efforts, there remains a need for real-time, technologically advanced, affordable, and adaptable solutions to effectively address the road safety challenges in the country.

Considering the prominence of road network and rising accidents in India it is imperative to have an adequate road safety ecosystem. Currently, the Indian road safety ecosystem comprises of following components:

Government agencies: The government of India has established various agencies such as the Ministry of Road Transport and Highways, National Highways Authority of India, State Road Transport Corporations, and traffic police to oversee the traffic management and road safety measures in the country.

Laws and Regulations: The Motor Vehicle Act, 1988 and the Central Motor Vehicles Rules 1989 set the framework for traffic rules and regulations in India. The government regularly updates these laws to ensure safer driving conditions for road users.

Road infrastructure: The quality of road infrastructure, including signage, markings, visibility, and lighting, plays a critical role in ensuring road safety. India has prioritized the development of the national highway network and other arterial roads to improve the quality of road infrastructure in the country.

Technology: Technology plays a vital role in improving road safety in India. Initiatives such as the installation of traffic cameras at intersections and the introduction of intelligent transport systems help to regulate traffic flow and reduce accidents on the road.

Public awareness: Public awareness is an essential component of the road safety ecosystem in India. The government, civil society organizations, and NGOs conduct various awareness

campaigns to educate road users about safe driving practices, including the use of helmets, seat belts, and the dangers of drunk driving.

Private sector engagement: Private sector companies, including automobile manufacturers and insurance providers, play a crucial role in promoting road safety in India. Companies are investing in the development of safer vehicles, promoting advanced driver assistance systems, and offering discounts on insurance premiums for safe driving behaviour.

Together, these components form a comprehensive road safety ecosystem that ensures the safety of road users in India.

Despite various initiatives globally and in India there is serious shortage of real time and technologically equipped solution for road safety.

This has been consequential to creating a solution for a problem with social cause through technological innovation. Founders of Good Mind were driven by this purpose and set out to solve this problem.

After considerable critical design thinking and ideation, a tangible outcome was achieved through “HUMSAFER” application. Simply put HUMSAFER equivalent of Hindi word called “humsafar”, literally meaning a trusted companion. The application was named so to associate it as the safe travel companion.

HUMSAFER's Journey and Road Safety Ecosystem

Introduction

HUMSAFER is an AI based travel companion created to promote road safety. It has positioned itself as tech enabled catalyst for initiating, improvising, and emphasizing road safety culture in India. The application has assessed and monitored awareness penetration and uses multiple means such as micro-size learnings, comic strips, gamification and meta-verse. A technology enabler across all components of Indian road safety ecosystem, which is easily available, adaptable, and affordable for all stakeholders.

Mentioned below are application's niche features, which benefit all stakeholders.

- Driver-Centric Approach
- Driver Management Service: Utilizes AI technology to track various driving parameters to ensure safety
- Real time data collection on driver performance and assign a Safe Driving Score (SDS)
- Alert System: Sleepiness/ drowsiness alerts, over speeding alerts, adequate break time alerts based on time spent driving vis-à-vis the distance covered, fatigue alerts
- Emergency accident support through collaboration with NGOs

Impact and Benefit to Stakeholders

Truck Drivers and their families

Based on research it is derived that 80% of accidents happen due to human error owing to driver fatigue and/or carelessness.

HUMSAFER's B2B2C model focuses on the needs of commercial vehicle drivers, working closely with fleet owners to grade and reward safe driving behaviours. By gamifying the driving experience, drivers' earned points for safe practices, which they can later redeem for cash. This incentivizes responsible driving and encourages a culture of safety.

It enables real-time tracking of truck drivers when they are on road by their family aiding assurance of their safety.

Alert and Monitoring System in HUMSAFER (App)

- Alerting and continuous on road monitoring through the app for improved safety
- Over speeding: Alerts at exceeding 65 km/hr, helping them maintain a safe speed.
- 4-hour break alert: Alerts for continuous driving over 4 hours without a break

- 10-hour stoppage: Alerts on driving beyond 10 hours a day, prompting them to rest and avoid fatigue-related accidents
- 500 km Safe Distance: Alerts on distance covered in a day is above 500km, encouraging a limit to daily driving distance.
- Blackspots: Alerts drivers when they are approaching accident-prone areas, allowing them to stay vigilant and exercise caution.
- Sleep detection: System monitors drivers for signs of drowsiness and sends an alert if their eyes are shut for more than 3 seconds, advising them to stop and rest.

Fleet Owners and Logistics / Transport Companies

Driver Management Service (DMS): A fundamental called “Driver Management Service (DMS)” is developed with pre-defined parameters for safe driving which are used to measure driver performance and accordingly assigns a Safe Driver Score (SDS) to subscribed drivers. This SDS aids fleet owners, aggregators, and transportation partners to assess driver performance and their credibility. This simultaneously supports fleet owners to streamline their operations and ensures drivers' wellbeing and job satisfaction.

Government and Policy Makers

A pilot run of HUMSAFER with World Economic Forum was conducted to assess its viability and impact. Pilot run results were very well received and appreciated which gave way to issue of an advisory mandate for adoption and usage of this application by Road Authorities of India.

By offering enhanced analytical processes, HUMSAFER aids government agencies, fleet owners, and other stakeholders in receiving and analysing critical data points instrumental for policy decisions and law-making. It also aids to better identify safety problems and select countermeasures to achieve optimal returns on safety investments.

Financial Institutions and Insurance Companies Logistics, Financial and Insurance Institutions lack data on drivers' driving performance and ability, which is a high operational risk for their business.

With an increasing subscriber base of drivers, HUMSAFER's current driver subscriber base is 50,000 and up. This data is used for adequate data analytics and aggregation.

The app provides the opportunity to adapt and use innovative modern technologies to address road safety risks in urban environments related to excessive speed limits, mixed traffic conflicting situations as well as safety of vulnerable road users and fatigued drivers.

HUMSAFER wants to enhance driver credibility for these stakeholders by providing adequate data for these stakeholders to assess driver credibility and develop trust, which are data – driven and fact based prior to entering long term commitments and services. This also helps in improving the quality of management and business arrangements for these institutions as well as drivers, which is an overall win-win.

Loans and Insurance for Drivers

In addition to promoting safe driving, HUMSAFER provides drivers with seamless access to loans and insurance through its platform, fostering financial security and stability for drivers and their families.

Way Forward: Shaping Road Safety in the Long Run

HUMSAFER's innovative AI-enabled application aims to improve the management and usage of road networks, providing a solid foundation for future advancements in road safety. As technology continues to advance, HUMSAFER will remain at the forefront, developing new solutions to address road safety challenges and ensure the well-being of road users in India.



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|  <p>the ability people <i>The wind beneath your wheels</i></p> <p>Dilip Patro MCA, M. Com, Director & Founder Secretary The Ability People</p>  <p>We work on 3R: 1. Road Safety Awareness 2. Responsible Good Samaritan Advocacy 3. Rehabilitation for Crash Victims & PwDs</p> <p>director@theabilitypeople.org 9177363600 / 6305136877 www.theabilitypeople.org theabilitypeople @theabilitypp</p> <p>Ability to Give Hope & Choice to the lives of Crash victims & their families. PwDs with CWSNs</p> |  <p>the ability people <i>The wind beneath your wheels</i></p> <p>Registered Office: The Ability People (TAP) Ground Floor, Sashiraj Palace, # 49-27-10, Madhura Nagar, Near Seethammageta Junction, Visakhapatnam-530 016, Andhra Pradesh, INDIA. Res. Phone: +91-891-2725292</p> <p>Programme Center: Ability Rehabilitation Center (ARC) # 22-21-2, GVMC DWCPA Bazar Basement, 27th ward, Opp. Classic Complex, Behind Bommana Brothers, Dabagardens, Visakhapatnam - 530 020 Andhra Pradesh, India Phone: +91 891 274 8911</p>  <p>8508365736 theabilitypeople@gmail.com, Andhra Pradesh, INDIA.</p> |
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YOU SHOULD CARE BECAUSE THE VICTIM COULD BE YOU

- India’s road crash victims do not get medical care in critical first hour.
- First responders are untrained to provide medical assistance.
- Passersby are apprehensive of legalities hence refrain from helping.



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The Ability People (TAP) is a nonprofit, non-government, community based and disable people’s organization registered under the Societies Registration Act, People with Disability Act and the National Trust (Ministry of Social Justice & Empowerment, Govt. of India) It is a secular, apolitical and independent body founded to create a measurable and sustainable impact in the lives of citizen of India. TAP’s mission is to promote 3R’s - Road Safety Awareness, Responsible Good Samaritan and Rehabilitation for crash victims/PwDs.

Road deaths and injuries in India are publicly glaring, while road safety is professionally lacking and politically missing. We need to make efforts to change this scenario. Global experience reveals that road crashes are predictable and preventable. Implementing road safety in India needs a change in 'mindset' by moving from a 'reactive approach' to a proactive approach'. It requires developing and implementing strong mechanisms for prevention, trauma care and rehabilitation.



The Ability People brings together governments, civil society and businesses to address this humanitarian crisis. We earnestly request stakeholders of all States to partner with The Ability People in revolutionizing the road safety scenario in India. **It only takes a split second to prevent an accident - if only we can make a split second decision to take our own safety and the safety of others into our hands.**
The time to change is NOW.

1. Red FM Business Brilliance awards 2022, Visakhapatnam Recognizes and applauds The Ability People for excellence in Humanitarian Service on 9th July 2022.
2. In recognition of our monumental services to the society the Rotary club of Hyderabad took pleasure in bestowing On the 25th day of June 2022 the distinguished citizen award for the year 2021 and 22 on Mr. Dilip Patro.
3. Dilip Patro is one of 3 eminent persons felicitated by ACME (A Creative Makers in Events), Visakhapatnam (19th Nov 2021). Our services on commemorate the 75th year of Indian Independence, Azadi Ka Amrit Mahotsav.
4. To commemorate the 75th year of Indian Independence, Azadi Ka Amrit Mahotsav, Income Tax Department, Visakhapatnam felicitate eminent dignitaries of Visakhapatnam Sri Dilip Patro, Social Activist on 28-08-2021.
5. Hon’ble Chief Minister of Andhra Pradesh Mr Jagan Mohan Reddy has recognised our services and involved us as an intellectual resource in the empowering of rehabilitation & livelihood for Person with Disabilities and for mentoring the community outreach programmes and developing the rehabilitation department in every district hospital on February 14th, 2022.

The ability people Visakhapatnam India initiated in the District Road safety Council on the occasion of global Road safety week 2023 supported by GANRS:

1. 30 km/h Zones at Busiest Area, etc.
2. 25 km/h Zones at Schools and Hospitals,
3. Wearing of Helmets as per BSI or ISI standard.
4. Helmet rule for rider and Pillion rider,
5. Crash Helmet or Bicycle Helmet
6. Vehicle free day in certain areas like RK beach.



DEVELOPMENT OF LANDUSE BASED ACCIDENT PREDICTION MODELS

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Road accidents are widespread all over the world, and annual global road crash statistics (Association for Safe International Road Travel, 2016) state that nearly 1.3 million people die in road crashes each year, with on an average 3,287 deaths a day, with an additional 20-50 million are injured or disabled. According to WHO (World Health Organization 2015), nearly 3400 people die on the world's roads every day. Tens of millions of people are injured or disabled every year. In developing countries, the total number of road accidents is more than that of developed nations because of insufficient infrastructure for Road Safety. Road safety is a term that describes the safety of road users by implementing sufficient improvement in infrastructure and policies to reduce road accidents.

Geographical information system (GIS) has its application in all fields. This technology helps to digitize all physical elements present in the city with their latitude and longitude as a georeferenced layer in GIS software. Hence, spatial analysis in GIS software can analyse the data imported as an attribute and then give the result. Greater Hyderabad Municipal Corporation (GHMC) has been selected as a study area. The study area is divided into two segments, namely MCH (Municipal Corporation of Hyderabad) and the rest of the GHMC area. It is observed that there are differences between accident rate, population density, and employment density between these two segments of the study area. Accident analysis has been carried out using Quantum GIS software for accidents from 2011 to 2015. The GIS analysis is carried out for accident, land use, and socio-economic characteristics and extracted TAZ (Traffic Analysis Zone) wise values of these parameters. Hazardous locations or blackspots are identified in the study area by the stretch-wise and area-wise approaches. The crash frequency method and kernel density method are used for these approaches. As a result, 110 blackspot locations are identified using the crash frequency method throughout the GHMC area, whereas the hotspot map is generated using the Kernel Density method. The hotspot analysis represents well to identify the hazardous locations in the urban area compared to the blackspot analysis.

This study tries to find out the relationship between the land use characteristics with the road accidents of the study area. Earlier, traffic characteristics, road geometric characteristics and road user characteristics were considered to study the road accident behaviour and to determine the causative factors. The modifications of the causative factors are limited to road stretch only and traffic regulations and design changes in the road geometric conditions. With the help of land use characteristics, the different modifications will be required geographically varying in terms of necessary actions taken in the study area for reducing road accidents. So, there is more scope in land use characteristics that will enhance road safety in the study area. Aggregating the transportation system at the TAZ level and developing TAZ level accident prediction models as a function of land use characteristics helps to reduce some of the difficulties caused by the 'lumpiness' of random events that occurred across intersections or road mid-blocks (Washington et al., 2006). Likewise, the importance to study and establish the relationship between road accidents and land use characteristics has been studied extensively (Kim et al. 2002, Wedagama et al., 2007, Pulugurtha et al. 2013, Songpatanasilp et al., 2015). According to these authors, the pattern of road accidents and the primary land use are challenging to define as detailed information on land use is usually not included in accident data in the FIR reports by the police. Therefore, an accident prediction model has been developed for GHMC, MCH, and the rest of GHMC areas considering total accidents and KSI accidents per year for each TAZ as dependent variables. Accident data has been segregated into several groups for modelling. For example, the total number of accidents can be bifurcated based on severity levels. Likewise, accident data has also been segregated from the total accidents (TA) and

Killed and Severe Injury (KSI) accidents for each mode type, which are all-vehicle-type (AVT), NMT-vehicle-type (NMT) and MT-vehicle-type (MT). The population density, employment density, and land-use proportions for each TAZ are considered independent variables. Generalized linear model, Poisson, and negative binomial techniques are used for developing the models. Thus, six model categories are considered for each study segment area of GHMC, MCH, and the rest of GHMC areas for establishing the relationship with land use and socioeconomic variables. In the correlation analysis of land use and socioeconomic variables, it is observed that there is a strong correlation between population density and residential land use.

Among the model results, the significant positive variables are commercial land use, road length and employment density, whereas recreational land use is negatively significant for the MCH area. At the same time, the residential land use, employment density and road length are found to have positive signs for the rest of the GHMC area, while the mixed land use is negatively significant with all accident variables. The MCH and the rest of the GHMC models perform better than the GHMC models. In each approach, the negative binomial model shows a better-fit. The study found that the employment density, residential area, and road length are positively associated with road accidents, whereas mixed land use is negatively associated with road accidents.

To evaluate the models of MCH and the rest of GHMC areas, sensitivity analysis is carried out to find the sensitivity of significant variables with all accident variables. One-way sensitivity analysis is carried out using a single significant variable with the accident variable. At the same time, a set of significant variable combinations is used in two-way sensitivity analysis, which will show the effect in the surface plot. It is observed that the sensitivity of the accident variables with the 10% change in the respective significant variables is appreciable for all models. To improve the safety in MCH area, according to sensitivity analysis, the proposed commercial and recreational land use combination can tend to reduce the accidents. There is a minimum chance of 1% reduction in MT accidents while 7% reduction in NMT accidents. Similarly, there is minimum chance of 5% reduction in AVT KSI accidents, while 2% reduction in MT KSI accidents. According to sensitivity analysis, to increase the safety conditions at rest of GHMC area, the proposed residential and mixed land use combination can tend to reduce a minimum of 13% and 10% in the AVT accidents and NMT accidents. Similar pattern is observed with the mixed land use and employment density combination. There is minimum chance of 16% reduction in NMT KSI accidents, and 17% reduction in MT KSI accidents when the proposed mixed land use and employment density land use variable combination adopted in the rest of GHMC area.

An attempt is made to develop the crash modification factors with the modification in land use proportions and socio-economic characteristics. As per Highway Safety Manual (HSM 2010), crash modification factor is defined as an index of how much crash experience is expected to change following a modification in response variables such as socio-economic characteristics or land use proportions. The following equation is for the representation of the crash modification factor.

$$CMF_i = \frac{\text{Expected crash frequency if change } i \text{ is made}}{\text{Expected crash frequency if change } i \text{ is not made}}$$

The CMF value indicates one (unity) when no such difference has been noticed in 'before' and 'after' accidents with the modifications of a significant variables. If the value of CMF is greater than one, it would mean there is an increase in the accidents with the modification of significant variables. Moreover, when the value of CMF is less than one, it would mean there is a decrease in the accidents with the modification of significant variables. The Crash Modification Factor is calculated for the most critical hazardous location of the study area for 'before' and 'after' situations of proposed land use criteria. Accordingly, the study revealed that CMF is reduced considerably (up to 0.85), which means that in overall hazardous location with the proposed land use characteristics, a total of about 15% reduction can be achieved in road accidents.

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URGENT NEED FOR ROAD SAFETY 2.0: HOW NEW AGE TECHNOLOGY - DRIVEN ROAD SAFETY MEASURES CAN PREVENT ROAD ACCIDENTS IN INDIA

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As per the Ministry of Road Transport and Highways, over 431 valuable lives are lost daily on Indian roads because road safety is ignored. As per WHO and many other reports, the actual figures are much higher than this. The under-reporting of the number of injured people in road accidents is much higher.

The unfortunate fatal road accident of Cyrus Mistry suddenly brought the media's attention on road safety. Another accident of cricketer Rishav Pant also drew the attention of the media on road safety, but these attentions are usually short-lived, and nothing substantially moves forward after the initial euphoria. This is not the first time such a tragedy is witnessed. A Maharashtra MLA recently died in a road accident. Cabinet Minister Gopinath Munde died in one such accident in 2014. Famous comedian Jaspal Bhatti met a similar fate in 2012. The fact is that one life is lost on Indian roads every 4 minutes! Nearly 1.3 million people died on Indian roads in the past decade.

Road traffic injuries (RTIs) are the leading cause of death globally for all ages and the first cause in the 5–29 years age group. Close to 1.55 lakh people die each year in India, and up to 4.5 lakh are injured by RTIs. More than 65% of these deaths are cause to vulnerable road users (i.e., pedestrians, cyclists, and motorcyclists).

Road traffic accidents reduce countries' annual GDP by a range of 1–3%. India fares worst with the highest number of global road fatalities. With just only 1% of the world's vehicles, India accounts for 11% of crash-related deaths, denting the Indian economy by nearly US\$ 38.9 billion, equivalent to 1.85% of GDP. If WHO figures for accidents are taken, the impact on GDP will be over 3.5%.

The traditional approach to road safety is not yielding the desired results, which is evident from the fact that despite some exciting & promising efforts like developing Zero fatality corridors, identifying & fixing blackspots, installing cameras for enforcement, etc., the highest number of road fatalities took place in 2021.

Where are we going wrong?

“Nothing works except in context, and finding out what works where and under what circumstances is a real scientific endeavour.” – Prof Angus Deaton.

Mere copying Western road safety solutions will not work on Indian roads with multi-layered problems. The traffic is not homogeneous like in Western countries, In India, over 60% of traffic constitutes two-wheelers. Unlike in Western countries, the heterogeneous traffic on Indian roads constitutes pedestrians, cyclists, motorcycles, cars, buses, commercial vehicles, trucks, tractors, and at times, animals also. Similarly, in High-Income western countries, maximum accidents revolve around cars, but in India, two-wheelers and pedestrians are the most vulnerable road users, with 60% of fatalities and injuries. The road safety measures of the Western countries are more focused on safety measures within cars like seatbelts, airbags, etc., whereas we need more focus on safety measures outside of cars without compromising the in-vehicle safety measures. Therefore adopting Western road safety parameters will not provide a human-centric solution in the Indian context.

An Indian solution will fit to the context of geo-socio-political scenarios and economic realities, where technology compensates for human limitations and encourages good drivers by creating a human-centric ecosystem. The engineering and road design problems are required to be addressed based on the traffic composition; there should be separate and enough lanes, foot-over bridges, and flyovers for the two-wheelers and pedestrians as far as possible. Vehicle safety features should comprise both within the vehicle and outside of the

vehicle, depending on the vulnerable road users. Similarly, we need to improvise the enforcement system with our innovative solutions considering the complexity of enforcement in India due to the dense population, shortage of traffic police manpower, the huge cost of automated enforcement systems, and the challenging financial positions of most of the municipalities. We need a carrot and stick approach to enforcement using low-cost technologies within our means, such as we can change driving behaviour by incentivizing good drivers rather than wasting time, energy and money on identifying and punishing bad drivers.

Identifying Road Safety & Risk Issues

Road safety has always been a complex and multifaceted issue. Despite many factors leading to fatal and non-fatal road injuries, the evidence identifies that four main risk factors consistently increase the risk for road crash related injuries and deaths, and are hence acknowledged by the WHO as major risk factors.

- speeding,
- drunk driving,
- helmet use, and
- use of seatbelt or child restraint.

According to a study published in The Lancet journal, at least 30,000 lives in India could have been saved just by the implementation of simple road safety measures to prevent the above four main risk factors. World Economic Forum-led Road Safety 2.0 pilots also reveal that majority of accidents are due to human errors and can be prevented with the use of technology to compensate for human limitations. Besides human errors, the deficits in road engineering that create accident-prone spots and the sudden appearance of potholes, and poor safety measures in vehicles also contribute to the accidents. But the major reason remains the driving behaviour.

How to Improve

Having identified the major risk factors of road accidents, the next question is how to improve the driver's behaviour to ensure adherence to traffic rules. The study reveals that the behaviour can be changed either by the fear of penalty through strict enforcement or by self-motivation through incentives. For a densely populated country like India, encouraging and self-motivating drivers for better driving through incentives and rewards can be a better option.

Reward Good Drivers

Road Safety 2.0 concept of tracking driver's behaviour through IoT and converting it into easily understandable scores called **Safe Driving Scores**, which can be popularized like CIBIL Scores by linking various road and vehicle-related incentives/financial benefits with it. Mandating a Safe Driving Score for every DL holder can be a real game changer for road safety in India.

The success of the World Economic Forum (WEF) led Road Safety 2.0 pilots demonstrated that this theory is more effective with a drastic reduction in accidents.

Safe Driving Scores

The driver's behaviour which is a subjective matter, can be tracked using IoT and converted into scores on a real-time basis that may be called **Safe Driving Scores**. Incentive schemes for encouraging SDS by linking it with all road and vehicle-related transactions, such as rebates in Insurance Premiums, rebates at Vehicle Workshops, and Wayside Amenities for drivers like CIBIL score can be a game changer for road safety in India.

Ecosystem to Reward Safe Driving Scores

There is a need to create an ecosystem to reward these scores.

For commercial vehicle drivers, this will generate a new revenue source for safe drivers as every transporter will prefer drivers with higher SDS, which will automatically create a ranking system of drivers based on their Safe Driving Scores. Insurance companies, who are major stakeholders can now come forward through regulatory modifications by IRDAI. This will reduce the dependency on third-party road safety funding and create a self-sustainable ecosystem. Safe Driving Scores mean better drivers who will get more rebates in insurance premiums. Similarly, a good/careful driver will lead to lesser accidents and thus a lesser pay-out for insurance companies. Thus, drivers will crave for higher Safe Driving Scores to get maximum rebates in the insurance premiums, thus driving safely, resulting in fewer road accidents.

A win-win for everyone.

Tech-Based Automated Enforcement System

The self-motivating measures for improving drivers' behaviours alone may not be a complete solution for road safety. Strict and transparent enforcement systems of traffic rules are equally essential. Both are complementary to each other.

The enforcement system needs to be automated, comprising speed cameras, incident detection cameras and ANPR systems, IoTs, and high-end software for real-time detection of violations and issuance of automated penalty challans with a robust recovery system.

But the problem with an automated system is not the availability of technology but the availability of funds. The equipment and software of automated enforcement systems are expensive and require skilled manpower for flawless operations. Most Indian cities /municipalities don't have enough financial resources. Here the cities require the PPP model.

How to Implement an Automated Enforcement System on PPP Model

World Economic Forum did a pilot for the automated enforcement system on the PPP model and found it quite effective and economically viable.

The technology companies / OEMs are ready to bear the upfront installation cost and 5 to 7 years of operation and management cost through their skilled manpower and to recover their Capex & Opex cost as a fixed annuity or as a part of challans/penalty recovered by the government. This is not only financially viable but will also bring additional revenue to cities/municipalities, improving road safety and providing many job opportunities.

A win-win for everyone.

Only with these measures will it be possible to achieve the target of reducing road deaths by 50%, otherwise the same old story will continue once the media euphoria is over.



ROAD SAFETY ACTIVITIES OF KSCSTE-NATPAC

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National Transportation Planning and Research Centre (NATPAC), an institution under Kerala State Council for Science, Technology and Environment (KSCSTE), Government of Kerala, is a premier Research & Development institution in the country which works on multi – modal system of transportation covering road, rail, water, air etc. NATPAC has been handling research and sponsored projects for more than four decades in the areas of road safety, traffic engineering, transportation planning, highway engineering, public transport system, alternative options for transportation system, transport energy, transport economics, inland water transport, tourism planning and rural roads. The Centre has played a vital role in addressing issues such as traffic congestion, traffic safety, parking, impact of climate change on transport infrastructure, scarcity of pavement materials, etc., thereby catalyzing the Government's efforts to bring positive changes in the society.

NATPAC has contributed significantly to the transport development of the country in general and to the State of Kerala in particular. NATPAC plays an important advisory role to the Government of Kerala and has been successfully able to bridge the gap between research and practice. The Head Office of the Centre is situated in Thiruvananthapuram and has its Regional Offices in Ernakulam and Kozhikode, addressing the needs of the transport sectors on a zonal basis.

The vision of the NATPAC is to develop a safe, sustainable, efficient and equitable transportation system through scientific, multi-disciplinary and innovative interventions for societal needs. Traffic Safety is one of the major thrust areas of NATPAC, where the centre focuses its activities broadly comprising of Research Studies, Development Projects, Sponsored Projects, and Outreach activities. NATPAC has carried out several studies and organised workshops under the Corporate Social Responsibility Scheme aimed at improving road safety.

NATPAC conducts research and development activities to develop innovative solutions for improving road safety. These activities include exploring safety modelling techniques, developing new road safety technologies, conducting crash data led investigations, and analysing crash data to identify patterns and trends. The Centre focuses its research on advanced crash data analytics, crash prediction models, blackspot studies, crash investigation studies, road user behavioural studies, risk assessment, geospatial analytics, surrogate safety assessment, etc. The applications of Intelligent Transport System in the field of road safety are being researched and products are being developed. Adaptive Traffic Signal Systems has been developed and tested for providing priority to the emergency vehicles at intersections.

NATPAC has developed a web portal and mobile app for imparting road safety education primarily focussing on school children. NATPAC is currently developing a database management system, which aims to bring out a real time information system and deploy advanced analytical techniques for obtaining better insights for the development of the transport sector in the State.

NATPAC has been in the forefront for preparing road safety related technical documents, protocols and guidelines for improving the road safety scenario in the State. The Centre has prepared technical documents such as Draft Kerala Road Safety Vision & Mission (2013), Draft Kerala Road Safety Policy (2016), Draft Kerala Road Safety Action Plan (2016) and had submitted them to the Government of Kerala. In line with the Global Road Safety Performance Targets set by World Health Organisation, NATPAC has proactively prepared a technical document on 'Strategic Road Map for Crash Reduction towards 2030 (2020)'. NATPAC has prepared a protocol for Blackspot Management in the State of Kerala, which

was instrumental for the stakeholder agencies to involve in the data-led analysis for the identification and rectification process, with the constant monitoring of Hon'ble Supreme Court Committee on Road Safety.

NATPAC conducts blackspot identification and rectification studies to identify crash prone locations and suggest remedial measures to reduce crashes at the vulnerable locations. NATPAC has identified 4592 crash blackspots/hazardous locations across the state in the year 2021 based on the crash data for the years 2018-2020 collected from Kerala State Crime Records Bureau, and has submitted the report to Kerala Road Safety Authority. Ernakulam district has the highest number (703) of crash blackspots, closely followed by Thiruvananthapuram district (694). A total of 323 crash vulnerable road corridors on National Highways and State Highways in Kerala are identified from the list of crash blackspots and were prioritized based on Blackspot Cluster Severity Index. Of this, 149 corridors are on National Highways and 174 corridors are on State Highways. Out of 4592 Blackspots in Kerala, more than 54% of the blackspots (2495 Nos) are in the identified crash vulnerable road corridors. The total road length of crash vulnerable road corridors in Kerala is found to be more than 2200 kms, which forms around 33% of the total length of highways in Kerala.

NATPAC periodically conducts road safety audits on highways, urban roads, and rural roads in accordance with the requirements of the stakeholder departments to identify potential hazards and recommend measures to mitigate them. The audits cover various aspects such as road design, signage, road markings, traffic calming measures, street lighting, drainage and traffic control systems relating to all types of road users. NATPAC is a recognised third party agency for carrying out road safety audits for road projects under Public Works Department (PWD) in Kerala. NATPAC is an empanelled agency for conducting Road Safety Audit for roads under Pradhan Mantri Gram Sadak Yojana (PMGSY). The Centre has conducted Road Safety Audits for more than 600 kms of roads in Kerala, which includes 100 km on National Highway 66 for International Road Federation – India Chapter (IRF-IC). NATPAC has signed the Memorandum of Understanding with the Ministry of Road transport and Highways (MoRTH) and Indian Roads Congress (IRC) to impart training on “Road Safety Audit and other Road Safety related aspects” for Engineers, Consultants, Practitioners, Researchers etc. NATPAC has imparted Road Safety Audit Certification Course to more than 65 candidates across the country.

NATPAC conducts capacity building programmes for road safety professionals, enforcement officials, practising engineers, and other stakeholders to enhance their knowledge and skills in road safety. These training programs cover multidisciplinary topics such as road safety audit, blackspot management, road alignment design, intersection design, ITS applications, legal frameworks, psychological aspects, road safety management, first aid & trauma care, etc. NATPAC also organises expert group meetings and stakeholder engagement for brainstorming, dissemination of knowledge and experiences, which aid in the field implementation of road safety measures.

As part of outreach activities, NATPAC regularly conducts road safety awareness programmes to educate various target groups about safe driving practices, traffic rules, and the importance of complying with seat belts and helmets norms. These awareness programmes include public campaigns, training sessions, seminars, and roadshows. Government of Kerala has accredited NATPAC as an Authorized Training Centre for training of drivers of vehicles carrying dangerous and hazardous goods. NATPAC has given training to more than 2000 heavy vehicle drivers who carry dangerous and hazardous goods.

NATPAC has conceptualised different road safety modules for various target groups and the focussed training programmes are being carried out across the State. The various target groups include School Children, Pedestrians, Cyclists, Students, Police Cadets, School Teachers, Communities, Drivers of Two wheelers, Autorickshaw, Tipper and other heavy vehicles, School bus, Ambulance and emergency vehicles, Hazardous goods carriers, KSRTC buses, etc. The Centre has trained more than 2200 school teachers and 1200 driving school instructors across the State. Safe Road to School programme, Road Safety

Youth Leadership Programmes and Safe Community Programme for Panchayaths are other focussed and tailormade training programmes being conducted by the Centre. Recently, NATPAC has conducted a Safe Road to School programme for 100 schools in the State, training more than 4000 school students.

NATPAC has received various awards and recognitions for its outstanding contributions to road safety in India. Some of these awards and recognitions are: Urban Mobility India Award – SOFT Program (2017), Maruti-Times Now Road Safety Award in the Institutional Category (2017), and Best Pavilion Awards for various Exhibitions. Two road safety films namely “Distraction is Extraction (2021)” and “Hands free is not risk free (2021)” were selected and screened in the Global Road Safety Film Festival (2022) held at Palais des Nations in Geneva.

NATPAC has prepared detailed project reports for more than 400 km of road projects in Kerala. The centre has prepared intersection improvement plans for more than 200 intersections in Kerala. NATPAC plays an advisory role to the Government and the staff of NATPAC are members of various Government Committees and professional societies. Overall, NATPAC's activities aim to improve road safety by promoting a safe and sustainable transportation system in the State.





KSCSTE - National Transportation Planning and Research Centre

KSCSTE-National Transportation Planning and Research Centre (NATPAC) has been at the forefront of solving the traffic and transportation problems faced by the State of Kerala since its inception in 1976. It has played a pivotal role in providing research and consultancy services in the fields of transportation planning, traffic engineering, highway and pavement engineering, road safety, rural roads, inland water transport, tourism planning, transport economics and management, intelligent transportation systems, transport energy and environment, geomatics, and other transportation-related aspects. Recognizing the contributions and achievements made by the institute, the Government of Kerala reconstituted NATPAC as an autonomous R&D Centre under the Department of Science and Technology in 1982. In November 2002, NATPAC was amalgamated with the Kerala State Council for Science, Technology and Environment (KSCSTE), an autonomous body under the Department of Science and Technology, Government of Kerala. This merger aimed to adopt an integrated approach to research and development activities in Kerala.

The main campus of NATPAC is located in Thiruvananthapuram, with two regional offices functioning in Kozhikode and Ernakulam. NATPAC has partnered with national and international agencies to carry out specialized technical projects. It has contributed significantly to the development of the transport sector in Kerala as a consultant and in an advisory role. The Centre has submitted reports like Transport Vision 2030, Enhancing Climate Resilience of Kerala's Road Network, Strategic Road Map for Crash Reduction in Kerala 2030, and many more. NATPAC provides technical support to various State Government Departments like Transport, PWD, Tourism, LSGD, KIIFB, KRFB, PMGSY, KSRTC, KMRL, KRSA, KSTP, KWIL, SWTD, KSINC, KMTA, etc. It has also been providing technical reports and proposals to national and international agencies in specialized fields of transportation.

In the area of road safety, NATPAC has been playing a key role in providing road safety education, awareness, and training programs. It has organized extension programs for children and teachers in schools, police officials, student police cadets, hazardous goods drivers and drivers of auto, taxi, trucks, and KSRTC bus. NATPAC has also prepared road safety materials for various target groups, road safety inspection, and preparation of short-term immediate improvement measures for selected crash black spots, impact assessment, engineering measures to ensure road safety, and training to departmental engineers.

NATPAC is also in charge of the state's most important and prominent infrastructure projects like the feasibility Study for Hill Highway Alignment, Preparation of DPR for Integrated Development of Coastal Highway, Preparation of DPR for the Development of Inland Waterways, Road Safety Improvement works of Kerala under World Bank assisted Challenge fund, Technical Review and Support Services for Preparation of Project Execution Documents of KIIFB funded road projects, Road Safety Auditing of 123 road projects under the PMGSY scheme for KSRRDA, FDR based technical review and support services for the development of PED in transport projects etc.

ROAD SAFETY SCENARIO IN INDIA

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1. ROAD NETWORK IN INDIA

1.1 Road transport is essentially the prominent mode of transport in India which caters to 60% of goods as well as 85% of passenger, thereby contributing significantly in the growth of the Nation's economy. Road transport service accounted for 3.3 percent of the country's gross value addition (GVA).

1.2 The share of National Highways is 2.1% and State Highways is 2.9% in the total road network. Two-lane National Highways constitute the largest share of 52% in the total length of NHs.

1.3 The number of motorized vehicles in India is increasing rapidly due to sustained economic development as well as with the expansion of the road network. According to the statistics of MoRTH, the total registered motor vehicles in India as of 31st March 2020 is 326 million. Composition of vehicle population in 2020 shows the highest share of two wheelers (74.7%) followed by cars, jeeps and taxis (13.4%), other vehicles 6.9%, goods vehicles (4.4%) and buses (0.7%). This is indicative of the growing road traffic congestion in the country.

2. ROAD CRASH SCENARIO IN INDIA

2.1 As per the MoRTH official data, 1,53,972 persons were killed and 3,84,448 injured in 4,12,432 road traffic crashes in India in 2021. Thus, road crashes led to 18 fatalities on an average every hour in India during 2021. Total number of accidents, fatal accidents, number of persons injured, and persons killed in road crashes since 2016 in India is given in **Table 1**.

TABLE 1 Number of Total Accidents, Fatal Accidents, Persons injured and killed (MoRTH, 2021)

| Year | No. of Total Accidents | No. of Fatal Accidents | No. of persons injured | No. of Persons Killed |
|------|------------------------|------------------------|------------------------|-----------------------|
| 2016 | 480652 | 136071 | 494624 | 150785 |
| 2017 | 464910 | 134796 | 470975 | 147913 |
| 2018 | 467044 | 137726 | 469418 | 151417 |
| 2019 | 449002 | 137689 | 451361 | 151113 |
| 2020 | 366138 | 120806 | 348279 | 131714 |
| 2021 | 412432 | 142163 | 384448 | 153972 |

It may be seen from the above table that due to various actions taken by Government number of accidents and number of persons injured have consistently decreased. However, number of fatal accidents and number of fatalities have generally increased. Further, crash severity i.e., number of persons killed per 100 crashes have increased from 20.2 in 2000 to 37.3 in 2021.

3 ACCIDENTS AS PER ROAD CATAGORY

3.1 The number of road accidents and persons killed by category of roads, i.e., NH, SH & Other, are shown in **Table 2**. National Highways constitute only 2.1% of the total length of roads in India, but account for 36.4% of the fatalities and 31.2% of total road accidents in 2021. State Highways which account for 2.9% of the total road length accounted for 23.4% and 24.7% of accidents and fatalities respectively. Other Roads which constitute about 95% of the total roads were responsible for the balance 45.4% of the accidents and 39% road accident fatalities.

TABLE 2 Road Accident in terms of Category of Roads

| Category of roads | 2020 | | 2021 | | % Change in 2021 over 2020 | |
|-------------------|-----------|--------|-----------|--------|----------------------------|--------|
| | Accidents | Killed | Accidents | Killed | Accidents | Killed |
| National Highways | 1,16,496 | 47,984 | 1,28,825 | 56,007 | 10.58 | 16.72 |
| State Highways | 90,755 | 33,148 | 96,382 | 37,963 | 6.20 | 14.53 |
| Other Roads | 1,58,887 | 50,582 | 1,87,225 | 60,002 | 17.84 | 18.62 |

3.2 More accidents on these highways have been attributed to higher vehicle speed and increasingly higher volume of traffic. Increase in both accidents and fatalities in 2021 over 2020 were mainly due to COVID conditions in 2020 causing lockdown for considerable period.

3.3 Crash Scenario on National Highways

3.3.1 India has the second largest road network across the world amounting to 6.37 million km. National Highways (NHs) of India are the major roads of the country supporting the economic activity apart from providing mobility and accessibility to the masses. They traverse the length and breadth of the country connecting the State Capitals and major Cities. NHs play a vital role in providing medium and long-distance inter-city passenger and freight traffic across the country.

3.3.2 The crash pattern of National Highways has revealed that two-wheelers recorded the highest number of deaths (40.7%) followed by Pedestrians (16.9%) and Cars, Taxis and Vans (16.4%).

3.3.3 The head-on collisions comprise 19% of the crashes on 4-lane divided roads. It shows the movement of vehicles in the wrong direction even after segregation of the traffic, direction wise on these highways. Rear end collisions are significantly high on all types of highways.

4 PROFILE OF ROAD ACCIDENTS

The details of persons killed in road accidents in terms of road user category during last three years is given in **Table 3** below. It may be seen that the share of Two-Wheeler riders getting killed in road accident is increasing from 37.1 % to 45.1%. Similarly, pedestrians getting killed have also increased from 17.1% to 18.9%. Thus, 64% of the fatalities are these two categories alone which requires special intervention at the policy level.

TABLE 3 Comparison of Persons killed in road accidents during 2019 to 2021

| Vehicle Type | Persons killed 2019 | Persons killed 2020 | Persons killed 2021 |
|--|---------------------|---------------------|---------------------|
| Pedestrian | 17.1% | 17.8% | 18.9% |
| Bicycle | 2.8% | 3.2% | 3.1% |
| Two-Wheeler | 37.1% | 43.5% | 45.1% |
| Auto Rickshaw | 4.4% | 3.9% | 3.9% |
| Car/Taxis/Vans & LMV | 15.8% | 13.7% | 12.9% |
| Truck/Lory | 9.0% | 7.5% | 6.2% |
| Bus | 4.3% | 2.3% | 2.0% |
| Other Non-Motorized Vehicles | 2.0% | 2.5% | 1.5% |
| Others (other animals drawn vehicles, cycle rickshaws) | 7.4% | 5.7% | 6.6% |

5. CAUSE OF ROAD ACCIDENTS

Road accidents, having multiple causes, are the result of an interplay of various factors. These can broadly be categorized into those relating to (i) human error, (ii) road condition/environment, and (iii) vehicular condition. The detail of road accidents caused by human error attributable to various traffic rule violations are given in **Table 4**.

TABLE 4 Road Accidents by Type of Traffic Rules Violation during 2021

| Category | Accidents | Fatalities | Injured |
|--|-----------------|-----------------|-----------------|
| Over-speeding | 2,95,522 | 1,07,236 | 2,80,285 |
| Drunken Driving/ consumption of alcohol & drug | 9,150 | 3,314 | 7,509 |
| Driving on wrong side/Lane indiscipline | 21,491 | 8,122 | 20,351 |
| Jumping red light | 2,203 | 679 | 1,905 |
| Use of mobile phone | 6,530 | 2,982 | 5,394 |
| Others | 77,536 | 31,639 | 69,004 |
| All India | 4,12,432 | 1,53,972 | 3,84,448 |

From the table above it may be seen that over speeding constitute the main violation associated with accident, accident-related deaths, and injuries during 2021. During 2021 itself over speeding accounting for 71.7% of the road accidents and 69.6% of the total deaths.

6. INITIATIVES TAKEN UP BY THE MINISTRY OF ROAD TRANSPORT & HIGHWAYS

I. Education Measures

The Ministry of Road Transport & Highways has implemented a scheme, “Grant of Financial Assistance for Administering Road Safety Advocacy and Awards for the Outstanding Work done in the field of Road Safety”. Under the scheme, financial assistance is provided to various eligible agencies such as NGO / Trust under Indian Trusts Act/ Cooperative Society Act under Societies Registration Act/ Firm registered under the companies Act, 1956/ 2013 to address the issue of road safety based on Education, Engineering (both of roads and vehicles), Enforcement and Emergency Care. To create effective public awareness about road safety, Ministry uses various social media platforms, electronic media and print media.

II. Engineering the Measures

High priority has been accorded for identification and rectification of blackspots (accidents prone spots) on National Highways. Concerted efforts have been made towards improvement of road safety through engineering measures on National Highways based on accident and fatality data of year 2015-2018 in 30 states / UTs.

The blackspots are being rectified by providing immediate short-term measures such as cautionary road signs and markings, transverse bar markings, rumble strips and solar blinkers. For long term rectification, measures such as Flyover, Underpasses, Foot Over Bridges, Service Roads, etc. are being provided wherever required.

Traffic calming measures such as warning signs, delineators, road studs, bar markings, humps at approach roads, etc. are taken at vulnerable sections of National Highways to reduce road accident fatalities.

III. Road Safety Audits

It is mandatory to carry out the Road Safety Audit of all highway projects at all stages, i.e. design, construction and operation & maintenance stages. The Road Safety Audit is being carried out as per Indian Roads Congress Standards IRC: SP:88.

IV. *Vehicle Engineering*

To enhance the safety aspect of the vehicle, fitment of front airbag for driver was mandated from 01st July 2019. From 31st December 2021 for all models, fitment of co-driver airbag has been made mandatory.

V. *Enforcement Measures*

The Motor Vehicles Act, 1988 is the principal instrument through which road transport is regulated in the country. The same has been amended first time in a comprehensive way by the Motor Vehicles (Amendment) Act, 2019, passed by the Parliament and published in the Gazette of India on 9th August 2019.

7. INDIAN ROADS CONGRESS INITIATIVES TOWARDS ROAD SAFETY

IRC has a dedicated Technical Expert Committee on Road Safety. In last couple of years numerous new/ revised documents on road safety have been published by IRC, viz. Road Safety Audit Manual (IRC:88); Identification and Treatments of Black spots (IRC:131); Traffic Calming Measure (IRC:99); Road Signage (IRC:67); Road Marking (IRC:35); Crash Barriers (IRC:119), Pedestrian Facilities (IRC:103), Parking Facilities (IRC: SP:12); Cycle Tracks (IRC:11) etc. for adoption by road user agencies and highway professionals.

IRC has formulated National Curriculum for 15 days training course on 'Road Safety Audit' at par with best international standards for imparting to Highway Engineers and Auditors with an aim to maintain uniformity in the country. Subsequently, the 'Memorandum of Understanding for Imparting Training on Road Safety and Safety Audit' was signed between MoRTH & IRC with 11 institutes. Through these institutes, 37 training programmes have so far been conducted in the last 3 years thereby training more than 1100 safety professionals. This has gone a long way in capacity building efforts of the Government of India and Indian Roads Congress for improving the safety scenario in the country.



CONSTRUCTION FEDERATION OF INDIA (CFI)

A Brief Profile & Activities

Construction Federation of India (CFI), a representative body of infrastructure construction industry. CFI enjoys the patronage of leading infrastructure construction companies in India and is a body "**of the sector, for the sector and by the sector**". The Governing Council of CFI headed by **Shri Ajit Gulabchand**, CMD, HCC Ltd. & Senior representatives from L&T, Gammon India, Shapoorji Pallonji, Afcons, Tata Projects, Kalpatru Projects, ITD Cementation, Patel Engineering, IRB Infrastructure, NCC Ltd., Simplex Infrastructure, S P Singla and its Secretariat has been continuously taking initiatives for the betterment of infrastructure construction sector.

CFI members are engaged in creation of building dams, power stations, roads & highways, bridges, tunnels, seaports, airports, metros and other basic infrastructure of national importance. The fundamental aim of the Federation is to bring about all-round improvements in the construction sector while striving towards resolution of operational as well as policy level problems faced by the industry. This involves making efforts to obtain from policy makers and authorities, the level of attention that the construction industry deserves in view of its tremendous contribution and importance to the national economy.

A few major Activities & Initiatives undertaken by the Federation in the recent years are:

Representation on Impact of steep rise in Steel, Cement Prices by the Manufacturers: Detailed representations addressed to **Shri Narendra Modi, Hon'ble Prime Minister of India** with copy to Smt. Nirmala Sitharaman, Union Minister of Finance & Corporate Affairs, Shri Nitin J Gadkari, Union Minister for Road Transport & Highways & MSME, Shri Ram Chandra Prasad Singh, Union Minister of Steel and Dr. Rajiv Kumar, Vice Chairman, NITIAAYOG.

NHAI Agreed to consider CFI Suggestions: Relief for Contractors/Developers:

NHAI has agreed upon to consider some suggestions for relief measures during the 2nd Wave of Covid-19 Pandemic submitted by CFI President, Shri Ajit Gulabchand to Shri Nitin J Gadkari, Union Minister for Road, Transport & Highways & MSME with cc to Shri Giridhar Aramane, Secretary, Ministry of Road Transport & Highways, Dr. Sukhbir Singh Sandhu, Chairman, NHAI, Mr. Keshav Kumar Pathak, M.D., NHIDCL.

Contractual & Arbitration Issues: Detailed Comments submitted to **Department of Expenditure**, Ministry of Finance on Vivad Se Vishwas II Scheme (Contractual Disputes) and **Dr. T K Vishwanathan**, Chairman of Committee on Working of Arbitration Law on Working of Arbitration Law & Need for Reforms in The Arbitration & Conciliation Act.

Interactive Meetings:

CFI Members Interaction with Russian Construction Companies -29th June 2023

An Interactive Meeting exclusively between CFI Members and a Delegation of Russian Construction Companies was organized by the Office of Trade Representation of Russian Federation on June 29th, 2023 at their Chanakyapuri Office, New Delhi.

CFI Meeting with Shri Vivek Aggarwal, Additional Secretary, GST Council on crucial GST Issues - 15th June 2022

CFI members had an opportunity to interact with Shri Vivek Aggarwal, Additional Secretary, Smt Ashima Bansal, Joint Secretary respectively from GST Council in an Offline Meeting held on 15th June 2022 at GST Council Secretariat, New Delhi.

SPEED MANAGEMENT: A NECESSITY FOR REDUCING ROAD CRASHES

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Introduction

Road crashes and resulting fatalities is a major social concern throughout the world, even more so in India. Among 199 countries worldwide, India is considered to be the most unsafe for road users, accounting for almost 11.6% of the crash-related deaths¹. In 2021, a total of 4,12,432 road crashes took place in India, leading to 1,53,972 fatalities² (Figure 1) which is equivalent to an aircraft crash with 422 fatalities every day. Road safety, thus has become one of the most critical concerns for the nation and combatting this problem is a matter of prime importance.

In Brasilia Declaration 2015, India committed to “halve the number of deaths and injuries from road traffic crashes by 2020” and affirmed “willingness to intensify both national action and international cooperation with a view to meeting this target”³. During 2015-2020, India witnessed 27% and 10% reductions in the total number of road crashes and associated fatalities respectively. However, it may be noted that the imposed lockdowns due to the COVID-19 pandemic resulted in mobility restrictions for several months across the nation in 2020. Unfortunately, the nation experienced increments of around 13% and 17% in total number of road crashes and deaths respectively in 2021. In September 2020, the UN General Assembly proclaimed the period 2021–2030 as the ‘Second Decade of Action for Road Safety’, with a goal of reducing road traffic deaths and injuries by at least 50 per cent from 2021 to 2030⁴. In 2021, Ministry of Road Transport & Highways (MoRTH), India also set a target of reducing road crashes and fatalities by 50% by the year 2024.

Over recent years, MoRTH has taken multiple initiatives pertaining to vehicular and road engineering as well as educational measures for raising awareness in the area of road safety. Attempts have been made at the national level to improve the road safety by focusing on all the 4 E-s of road safety (i.e., Engineering, Enforcement, Education, and Emergency Response). The ‘Motor Vehicle Amendment Act (MVAA) 2019’ has been enacted with a view of bringing down the number of traffic violations and to bring in a more responsible attitude amongst road users. The Supreme Court Committee on Road Safety (SCCoRS) has directed the states to form district road safety committees to monitor and manage the road crashes effectively and efficiently. Identification and rectification of blackspots throughout the country have become a priority area of intervention and the corresponding progress is being reviewed at the highest level in a systematic manner. Multiple capacity building workshops have been organized to train the traffic personnel who are directly involved in enforcement of traffic rules and regulations. In different states, concerted road safety campaigns have been organized, involving all segments of society to make them aware and educate road users about common dos and don’ts while using the road. Emergency response system, to cater to the needs of road crash victims, has been augmented and improved across the nation. A ‘Road Safety Week’ is observed every year in India to spread awareness about traffic rules and regulations set by the government. Various interactive programmes and meetings have been organized on television and radio channels emphasizing on the key elements of road safety. Social media platforms such as Twitter, Facebook, Instagram, YouTube, etc. have

¹ International Road Federation. World Road Statistics 2018. <https://www.worldroadstatistics.org/>

² Transport Research Wing. Road Accidents in India – 2021. New Delhi: Ministry of Road Transport & Highways, Government of India; 2022

³ Brasilia Declaration. Second Global High-level Conference on Road Safety: Time for Results, Brasilia, 18-19 November 2015. Geneva: World Health Organization; 2015

⁴ World Health Organization. Global plan for the decade of action for road safety 2021-2030. WHO Regional Office for the Western Pacific; 2022

also been utilized effectively to educate the young generation in an effort to make them responsible road users.

Despite all these positive developments, the issue of road safety still looms large as a challenge in India. The crash severity rate (number of fatalities per 100 crashes) in the country is around 37.3⁵, which calls for the need of relooking at the current practices to bring down the number of fatal crashes. The classified share of crashes in 2021 with respect to the type of impacting objects/ vehicles (Figure 1) reveals that around 69% of crash fatalities in India comprise the vulnerable road users (VRUs), which clearly establishes the concern over safety of VRUs. Altogether, it is evident that road crash and fatality still is a major point of concern in the context of road safety, and further targeted actions are needed to address the issue.

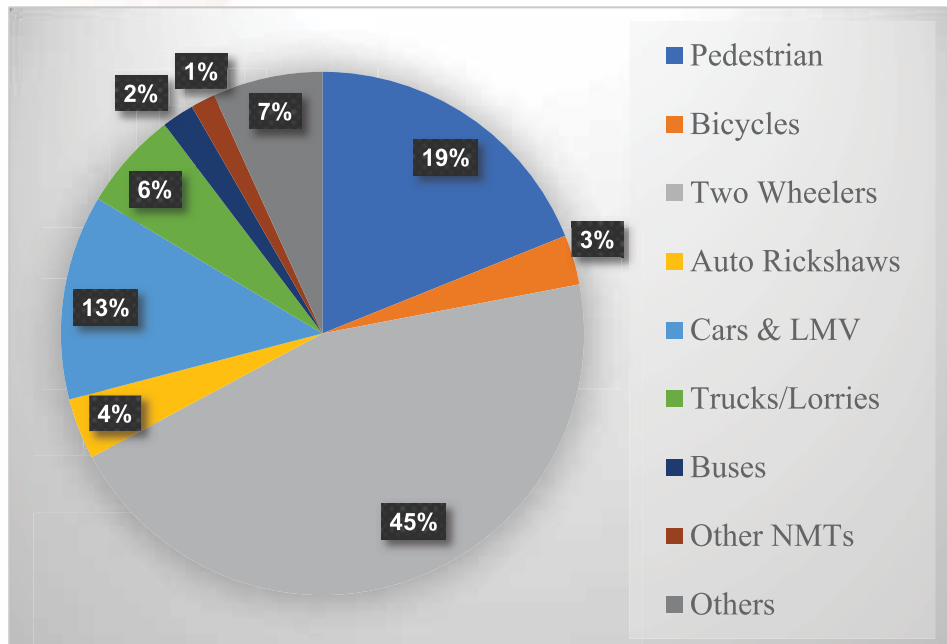


Figure 1: Crash fatalities classified according to type of impacting vehicles/ objects in India in 2021

Safe System Approach

To deal with the growing road traffic crash and injury problems, the World Health Organization (WHO) and the World Bank recommended a “system-wide, multi-sectoral implementation of proven road safety interventions that are culturally appropriate and locally tested” approach that countries may consider advantageously to improve their road safety records⁶. In this regard, the Safe System Approach, which provides a viable framework to examine road traffic injury risk factors and interventions from a holistic perspective⁷, has been recognized as the most effective way of considering and responding to fatal and serious injury crash risks on a network. The Safe System principle recognizes that people will make mistakes that may lead to road crashes, but the system should be forgiving enough to ensure that those crashes do not result in a fatality or even a major injury⁸. The safe system approach represents an ambitious safety performance level and current best practice safety culture in road safety. Adopting the Safe System approach can contribute to

⁵ Transport Research Wing. Road Accidents in India – 2021. New Delhi: Ministry of Road Transport & Highways, Government of India; 2022

⁶ Peden, M. World report on road traffic injury prevention; 2004
apps.who.int/iris/bitstream/handle/10665/42871/9241562609.pdf?sequence=1

⁷ World Health Organization. Save lives: a road safety technical package; 2017

⁸ World Health Organization. Speed management: a road safety manual for decision-makers and practitioners; 2008

the immediate needs of a country like India for a more rapid, long-term road safety improvement.

A safe system has five major areas of action, namely (i) Safe Roads, (ii) Safe Road Users, (iii) Safe Speeds, (iv) Safe Vehicles, and (v) Efficient Post-Crash Care⁹. As per this approach, safety is treated in a proactive manner; i.e., tools should be used to identify and mitigate latent risks in the transportation system, rather than waiting for crashes to occur and reacting afterwards. All stakeholders (ministries and allied departments of Central and State Governments, enforcement agencies, transportation system users and managers, vehicle manufacturers, etc.) must ensure that crashes don't lead to fatal or serious injuries. Risk management associated with all parts of the system needs to be strengthened, so that in case of failure of one part, the other parts still have the capability of protecting road users. An efficient road safety management framework with due attention given to these five areas has become the need of the hour. A focus on these areas is also commensurate with the instructions given by the SCCoRS.

Need of Speed Management

The speed at which a vehicle travels directly influences the risk of a crash as well as the severity of injuries, and likelihood of death resulting from the crash. Experts recognize inappropriate speed limits (i.e., posted speed limits which are unsafe for the prevailing conditions) and speeding (i.e., driving above the posted speed limit) as major contributory factors in both the number and severity of traffic crashes. Out of various types of traffic rules violation in India, speeding is observed to be the most important concern, contributing towards around 70% of crash fatalities in 2021¹⁰ (Figure 2). Moreover, high speed corridors, such as Expressways, National and State Highways, which comprise only about 5% of the total road network, contributed to a disproportionate share of about 60% of crash fatalities. Therefore, addressing this issue of speed management may provide the scope of further bringing down the severity of road crashes.

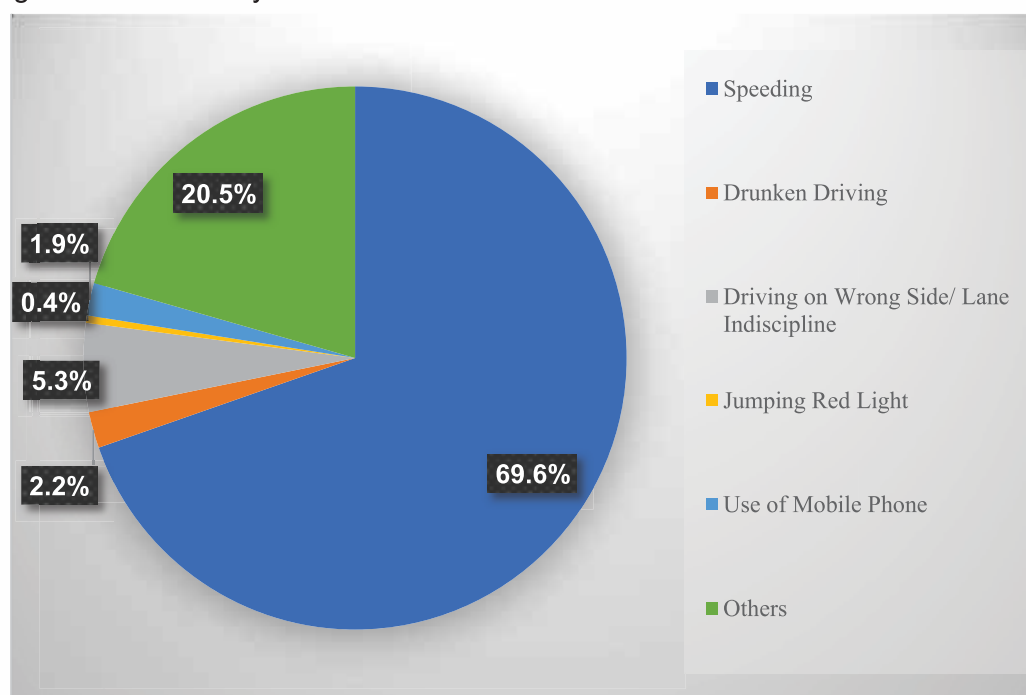


Figure 2: Crash fatalities by type of traffic rules violation in India in 2021

⁹ Federal Highway Administration. Safe System Brochure; 2017

¹⁰ Transport Research Wing. Road Accidents in India – 2021. New Delhi: Ministry of Road Transport & Highways, Government of India; 2022

It is important to note that a high proportion of Indian traffic is comprised of VRUs sharing the same road space with high-speed vehicles. Speed can be lethal for such VRUs as they are significantly less protected. With the increase in speed, a driver's field of vision narrows, and there are higher chances that the driver misses a potential hazard, leading to a severe crash¹¹. Furthermore, the higher the speed of a vehicle, the shorter the time a driver has to stop and avoid a crash. In a heterogeneous traffic scenario such as in India, exceeding the speed limit by a seemingly inconsequential 10 kmph can not only significantly increase the risk of a crash but also endanger the lives of other road users. An increase in average speed of 1 kmph typically results in a 3% higher risk of a crash involving injury, with a 4-5% increase for crashes resulting in fatalities¹². This gives rise to the concept of setting speed limits on the basis of human injury tolerance criterion which defines the limit which will not usually result in death or serious injury to road users when crashes occur. It has now become a matter of utmost necessity to pay attention on speeding issue and take effective speed management measures to reduce speeding in order to reduce road crashes and resulting fatalities in a time-bound manner. A focus on this issue with necessary policy interventions and effective implementation can produce significant benefits in the short run.

Way Forward

Speeding is identified as a major contributing factor leading to road crashes and fatalities in India. The fatality risk is also scientifically related to the speed, and the share of VRUs in road crashes and resulting fatalities is alarmingly high. Therefore, speed management plays a vital role in reducing road crashes and fatalities in the short run. Safe speed commensurate with road infrastructure, traffic characteristics and human injury tolerance criteria can be instrumental in fulfilling the dream of reducing road crashes and fatalities by 50% by the year 2024. The necessary road engineering, enforcement and other aspects related to speed management need to be prioritised and implemented in a holistic manner.



¹¹ Berson, F. B., Mark C. Kuperwaser, Lloyd Paul Aiello, and James W. Rosenberg. "Visual requirements and commercial drivers." Retrieved March 21 (1998): 2002

¹² World Health Organization. World Report on Road Traffic Injury Prevention. https://www.who.int/violence_injury_prevention/publications/road_traffic/world_report/speed_en.pdf?ua=1



STATEMENT OF SIGNIFICANCE / ACHIEVEMENT

IJM (India) Infrastructure Limited (IJMII), a subsidiary of IJM Corporation Berhad, is one of Malaysia's leading conglomerates and is listed on the Main Market of Bursa Malaysia Securities Berhad with its Group Head quarters at Kuala Lumpur, Malaysia. For the past 38 years in existence, the core business activities of IJM encompass construction, property development, manufacturing, concrete products, RMC, quarrying, Infrastructure concessions and plantations.

IJMII, incorporated in 1998 with its Indian operations headquartered at Hyderabad, Telangana is focused on timely construction of infrastructure projects, metro rails, commercial and office buildings, world class townships in SEZ parks under the Smart Cities initiative led by Government of India. The Company is also engaged in construction and upgrading of National Highways, using modern technology and equipment without compromising on Health, safety and sustainability. Design, build, quality and safety using modern technology, a unique hallmark of IJMII construction philosophy. Some of our notable works are :

- Completed India's first flagship Expressway Project - The Mumbai Pune Expressway from Kon to Chowk in April 2000. One of the more recent projects completed by IJMII in 2020 is the Dewas Bypass Road Project (Madhya Pradesh).
- Was the first company to implement an automatised toll collection system in the year 2003 on Tada – Nellore stretch of National Highway 5 (currently it is NH 65) which is a G2G project.
- IJMII has also delivered the first world-class integrated township in Hyderabad - Raintree Park (Malaysian Township) Kukatpally.
- Constructed the tallest building in Delhi - the MCD Civic Centre with 28 floors. It is 102 metres high.
- IJMII played a key role by involving in the sphere of mass urban transportation in India - in the construction of Delhi Metro Rail. IJMII was first company in India to construct “U” shaped segment and complete “U” Girder in any Metro Rail construction.
- IJMII also played a key role in constructing the first integrated township Prestige Shantiniketan, White fields, in Bengaluru and the largest fully constructed township in Bengaluru as of 2017. At present, IJMII is involved in the construction of residential townships in Vijayawada – Raintree Park Dwaraka Krishna, and First city Project in the MIHAN – SEZ, Nagpur.
- During the peak of the Covid Pandemic, practicing healthy safety measures, on 25/2/21, IJMII set a record of laying Bituminous Concrete on 25.54 lane kilometres in a short span of 17:45 hours on the Solapur – Bijapur section of the Four Lane National Highway-13. A unique achievement by IJM which is a first in terms of quantum and duration for National Highway Projects in India, thus setting a bench mark in the per day national highway construction rate of a record 37 Km / day during the financial year 2020 - 2021.

“Over the years IJMII has grown from a turnover of INR1.059 Cr in the financial year 1998 to INR 813.77 Cr in the financial year 2021- 2022.”

ROAD SAFETY: A SHARED RESPONSIBILITY FOR A SAFER FUTURE

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Road safety is a critical issue that affects everyone, regardless of age, gender, or occupation. Every day, countless lives are lost or forever changed due to road accidents. It is our collective responsibility to prioritize and promote road safety to ensure a safer future for all. This article will explore the importance of road safety and discuss actionable steps that can be taken to make the roads safer.

As per United Nations statistics, an estimated 1.35 million people die on the world's roads each year, with more than 600 children and young people losing their lives in traffic accidents every day.

Every year, approximately 1.5 lakh people die on Indian roads, which translates on average into 1130 accidents and 422 deaths every day or 47 accidents and 18 deaths every hour. According to a report by the World Bank, India accounts for the highest number of death in road accidents in the world. Notably, India accounts for 11 percent of the global death in road accidents despite having 1% of the world's vehicles.

According to the study, the total socio-economic cost due to road traffic accidents in India is between USD 15.71-38.81 billion, which is estimated to be approximately 0.55-1.35% of the country's GDP, which is equivalent to the losing every year Companies like Maruti Suzuki or Tata Motors equivalent value.

Therefore, now time has come to seriously take the necessary steps and actions to prevent road crashes and deaths in India.

1. **Understand the Importance:** For road safety, is paramount to understand the importance of road safety for preventing the accidents, injuries, and loss of life. It encompasses a range of measures aimed at reducing risks on the roads, including safe driving practices, proper road infrastructure, and vehicle maintenance. By prioritizing road safety, we can create an environment where everyone feels secure and protected while traveling.
2. **Safe Driving Practices:** Adhering to safe driving practices is crucial for reducing road accidents. Some essential tips to remember include:
 - Obeying traffic rules and regulations
 - Avoiding distractions while driving, such as mobile phone use
 - Respecting speed limits and adjusting driving speed according to road conditions
 - Maintaining a safe distance from other vehicles
 - Using indicators and following proper lane discipline
3. **Road Infrastructure and Design:** Well-designed road infrastructure plays a significant role in ensuring road safety. Governments and relevant authorities should focus on:
 - Implementing proper signage and road markings for clear navigation
 - Ensuring well-maintained roads free from potholes and hazards
 - Installing streetlights for improved visibility, especially during night time
 - Creating pedestrian-friendly sidewalks and designated crosswalks
4. **Vehicle Maintenance:** Regular vehicle maintenance is essential for safe and smooth journeys. Vehicle owners should prioritize:
 - Regularly checking tires, brakes, headlights, and indicators
 - Keeping vehicles clean and free from obstructions that may hinder visibility

- Ensuring proper functioning of essential safety features, such as seatbelts and airbags
 - Following the manufacturer's recommendations for scheduled maintenance and servicing
5. **Educating and Raising Awareness:** Education and awareness campaigns play a crucial role in promoting road safety. By educating individuals, especially young drivers, about safe driving practices and the consequences of reckless behaviour, we can cultivate a culture of responsible road users. Community programs, workshops, and awareness campaigns can help disseminate essential information and instil a sense of responsibility among all road users.
 6. **The Role of HelpMeQR in Road Safety:** In our pursuit of safer roads, innovative solutions like HelpMeQR can make a significant difference. HelpMeQR is an advanced emergency identification tag that provides vital information about individuals in case of accidents or emergencies. By using HelpMeQR tags, emergency responders can quickly access critical details, such as medical conditions, allergies, and emergency contacts, allowing them to provide timely and appropriate assistance. HelpMeQR serves as an additional layer of protection, enabling faster and more efficient emergency response.

UN has emphasized on six actions that can make a difference on the road.

✓ **Speed limitation**

People have a 90% chance of surviving after being hit by a car travelling at 30km/h but less than 50% at 50km/h.

✓ **Wearing a seatbelt**

Reduces the risk of deaths among drivers and front seat occupants by 45-50% and the risk of death and serious injuries among rear seat occupants by 25%.

✓ **The use of child restraints**

This can lead to a 60% reduction in deaths.

✓ **Correct helmet use**

This can lead to a 69% reduction in the risk of injuries.

✓ **Don't drive under the influence**

Alcohol or drugs increase the risk of a crash that results in deaths or serious injuries

✓ **Avoid distracted driving**

Drivers using phones are approximately 4 times more likely to be involved in a crash.

Road safety is a shared responsibility that requires collective action. By embracing safe driving practices, advocating for better road infrastructure, and utilizing innovative solutions like HelpMeQR, we can create a safer and more secure environment for everyone. Let us all commit to making road safety a priority and work together towards a future where accidents and tragedies on the road become a thing of the past.

Remember, road safety begins with you. Stay vigilant, follow the rules, and make responsible choices to protect yourself and others on the road.



THE EVOLUTION OF GLOBAL ROAD SAFETY MANAGEMENT

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Road crashes cause 1.35 million deaths and up to 50 million injuries worldwide each year, with over 90% of the deaths occurring in developing countries like India. Road crashes are the leading cause of death around the world for children and young people between 15 and 29 years of age, as per published statistics. This is an unacceptable and preventable malaise of epidemic proportions that needs comprehensive redressal.

Major steps towards road safety improvement were initiated when the United Nations (UN) General Assembly Resolution 58/289 of April 2004 invited the World Health Organization (WHO) to coordinate road safety issues within the UN System. The United Nations Road Safety Collaboration (UNRSC) was established, bringing together international organizations, governments, non-governmental organizations, foundations and private sector entities to coordinate effective responses to road safety. Two major reports documenting the road safety problem - the “*World Report on Road Traffic Injury Prevention*” and the “*Global Status Report on Road Safety*” were published by the WHO in 2004 and 2009 respectively.

In 2008, the *Organization for Economic Cooperation and Development (OECD)* and the *International Transport Forum (ITF)* published “*Towards Zero: Ambitious Road Safety Targets and the Safe System Approach*” which proclaimed the **Safe System Approach** as the *fundamental principle* to improve Road Safety. It is a distillation of visions and objectives contained in the road safety models of *Vision Zero (Sweden)* and *Sustainable Safety (The Netherlands)* developed in the 1990s, and the framework for emergency preparedness and response developed as *Haddon Matrix (USA)* for injury prevention in 1960s.

Reframing the way in which Road Safety is treated, the *Safe System Approach* accepts that human errors and traffic crashes cannot be completely avoided, and yet occurrence of death and serious injury due to road crash is unacceptable and avoidable. It aims to develop a road transport system that is better able to accommodate human error and take into consideration the vulnerability of the human body. It emphasises upon the importance of a ‘*shared responsibility*’ among stakeholders, with a major share of responsibilities shifting from *road users* to road transport system *designers*, which include road managers, automotive industry, police, politicians, legislative bodies, health services, judicial system, schools and non-government organizations (NGO), in order to cohesively address all elements of the transport system to ensure that human beings are protected from death and serious injury in the event of road crashes. The approach requires reconfiguration of the road transport system, such that roads become ‘*forgiving*’ of human (road user) errors that cause road crashes. Thus, it is made as an ‘ethical’ system.

The Safe System Approach is institutionalised in the global **Road Safety Management System Framework**, depicted as a pyramid depicted in **Figure 1**, published in 2009 by the *Global Road Safety Facility (GRSF)*, an arm of the *World Bank*, based upon its comprehensive review of the world’s proven best practices in road safety management.

The **Framework** consists of three *inter-related* elements:

- **Institutional Management Functions;**
- **Interventions;**
- **Results.**

Result-oriented Institutional Management Functions form the base of the Framework Pyramid.

The necessary Results focus is provided by promulgation of the Road Safety Policy, which guides all Institutional Management Functions.

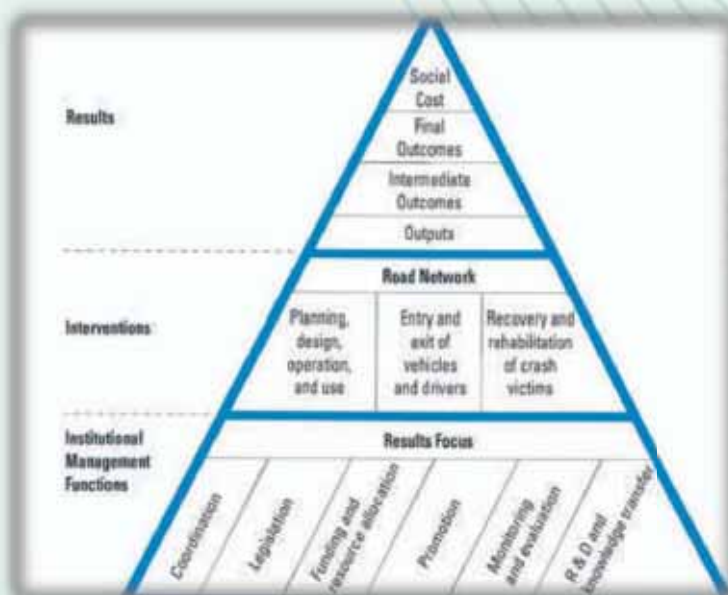


Fig. 1: Road Safety Management System

Framework (GRSF)

The **Institutional Management Functions** are:

- **Coordination:** facilitation of effective and efficient deployment of road safety interventions;
- **Legislation:** enactment of laws, promulgation of standards, rules and regulations concerned with road safety, ensuring accountability in regard to land use, road network, road user, vehicle and post-crash medical care;
- **Funding and Resource Allocation:** provision of budget and disbursement of funds based upon a judicious fund allocation framework for carrying out plan, design, implementation, monitoring and evaluation of sustainable road safety interventions and activities;
- **Promotion:** proclamation and sustained dissemination among the public, to impress upon them the importance of road safety improvement as a shared responsibility of both public and private entities, as well as the urgency of concerned interventions to be carried out;
- **Monitoring and Evaluation:** regular measurement of actual outputs versus targets of road safety performance indicators, calculating deviations as well as evaluating outcomes to determine efficiency and effectiveness of interventions;
- **Research and Knowledge Transfer:** systematic and periodic creation, updation, codification, transfer and application of knowledge on road safety.

Supported on the bedrock of above-mentioned *Institutional Management Functions*, the *main body* of required **Interventions** are determined for implementation by a combination of *education, enforcement and incentives* to achieve desired *Results*:

- ✓ **planning, design, operation and use of road network;**
- ✓ **conditions of entry and exit to the road network by vehicles and drivers;**
- ✓ **recovery and rehabilitation of road crash victims.**

The final element of the GRSF Framework is the desired **Results** of *Interventions* expressed as *measurable performance targets*, forming the *crown of the framework pyramid*:

- **Social Costs:** represent the cumulative cost burden on society due to lost and crippled lives, medical interventions, lost productivity, congestion induced delays caused by road crashes;

- **Final outcomes:** represent a desired vision of improved road safety, resulting from long-term road safety interventions, as evident in *outcome indicators* such as reductions in fatalities, serious injuries, road crashes vis-à-vis road safety risk exposure;
- **Intermediate outcomes:** represent the desired results of interventions of short and medium duration that have a proven impact on final outcomes, as evident in *performance indicators* such as reduction in average operating speed and drunken driving incidents, improvement in safety rating of vehicles;
- **Outputs:** represent the desired results of strategic and operational interventions that signify achievement of intermediate and final outcomes, as evident in *process implementation indicators* such as road safety policy, plans, programmes, road safety audit, assessment and engineering, enhanced enforcement activities and achievement of specific activity milestones.

Following the pioneering work in Road Safety, the *UN General Assembly (UNGA)* in 2010 declared a *Decade of Action for Road Safety*, with the goal of stabilizing and then reducing road traffic deaths around the world. The *Global Plan for the Decade of Action for Road Safety 2011 to 2020* published in 2011 identified **five pillars** of Road Safety with their aims mentioned below:

Pillar-1 Road Safety Management:

Designation of Lead Agency with the capacity to set-up multi-sectoral partnerships and progressively lead the delivery of road safety strategies, plans and targets based on data collection and analysis, to determine evidence-based countermeasures, efficiency of their design, implementation and monitoring, as well as evaluation of their effectiveness.

Pillar-2 Safer Roads and Mobility:

Safety enhanced design, construction, operation and maintenance of roads, which result in progressively safe road networks that are efficient and effective in preventing deaths and serious injuries of road users, especially vulnerable ones, such as pedestrians, bicyclists and motorcyclists.

Pillar-3 Safer Vehicles:

Deployment of safety devices and technologies in vehicles towards achieving universal operation of progressively safe vehicles on roads, that will prevent road crashes and deaths and serious injuries resulting from crashes.

Pillar-4 Safer Road Users:

Design and implementation of programmes to progressively raise standards of road user behaviour, combined with enhanced enforcement of traffic rules and regulations on roads, as well as widespread conduct of public campaigns to sensitise road users on the urgency of driving only while wearing seat-belt/helmet, not driving under fatigue, distraction and alcohol/narcotic/psychotropic substance influence, not indulging in improper road use behaviour, unauthorised parking, disobeying posted speed-limits, and to performing race/stunts on roads.

Pillar-5 Post-Crash Response:

Promoting progressively efficient and effective response to road crash victims, covering activities ranging from proper evacuation from crash location, first-aid/para-medical support during transportation to medical centres, standard emergency medical treatment by qualified medical personnel aided by medical devices and technologies, to providing sustainable rehabilitation of crash victims.

UNGA Resolution 74/299 of 31-August-2020 proclaimed the **Second Decade of Action for Road Safety 2021-2030** and established a target of reducing the number of road traffic deaths and serious injuries by at least 50% by 2030. *UNGA Resolution 75/308 of 21-July-2021* called for a **UNGA High-level Meeting on Road Safety, which was held on 30-June-2022.**

The Road Safety goals have been strategically merged with the **UN 2030 Agenda** proclaimed as the **Sustainable Development Goals (SDG)** established in 2015, which implies that Road Safety is now:

- recognised as being an integral part of the global development agenda;
- on the same critical footing as of climate, health and equity issues;
- the responsibility of a wider range of stakeholders, both public and private;
- no longer to be traded off in order to promote other development needs;
- targeted at 50% reduction in the number of global deaths and injuries due to road crashes by 2030.

India, as a founding member of UN, firmly stands by the principles of the UN Charter for accomplishing shared goals and addressing common challenges of nations including road safety. Transport as a subject is included in the Concurrent List given in the Seventh Schedule of the Indian Constitution. Thus, road safety governance is treated as a *shared responsibility of State Governments as well as the Union Government*.





The Beginning:

DOZCO was set up in 1983 as a Partnership Company by Bangur Brothers in Dhanbad followed by Bilaspur. The Company was engaged in Trading of General Engineering items with focus on indigenous Mining Machinery Spare Parts. With a vision 'start small; think big', DOZCO is celebrating its '40th Anniversary of the Foundation Day' in 2023.

In 1992 to intensify the business activities and potential for genuine imported Spares for Heavy Earth Moving Machineries, the Company became a private limited firm – DOZCO (India) Pvt Ltd with Registered Office at Kolkata. The company focused on imported spare parts for Heavy Earth Moving Machineries (HEMM), viz., Bulldozers, Excavators, Pay Loaders and provided exclusive range of spare parts of world renowned brands. DOZCO has commendable market presence through country wide branch network and service centers at strategically located places holding 'exclusive' and 'non-exclusive' distributorship of many world renowned and globally acclaimed brands of HEMM - ranging from under Carriage parts to ground engaging parts to all types of forged parts, engine parts, seals, fasteners, bearings, lights & light fittings and also Wheels & Tyres.

The Scope Enlargement:

Since 2003, DOZCO enlarged the scope by engaging in sales and services of complete HEMM and other construction and infrastructure machinery of international repute, which unfolded a new chapter towards achieving reality of its dream of becoming the market leader in Construction and Mining Machinery and Spare Parts in India. DOZCO established its corporate office at Block D, Industrial Development Park, Auto Nagar, Visakhapatnam - 530012, AP. Presently, DOZCO has 36 branches for marketing and services, 5 Regional Warehouses and 2 Training Centers and a loyal client base for its service quality and sense of commitment.

The Strength:

DOZCO's strength lies in its market presence through a wide branch network, competent and well-equipped service and training centers and a dedicated client base which is helping DOZCO to become market leaders in Infrastructure and Construction sector.

DOZCO recently established its own office & warehouse at Guwahati and Singrauli and obtained new facility of Bonded warehouse having 50000 sq. feet area. A new factory of 7000 Sq. Mtr. Area is coming up at Vishakhapatnam, to double the manufacturing capacity of Rock Breakers and Chisels backed by additional test bench, painting line and dedicated warehousing system. The Company's SAP-ERP facility since 2014, equipped with nationwide network, is well connected with the latest communication hardware and software ensuring smooth and efficient operations and communications under advanced connectivity and fully computerized environment. DOZCO employs 850+ personnel comprising of designing, manufacturing, marketing, servicing, and administration with a progressing annual turnover year on year.

In 2022, DOZCO started a new subsidiary in Australia called 'DOZCO Australia Pty. Ltd' another subsidiary company operating in Seoul, Korea (Korea Excon Equipment Limited) in 2017-18. All these aid in its global presence.

IDENTIFICATION OF POTENTIAL RISK FACTORS FOR ROAD CRASHES: ANALYSIS OF LARGE SCALE BLACKSPOT DATA

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1. Introduction

Road safety is considered as one of the most primary concern in road transportation. According to a WHO report on road safety, approximately 1.35 million people die every year in road accidents with 90% of the fatalities being reported for developing countries (WHO, 2018). The death rate related to road accidents is almost three times in low-income countries in comparison to high-income countries (WHO, 2018). In India, the road accidents result in death of almost 1.5 lakh people each year which is around 11% of global road accident related deaths (MoRTH, 2020). In year 2019, the percent share of fatalities in urban and rural areas of India was around 32.9% and 67.1% respectively which means that rural areas are more susceptible to road accident related fatalities. The highways (i.e. national and state highways) in India alone accounted for 55% of total road accidents and 63% of total road accident related fatalities in 2019. Hence, it becomes necessary to first identify the possible accident causes and implement suitable measures in order to mitigate these crashes.

Researchers and transportation engineers are constantly trying to find new methods to reduce the chances of the crashes. But most of the methodologies require comprehensive road accident details to model crash prediction or its severity. In cases, when limited details are available regarding the road accidents, Road Safety Audit (RSA) process can be adopted to identify the probable road accident causes by visiting the sites. RSA is defined as 'the formal detailed safety examination process of road projects by an independent and qualified audit team which can identify the potential safety risks associated with the project'. IRC SP: 88-2019 (Indian Roads Congress 2019) provides the comprehensive methodology for conducting RSA at different stages of a project.

2. Details of the Blackspot

Presently, 216 blackspots were identified in the various district of eastern Uttar Pradesh (India). Figure 1 shows the number of blackspots identified in each of the district in eastern Uttar Pradesh and the number of fatalities and crashes associated with the blackspots in each district. As can be seen in the figure, Prayagraj recorded most number of fatalities (485) associated with 20 blackspots identified in the district and had second most number of crashes (153). While, Banda had the most number of blackspots (33) and crashes (162) with second highest number of fatalities (201) associated with the blackspots. On the other hand, Amethi, Kannauj, and Sonbhadra had one blackspot each with a combined 23 crashes and 27 fatalities. RSA was conducted at each blackspot to find the probable factors which contribute to road accidents.

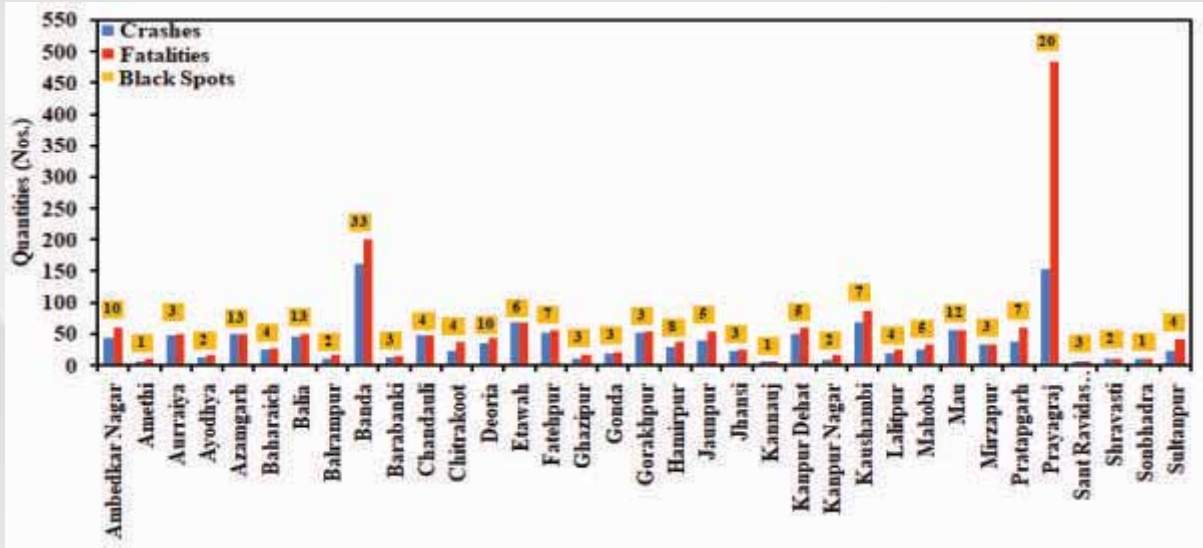


Figure 1: Crash and fatalities details at each district

3. Data Analysis

Analysis was carried out based on various factors like facility type, land-use pattern, major road classification, carriageway type, and lane numbers. It was found that most of the blackspots were present on intersection and most of them had state highways (SH) as major road. It was also found that roads with undivided carriageway had a significantly large number of blackspot in comparison to divided carriageway. Road safety audit team found that factors such as insufficient speed calming measures, insufficient road signages and pavement markings were more common on a majority of the blackspots.

Figure 2 shows that around 152 blackspots were of intersections which in total accounted around 926 crashes and 1314 fatalities. T-intersection was the most prevalent facility type that was present at 60 blackspots followed by the X intersection, which was present at 48 blackspots. Similarly, T-intersection also accounted for most of crashes and fatalities which were 379 and 529 respectively followed by X intersection, which had in total of 299 crashes and 393 fatalities. Also, a significant number of crashes and fatalities were observed for Staggered (STG) intersection. Most of the audited blackspots were of uncontrolled type, which might be the reason for higher number of crashes and fatalities. Among the other three facility types, i.e. straight, curve and road with culvert and flyovers (RCF). RCF had the most significant crashes per blackspot with value of 8.2 followed by 6.2 for curve type facility. On the other hand, Y intersection had the highest fatalities per crash of around 1.82.

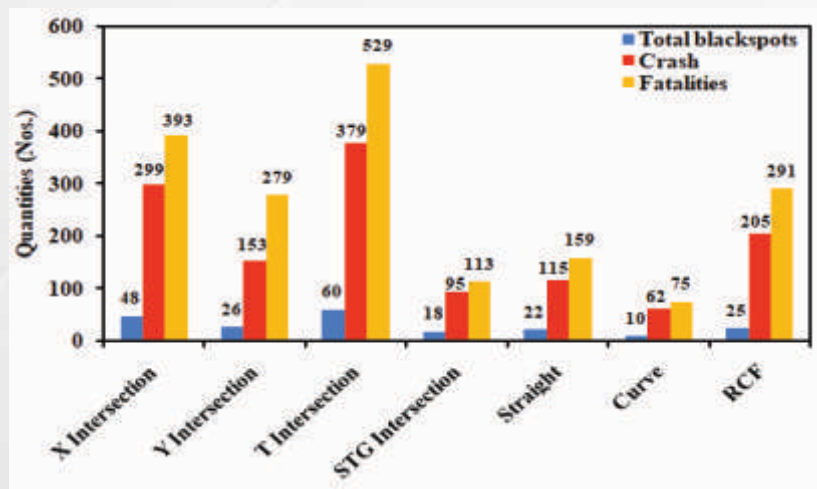


Figure 2: Blackspot, crash and fatalities data based on facility type

Figure 3 shows the crash and fatalities data for different major road categories. It is evident from the figure that SH had the highest number of crashes in all road categories with almost four times the crashes as compared to the second highest road category, i.e. major district roads (MDR). SH also recorded the most number of fatalities which were approximately four times the fatalities on national highways (NH) and MDR. On the other hand, City Road (CR) had the highest fatalities per crash ratio of 2.7.

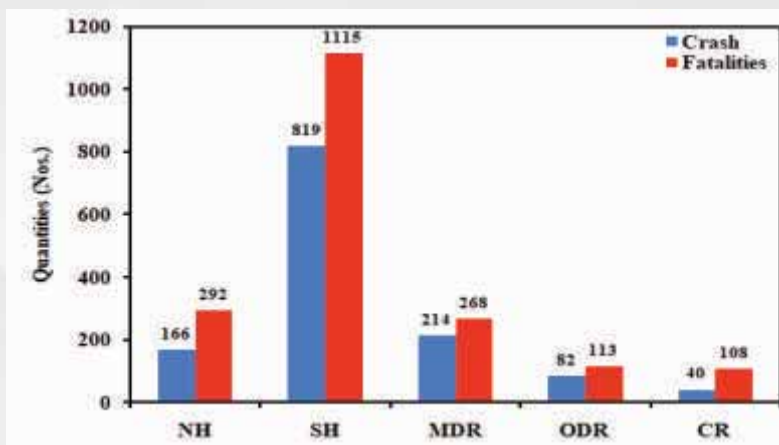


Figure 3: Crash and fatalities data based on major road classification

Figure 4 shows the blackspot data for different categories of road as well as crash and fatalities data for different major road categories and carriageway type (viz. divided or undivided). Undivided roads had more number of blackspots as well as crashes and fatalities in comparison to divided roads. Most of the blackspots were present on SH for both the carriageway types. However, SH with divided carriageway had a higher fatalities per crash ratio than SH with undivided carriageway.

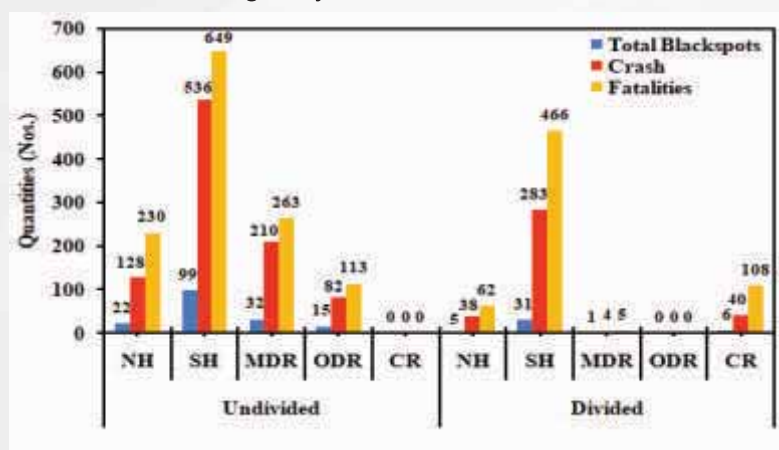


Figure 4: Blackspot, crash and fatality data based on major road classification and carriageway type

After auditing all of the 216 blackspots, the audit team found 13 factors as the most probable factors, which may have an influence over road traffic accidents. These factors included pavement surface condition (PSC), geometric feature (GF), absence of footpath facility (FF), shoulder condition (SC), drainage condition (DC), driveway & other facility (DOF), roadway activities (RA), speed calming measures (SCM), road signal & signages (RSS), pavement markings (PM), crash barriers & crash cushion (CBCC), sight distance obstruction (SDO) and visibility & lightning condition (VLC). Figure 5 shows the number of blackspots, where the identified causes were present.

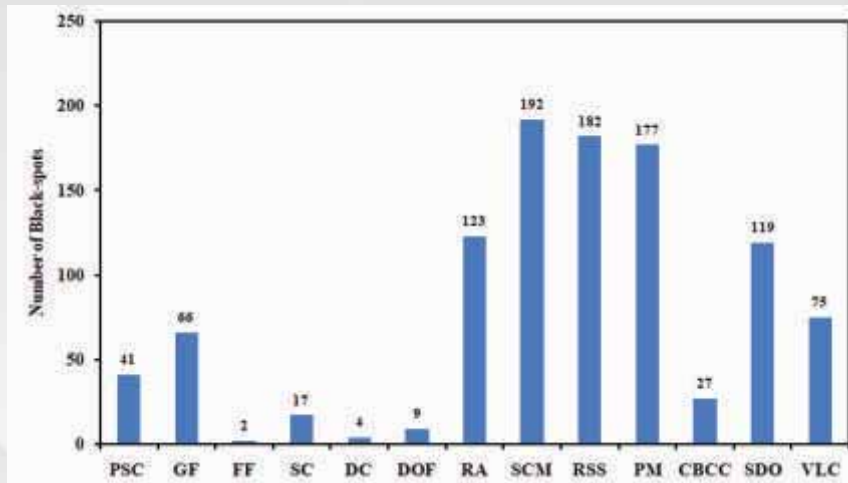


Figure 5: Probable accident causes on different blackspots identified by audit team

It is evident from the Figure 5 that most of the blackspot had insufficient speed calming measures, insufficient road signal & signages as well as insufficient pavement markings and these were identified as the most frequent causes. While roadway activities and sight distance obstruction were the second most common causes, which had the influence on road traffic accidents. Factors such as visibility & lightning condition, geometric feature, pavement surface condition and crash barrier & crash cushion were present over 1/4th of the total blackspots. On the other hand, probable accident causes such as absence of footpath facility, driveway and other facility, drainage condition and shoulder condition were identified on only a few of the blackspots.

4. Discussions and Conclusion

It is to be noted that a road accident can happen either due to one of these factors or combination of these. Secondly, the frequency of these factors does not represent the importance of these factors in causing the road accidents. For example, absence of crash barrier and crash cushion can play a significant role in the occurrence of crashes and fatalities, but this factor was identified only on 27 of such blackspots. The outcomes from this work will help to identify the potential risk factors to improve road safety for various facility types. Also, it may be helpful to the field practitioners suggesting about the various potential risk factors at different facility types. Moreover, the outcomes of the study could be taken as a reference while implementing the blackspot rectification measures.





Forum for Prevention of Road Accidents

Forum for Prevention of Road Accidents (FPRA) is a dedicated organization committed to promoting road safety and creating a safer environment for all road users. Established with the aim of minimizing road accidents and their consequences, FPRA has achieved significant milestones since its inception.



With our conspicuous drive, we affix retroreflective tapes on bicycles, enhancing visibility and promoting safety on the road, day and night



Our skilled trainers provide comprehensive first-aid training to company employees, empowering them with life-saving skills and ensuring a safer workplace for all

Activities:

1. **Refresher Training to HMV Drivers:** We conduct specialized refresher training programs for heavy motor vehicle (HMV) drivers, equipping them with updated knowledge and skills to ensure safe and responsible driving practices. We also organise health checkup programs for Drivers to ensure their physical well being.
2. **Ambulance Service for RTA Victims:** Our organization provides prompt and efficient free ambulance services to road traffic accident (RTA) victims, offering immediate medical assistance and transportation to hospitals for emergency care.
3. **Safe School Zone:** FPRA establishes safe school zones by implementing traffic management measures, signage, and infrastructure enhancements to ensure the safety of children commuting to and from schools.
4. **Road Safety Films:** FPRA produces informative and impactful road safety films to educate the public, drivers, and pedestrians about safe practices and the importance of responsible road behavior.
5. **First Aid Training:** We conduct comprehensive first aid training programs, equipping individuals with essential life-saving skills to respond effectively in emergency situations.
6. **Bicycle Conspicuity Drive:** Affixing of AIS-90 retro-reflective tapes on bicycles to enhance their visibility and safety during dark hours.
7. **First Aid Kit (As per Factory Act, 1948):** We provide guidance and support to organizations in implementing proper first aid kits, ensuring compliance with the Factory Act, 1948, and creating a safe working environment.

Milestones:

1. Trained over 12,000 HMV drivers, empowering them with updated knowledge and skills for safe driving practices.
2. Over 1,500 RTAs catered to with timely Ambulance Service.
3. Safe School Zone initiatives are helping to consistently create increasing awareness amongst school children towards Road safety.

Future Goals:

We will strive towards the following objectives in the Future:-

- Collaborate and Synergise with Government
- Increase geographical reach of our training programs for drivers and value add
- Focus on Research to prepare impactful programs

For more information about FPRA and our initiatives, please visit our website at www.fpra.in or contact us directly at +91 7735033020 or Email: fprango@gmail.com

ENHANCING ROAD SAFETY IN INDIA: OVERCOMING CHALLENGES AND PROPOSING SOLUTIONS

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Introduction

Road safety remains a critical concern in India, with high rates of road accidents and fatalities posing significant risks to human lives, as well as economic and social well-being. This article delves into the key challenges faced by India in ensuring road safety and presents potential solutions to mitigate these issues effectively.

1. Addressing Inadequate Infrastructure:

One of the primary factors contributing to road accidents is the inadequacy of infrastructure in India. Poor road design, the absence of pedestrian walkways, insufficient lighting, and inadequate signage all contribute to heightened risks on Indian roads. To tackle this issue, it is imperative for the government to invest in upgrading existing infrastructure and implementing modern design standards to ensure safer roads for all road users.

2. Combating Reckless Driving Behavior:

Reckless driving behavior is a significant challenge to road safety in India. Instances of speeding, lane indiscipline, disregard for traffic rules, and driving under the influence of alcohol are distressingly common. Combating this issue requires a comprehensive approach, including stricter law enforcement, targeted public awareness campaigns promoting responsible driving, and comprehensive driver education programs that emphasize the importance of adhering to traffic regulations.

3. Strengthening Enforcement Mechanisms:

While traffic laws and regulations exist, their enforcement remains a major hurdle. This lack of effective enforcement allows offenders to engage in dangerous behavior without consequences. To address this, there is a need to strengthen traffic enforcement by increasing the presence of traffic police, leveraging technology for enhanced surveillance and monitoring, and implementing stricter penalties. These measures can serve as effective deterrents and foster compliance with traffic rules.

4. Improving Licensing and Training Procedures:

The prevailing licensing process in India often falls short of ensuring thoroughness, resulting in a significant number of unqualified and inexperienced drivers on the roads. Enhancing the rigor in licensing process is crucial, and this can be achieved by introducing comprehensive tests that evaluate both theoretical knowledge and practical driving skills. Additionally, promoting accessible driver training programs can enhance the overall competence and awareness of drivers.

5. Ensuring Safety of Vulnerable Road Users:

Pedestrians, cyclists, and two-wheeler riders constitute a significant portion of road users in India. However, their safety remains a concern due to inadequate infrastructure and a lack of awareness among both drivers and vulnerable road users themselves. To address this, it is essential to establish separate lanes and dedicated infrastructure for non-motorized transport, improved road signage and lighting, and conduct educational campaigns aimed at enhancing awareness among all road users.

6. Promoting Public Awareness and Education:

Raising public awareness about road safety and cultivating a culture of responsible behavior is crucial. Educational campaigns targeted at schools, colleges, workplaces, and

communities can play a pivotal role in disseminating knowledge about road safety practices, like the consequences of reckless driving, and the importance of adhering to traffic rules. Utilizing various media channels and collaborating with civil society the responsible organizations can effectively reach a broader audience and instigate positive behavioral changes.

Conclusion

Addressing the challenges surrounding road safety in India necessitates a holistic approach encompassing infrastructure development, robust law enforcement, licensing reforms, education, and extensive public awareness campaigns. By prioritizing these aspects, the nation can make significant progress in creating safer roads and reducing the alarming number of road accidents. Achieving improved road safety in India is not only a possibility but also a necessity for safeguarding the well-being of its citizens.





Kataline®

COMPANY PROFILE

With a focus on providing high-quality durable road marking solutions, Kataline is a trusted name in the road marking industry. We manufacture a range of road marking products including thermoplastic, cold plastic, reflective paints and much more.

We offer safety marking solutions for Road & Highway markings, Bus Lane markings, Cycle Track & Walking Track Markings, Parking Area Markings, Railway & Port Markings, Industrial Markings.

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- RACETRACK MARKINGS
- RAILWAY & PORT MARKINGS
- RAISED PAVEMENT MARKINGS
- COLOURED ROAD SURFACING
- VERTICAL SURFACE MARKINGS
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THE NEED FOR A ROAD TRAFFIC ACT IN INDIA

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Introduction

The Road Traffic Act, which gives rise to a set of rules for road use, is necessary for legally making the road users for their correct and incorrect use of the road. Thus, Road Traffic/Transport Code is the body of rules and guidelines on how to use the roads for safety of all road users. These rules and guidelines for use of the road by different modes of road transport are supposed to be based on the provisions of the Motor Vehicles Act (MVA, 1988) and its comprehensive updation in Motor Vehicles (Amendment) Act (MVAA, 2019) in India. There is Central Motor Vehicle Rules of 1989 (CMVR 1989), while most states have prepared their own State Motor Vehicle Rules with certain modifications in the CMVR 1989. As the same carriageway (right of way) is generally used by various modes in case of road transport, conflicts are inherent in any road traffic system. In India, this problem is even more aggravated due to the mixed traffic of a variety of vehicles (modes: motorized and non-motorised) with different size, shape and speed capabilities sharing the road space. In road traffic, all users are supposed to behave in a considerate and responsible manner towards others, which can make the road travel safer and less stressful.

In India, the enforcement is extremely weak and the lower modes, especially the vulnerable modes exploits this situation in every possible way and violates in every situation jeopardizing the safety. Pedestrians cross road anywhere they like just by indicating to the traffic (showing hand). Because of the sheer number in the traffic streams, the enforcing personnel always ignore the violations of motorized two-wheelers (who are seen to gang up against any enforcement), and thus giving them same liberty as in case of pedestrians. With this situation prevailing, the new mode added now-a-days, i.e. E-Rickshaws have also liberated themselves from any enforcements. As a result of such behaviours of these lower modes, which also have reasonable speed of movement (except the pedestrians) to cause grievous injuries or death to others in the traffic stream. In addition, the MVAA and CMVR are not legally applicable to pedestrians and other non-motorised transport modes, which are used abundantly in India, and enforcement action on them can be challenged in court.

The Road Traffic Act supported by the Code, with the guidelines for using the road by each type of potential road users, will be of particular interest to the learner drivers, which can be a special requirement for passing the driving test. However, it will be useful to even those who have been driving for some time, and can read the Code in order to refresh their knowledge about the correct and safe use of the road. Thus, the Road Traffic/Transport Code shall contain much useful advice for pedestrians, cyclists and other vulnerable road users, and all other vulnerable road users to have a duty to behave in a considerate and careful manner in traffic stream for safety of all road users. This will also change the present system of blaming the larger vehicle in every case of any accident that take place in India.

Context of the Code

The *Road Traffic/Transport Code* is a mixture of rules and advice for correct use of the road. The rules/guidances for road use, given in the Code, are simple interpretations of the complex provisions of the Road Traffic Act and associated Regulations. If anyone disobeys them, he/she is committing an offence, and, if caught and convicted, he/she may be fined and disqualified from driving. He/She can also be sent to prison. Thus, the *Road Traffic/Transport Code* contains much good advice for road users. Driving on the busy roads is a complex task and it is impossible to give rules and advice that cover every possible situation one will encounter. Common sense may be used, and always to give way, if it can help to avoid a collision.

For safe use of the road network, there are a set of advice for all road users, as listed here below.

Be fit and well. Road users have to be fit and well to use the road safely. If one is not well, do not drive also get help if wanted to walk somewhere. Do not use the road if using alcohol or drugs to the extent which may not allow to be fully in control of himself/herself. Also, If taking medicine, ask the doctor for advice on whether it is advisable to drive.

Be responsible. Road user has a duty to make every effort to avoid doing anything that might result in harm to others. This includes things that are known to be dangerous, such as speeding, drinking and driving, and overtaking at a bend.

Concentrate. Safe use of the road requires full concentration, whether one is a driver or a pedestrian. Do not be distracted by actions of others.

Be calm and patient. Avoid getting angry about the bad behaviour of others. Never try to punish them. Be patient in traffic jams, and do not make things worse by trying to get ahead of those in front. Do not use the road when angry, over-excited or very upset about something.

Be helpful to others. If everyone follows the rules and is helpful to others there will be less delays. Selfishness makes things worse for everyone and can be dangerous.

Protect the vulnerable. A road user has a duty to protect and assist old people, the disabled, and children. Drivers of motor vehicles must take extra care when sharing the road with those who have little protection against injury – this includes all pedestrians, cyclists and motorcyclists.

Do not make unnecessary noise. Excessive noise is distracting and tiring. While driving a vehicle remember that the horn is for use only in an emergency.

General Safety Rules for All Road Users

Traffic Rules have been established as a systematic framework to serve as a guide and commitment common to all. Obedience of traffic rules is a fundamental responsibility of all citizens. Everyone must follow the basic road rules and drive with common sense and with consideration for safety of all the road users. But, as it is seen in India, a major section of the road users have very poor respect to road rules, who may be ignorant or defiant to the rules. This is the reason why a set of guidance for road users would help, which will provide the correct use of the road by each type of road users, and any wrong use will make them responsible for the incident or accident. At this time, this responsibility cannot be imposed on any of the road users due to slack enforcement and wrong interpretation of even M.V.(A) Act.

It is everyone's social responsibility to understand and follow the road rules, road signs and markings. Some of the general rules that should be remembered in using road are:

- It is an offence for any person to disregard a traffic law or fail to follow the instructions stipulated therein.
- All traffic must keep to the left side of the road.
- No person should drive a motorised vehicle without a driving license valid for the class of vehicle being driven.
- Driver must produce his/her driving license if he/she is driving a motor vehicle in any public place, on demand for examination by a Police Officer in uniform.
- Before driving, a driver must ensure that vehicle is properly licenced, registered and insured and that there are no restrictions in the relevant insurance policy (for example as to who can drive the vehicle), which would make the insurance invalid.
- Every driver of a motor vehicle shall cause the vehicle to stop and remain stationary so long as may be reasonably necessary, when required to do so by a Police Officer in uniform or when the vehicle is involved in a crash, irrespective of whether he/she is or is

not responsible for the crash. He/she shall give his/her name and address of the owner of the vehicle to any other person affected by such crash and who demands it, provided that such person also furnishes his/her name and address.

- When someone else appears to behave recklessly or rudely, be calm and controlled and never stop to retaliate, it is both degrading and dangerous.
- Vehicles displaying "L" plates are in the charge of learners and inexperienced drivers; be wary of them and give them clear passage and chance.
- Be particularly patient with old people, young children, the blind and the infirm, and assist them wherever possible, as they have special problem in negotiating in traffic.
- If a fire service vehicle or an ambulance or police car with siren are approaching, allow them free passage by driving to the side of the road.
- Driver should not go on to the road, if he/she is in a temper, excited or upset; try to calm himself/herself before entering the road.
- Do not flash a light onto the road so as to dazzle and blind the eyes of an approaching driver of a vehicle.
- Refrain from throwing things like cigarette butts, empty juice cans, packaging, etc. out of vehicle window onto the road. These can be highly dangerous and troublesome for other road users. Do not project part of body or objects from inside the vehicle.
- Do not use horn unless absolutely necessary. Do not make unnecessary noise or do anything else which may irritate others.
- If it is noticed that any person(s) who have had either a crash or breakdown, inform the police and ambulance services and give the injured a helping hand in any way you can.
- While on the road, be prepared for the worst and keep sufficient emergency and first-aid equipment in the vehicle.
- No person driving a vehicle should allow any person to stand or sit or place anything in such a manner or position as to hamper/obstruct the driver's vision or his/her control of the vehicle.
- When a police officer in uniform is on the spot directing traffic, obey his hand signal, even if the hand motion contradicts the traffic signal light, sign or pavement marking on traffic lanes, but do so with the greatest caution.
- At non-signalised zebra pedestrian crossings, vehicles should give way to pedestrians. At signalised crossings, when red light is on vehicles should not cross or block zebra crossing.

Coverage of the Code

The *Road Traffic/Transport Code* shall provide mandatory rules and guidance (in terms of safe use of the road), which are required to be obeyed, separately for each road user like pedestrian, other NMT users, two-wheelers, as well as various motorised passenger and goods vehicles. The Code will provide do's and don'ts in much simpler way than the Act itself and deviations from these will be the means to identify the responsibility in case of a collision or crash. Most cities in India are implementing cameras in all critical locations, while high speed highways are also deploying cameras for traffic management. At the present time, the violators take it for granted that there will be no means to establish their faults in road use, and that is the basic premise on which the chaotic traffic continues unabated. The author acknowledges the use of the ideas from the SATCC Manual for Learner Drivers, the UN-ECA Guide for Drivers of Heavy Goods Vehicles, The Highway Code for Uganda and Tanzania, The Highway Code of United Kingdom, and a relatively old Indian Safety Code.



ORAFOL Group is one of the leading manufacturers of innovative, self-adhesive graphic products, retroreflective materials, adhesive tape systems and high-quality polymer films. The founding history of ORAFOL Europe GmbH dates to the year 1808. ORAFOL Europe GmbH is certified according to EN ISO 9001 and EN ISO 14001, and all production takes place on the most advanced and reliable production equipment available in the industry today.

With a global presence in over 100 countries, ORAFOL India started its operations in 2019. With a strong team of road safety experts ORAFOL India is achieving new milestones and setting highest standards for the product quality. In the span of just 3-years ORAFOL India has made its strong position in the Indian Market. It has been an integral part of various National and State Highways projects, Urban Mobility and Signage Solutions, Tourism and Railways, Vehicle Marking and Wrapping Solutions.

In India, currently, ORAFOL Group is operating in Graphics and Reflective Solutions Division. We offer complete solutions for Road Signage and Road Furniture along-with Vehicle Marking/Wrapping Solutions. Being an innovative solution provider, ORAFOL India has been a market changer by providing customized solutions to its customers and has established its strong position in the challenging Indian market. We have successfully completed more than 100 projects across India and gained customer confidence in the superior quality and technical support provided by our team of Traffic Engineers. Together we are building a strong base in India, and we are dedicated for cause of Road Safety on the Indian Roads, with the vision of reaching zero fatalities.



ROAD SAFETY EVALUATION AND IMPLICATIONS: FUTURE RESEARCH DIRECTIONS, CHALLENGES, AND OPPORTUNITIES

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Background

Road traffic crashes cause loss of human lives and injuries including related huge financial losses each year. In a global scale 1.35 million fatalities and 50 million injuries take place and nearly 60% to 90% of all fatal traffic crashes occur in low and middle-income countries (WHO, 2018). Further, around 88 countries had a drop in fatalities on the road system due to comprehensive analysis and timely implementation of suitable safety measures. However, in nearly the same number of nations where motorization is fast developing, there has been a rise in the frequency of fatal traffic crashes. India is one of the fastest growing nation in the world regarding development and technological advancements. It serves around 1.4 billion population of the country **via** roadways, railways, waterways, and air transport networks. However, with the development and rise in the earning capacity of households in India, the ridership in private transport is also seen to be increasing at an alarming rate. Most of the **commuters** in each state can be seen shifting to personally owned vehicles leading to an increased percentage share of private motor vehicles in road traffic. Given this, enhancing traffic safety by providing suitable proactive safety measures is the most practical approach. However, in the past, traffic safety at intersections, mid-block sections, and urban arterial roads is mostly analyzed using historical crash data. Road safety analysis using crash data may be considered a reactive method and it depends on the availability of reliable and accurate crash data. Road traffic crashes are random events, and collecting a good amount of quality crash data is always challenging. Given this, several traffic conflict-based procedures are suggested to study traffic safety without depending on crash data, as a more proactive approach.

Reactive and Proactive Approaches

The present article focuses on two important aspects to enhance safety in road traffic operation. **The former** being the reactive safety approach (safety evaluation based on the available reliable crash data), and the proactive safety approach (safety evaluation considering the safety surrogate measures) as the **latter**. For both the approaches, significant number of studies are conducted in the two areas, especially signalized or unsignalized intersections and mid-block sections. To this end, two data types are mainly collected for this purpose. The primary data collected consisting of road inventory including geometry and land-use, traffic volume, and traffic composition data, while the secondary data includes province-wise population, gross domestic product, vehicles registered, length of National and State Highways, total road network, total distance covered by each mode and vehicular crash information with crash severity.

Now, consider the first approach, the Data Envelopment Analysis (DEA) is used to identify the effective states or provinces that are leaders in road safety regarding crashes. DEA is a non-parametric test used in road safety by ranking provinces, generally called Decision Making Units (DMU). For that, adopting a hierarchical cluster, the inefficient DMUs are identified as having more road crashes and fatalities. Two techniques for modeling DEA are generally adopted: Charnes Cooper Rhodes (CCR) and Banker Charnes Cooper (BCC). Based on the efficiency score, the province is ranked, and the inefficient province is highlighted in terms of the number of crashes. Therefore, the DEA may serve as one of the efficient techniques in deriving road safety by ranking the Indian states with multiple decision criteria more rigorously. Henceforth, the policymakers/decision makers can rank and weigh the necessary safeguards required for each inefficient province in that cluster for recommending and framing some policies for enhancing road safety. In the second

approach, the vehicular trajectory is traced. Based on their movements in the longitudinal and lateral direction, the various types of traffic conflicts are identified, like rear-end, crossing, side swap, and lane-changing, etc using the various surrogate safety measures. Afterward, based on identified conflicts, the safety performance function is developed at two locations, signalized intersections, and mid-block sections, seeing the effects of the various traffic stream factors like vehicle composition, volume, time of the day, etc. Before using the developed safety performance function for the road safety evaluation, the validity of the developed model must be checked with the reported crashes. In view of this, suitable proactive safety measures can be provided to reduce traffic crashes and increase the roadway system's operational efficiency by minimizing the likelihood of crashes.

Behavioural Research

Driver behavior study is a breakthrough approach, where naturalistic-driving data could be leveraged to gather fundamental information in a naturalistic way without any experiment control. This type of information can be collected unobtrusively using a very sophisticated tailored instrumented vehicle with built-in high-end sensors like long range solid-state Light Detection And Ranging (LIDAR), RAdio Detection And Ranging (RADAR), Global navigation satellite system (GNSS), potentiometer, MQ3 alcohol sensors, cameras, etc. and state-of-the-art data logger cum processor. The same data is analyzed, across time and spatial location to understand how people navigate, how they avoid crashes, how they drive to stay within their lane, control the vehicle, and how these things vary according to gender, age, experience, skill, and other roadway and environmental factors. Based on the results obtained, suitable proactive safety measures can be designed to improve driving behavior and or roadway conditions. The same type of study can also be extended to various modes of road transport.

Intelligent Transportation System

Intelligent Transportation Systems (ITS) can play a vital role in developing and implementing different components such as Advanced Traffic Information Systems (ATIS) and Advanced Traffic Management Systems (ATMS). This can include adjusting traffic signal timings, rerouting vehicles to alleviate congestion, and providing alternative routes to optimize traffic patterns and reduce accidents caused by traffic congestion. As a part of such implementations, there is an urgent need to build an interdisciplinary approach towards developing and designing sensors of different types indigenously. This may be more effective in tracking and understanding drivers' behaviour and habits as a function of different traffic situations and roadway conditions along with certain important environment-related variables. In this regard, certain pilot studies with more technological advancements and automation should be conducted comprehensively. As a part of ITS, real-time image processing tools using advanced computational methods (computer-vision based) can be utilized in tracking vehicles operating under mixed traffic conditions. Developing accurate trajectory data from video extraction tools is a big challenge for traffic with high heterogeneity in composition and weak lane discipline.

These types of automation, as described above, could undoubtedly benefit trajectory development under mixed traffic conditions. The data acquired in this way can be explored extensively in unfolding numerous research findings in the direction of improving mixed traffic streams' safety performance coupled with better enforcement. Also, with the meticulousness of extracted trajectory data over several sections in sequence (over a road corridor/network), the accuracy of the developed stitching algorithm can be improved. Based on the robust stitching algorithm, trajectory data from mixed traffic conditions can be developed systematically. Further, the developed trajectory datasets can help explore different aspects of driving behavior, including vehicle following, lateral movement, and traffic safety analytics, such as time to collisions (TTC) and deceleration rate to avoid collisions (DRAC), etc. Even Post Encroachment Time (PET) could be a good indicator for assessing safety at unsignalised intersections. Pedestrians (especially children and elderly users) are vulnerable road users. The ITS-based system can provide good insights into the state-of-art

practice toward pedestrian risk based on individual characteristics like gap rejection/acceptance over time, crossing speed, etc., and also could be helpful in the review of design parameters for pedestrian-crossing facilities to enhance pedestrian safety. Utilizing ITS, traffic management systems, equipped with Automatic Number Plate Recognition System (ANPRS) and variable message signs (VMS), can dynamically monitor and control traffic flow in real-time towards improving lane-changing and over-speeding behaviors of the drivers. Intelligent Speed Adaptation (ISA) system, a part of ITS, uses GPS and digital mapping data to monitor vehicle speed and provide feedback to drivers. These systems, including Advanced Driver Assistance Systems (ADAS), can alert drivers when they exceed speed limits, promote compliance with speed regulations, and reduce the likelihood of accidents caused by excessive speed. Such opportunities related to interdisciplinary research works majorly involve main branches of Industry 4.0 like AI/ML, Data Science, Sensors, and Drones.



TEXLA PLASTICS AND METALS PVT. LTD



INTRODUCTION

- Incorporated in March 1990.
- Located in Ludhiana, Dehradun & New Delhi.
- It is part of a progressive Indian business group, which began manufacturing plastics for televisions, car parts and cassette tapes
- Expanded to Tooling, processing & Manufacturing Plastic components Industry, Education, Entertainment, Hospitality and Road Safety for over 25 Years
- Traffic and Road Safety Division began in 1998, and is currently the leading manufacturer of traffic & road safety products in India

Work Environs

- Factory is installed in over 152460 Sq. ft. of area.
- Machinery setup is aimed to minimize wastage of time and labour.
- Green, airy and healthy environment
- Quality raw material, modern equipment, latest management methodologies & stringent quality control

Our Human Resources

- Team of 250 well-qualified and experienced members from all around India under one roof
- Dedicated, Hard Working Quality & Manufacturing team
- Experienced Design facility for product and tool design using CAD/CAM

Our Business Division

- Tool Room Division
- Molding Division
- Quality & Design
- Paint & Assembly
- Storage
- Road Safety Products Division

Manufacturing Facility

- We have two world class State-of-Arts Factories in Ludhiana & Dehradun respectively.
- We have 35 NC Injection & Blow molding machines. (from 60 ton to 1420 ton to produce sophisticated components)
- With its present capacity, it is able to produce component ranging from 2 gm to 6.5kg in different Engineering Plastics.
- In House Tool Rooms for tools & dyes.
- In House Quality Testing Lab & Design Room.

TPM is manufacturing components for almost all industries like Automobile, Electronic, Engineering, Home Appliances, Sports, Medical Equipment to name a few

TPM owns a range of Road Safety Products under the Brand name **“DARK EYE”**

TPM is presently manufacturing road Studs, Delineators, Spring Posts, Guide Posts, Chevron Posts, Rear Reflectors, Electronic Flashlights, Safety Bar, Road Blinkers etc.

There is no other manufacturer of these products in the country to match with our capacity & quality.



Muskaan: Foundation for Road Safety is a nationwide charitable trust established in 1999. Born out of the devastating loss of Durva Bhasin, a cherished 17-year-old whose life was tragically cut short in a road accident, Muskaan stands tall as a beacon of hope. Led by visionary founders, Mr. Pramod Bhasin and Dr. Mridul Bhasin, we firmly believe that road safety is a collective responsibility. We take a comprehensive, community-focused approach to tackle the complex issues related to road safety.

Muskaan: Foundation for Road Safety, a force of change, extends its reach to the vast terrains of Rajasthan, Odisha, Bihar, Uttar Pradesh, Punjab, Haryana, Gujarat, and New Delhi. Our NGO collaborates with Government and Private sectors, including Education Institutes, Corporate entities, Enforcement agencies, and Road Owning Agencies in these states. Through a tapestry of projects and campaigns, we weave together the fabric of road safety, fostering corporate partnerships under Corporate Social Responsibility (CSR). With resolute Government support and assistance, coupled with technical guidance from esteemed experts, Muskaan paves the way for safer roads, transcending geographical boundaries.

Achievements and Awards

- Muskaan proudly basks in the glory of not one, but two prestigious National Road Safety Awards. Bestowed upon us by the esteemed Ministry of Road Transport and Highways, Government of India, in 2010 and 2020.
- Furthermore, we stand tall among the select few NGOs fortunate enough to collaborate with the noble Defense forces of India i.e. The Indian Army, The Indian Air Force, and The Military Police.
- Curriculum Formulation: Recognized for expertise, Muskaan was nominated in 2005 to contribute to the curriculum development on road safety and social issues for schools by the Central Board of Secondary Education, New Delhi.
- Teachers' Training Collaboration: Muskaan collaborated with The Indian Air Force Educational and Cultural Society to conduct Training of Trainers programs, empowering teachers with road safety education skills.
- Muskaan actively contributed to the road safety curriculum for the Government of Rajasthan's "NO Bag Day" initiative.

Muskaan's **Capacity Building initiatives** target a diverse range of stakeholders, including Enforcement Agencies such as the Police and Transport departments, Emergency Response Professionals, Engineers, Road Owning Agencies and Commercial Drivers.

Muskaan's **Education and Awareness** programs target education institutions, corporates and rural communities. Our impactful programs and events include Road Safety orientation, Defensive Driving Training, On-Road Campaigns, Road Safety Carnivals, observing Road Safety Month, Community Interactions, wall painting etc.

Advocacy: Muskaan collaborates with local authorities and policymakers to advocate for crucial measures such as enhanced road infrastructure, effective traffic management systems, and strict enforcement of traffic regulations. We have also made significant contributions at state-level forums, engaging with the Chief Minister's office, leading to strengthened emergency response systems in Rajasthan. This includes the establishment of trauma centers, provision of free treatment to victims, and cash awards for Good Samaritans.

Photo Album of IRF-IC's 5E Programme



Road Safety Audit on Krishnagiri to Karur Stretch



IRF India Team with Traffic Police Rajasthan



Blackspot Audit at Delhi



Project Team measuring height of Metal Beam Crash Barriers



IRF India Team with NHAI Officials from Salem, Tamil Nadu

Photo Album of IRF-IC's 5E Programme



Road Safety Education being imparted in a School at Karnataka



Road Safety Education being imparted in a School in Madhya Pradesh



Road Safety Education being imparted in a School at Rajasthan



Road Safety Education being imparted in a School at Madhya Pradesh



Road Safety Education Being Imparted in a School at Bundelkhand



Road Safety Education being imparted in a School at Kerala

Photo Album of IRF-IC's 5E Programme



Lecture to Rajasthan Police by Dr. Rohit Baluja



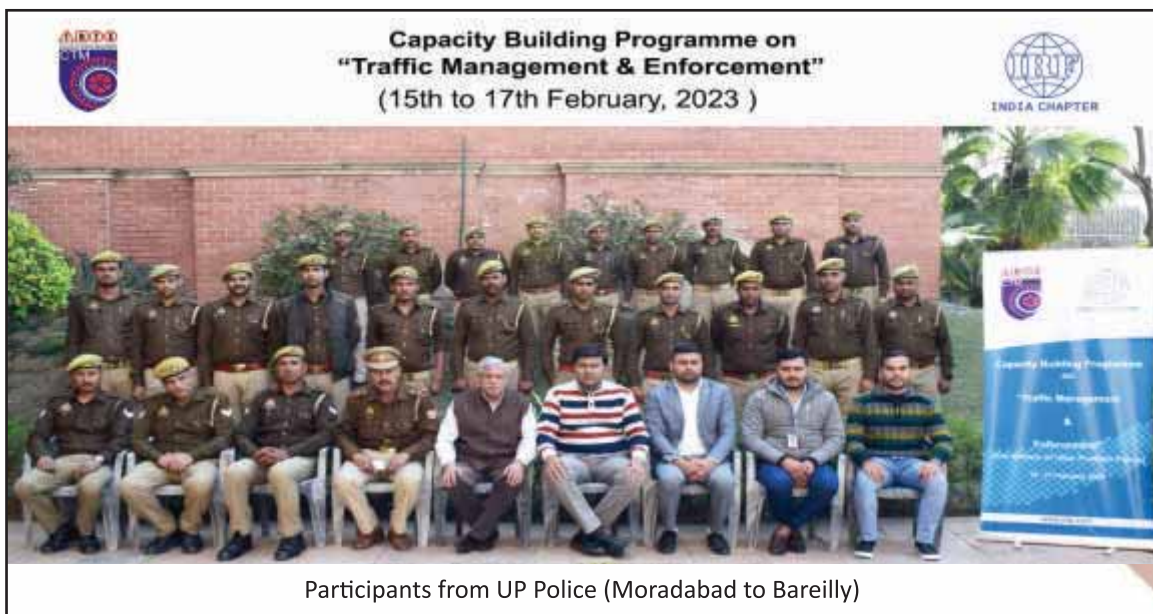
Capacity Building Program of Rajasthan Police at IRTE



Capacity Building Program of Madhya Pradesh Police at IRTE



Enumeration of Police Stations, Madhya Pradesh



Participants from UP Police (Moradabad to Bareilly)

Photo Album of IRF-IC's 5E Programme



Explaining Helmet Removal Technique



Demonstration of Hand Position for CPR



Explaining the First-Aid Training Session



Response check during CPR



Participants showing Hand Position for CPR



Explanation about Tourniquet

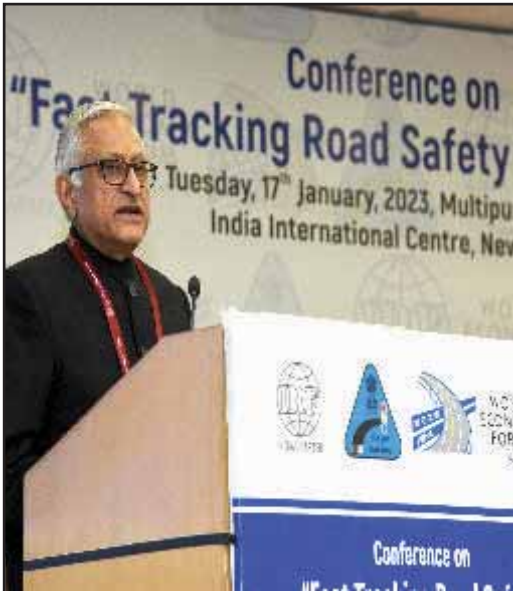
Conference in January, 2023



Welcome Address by Mr. Satish Parakh



Keynote Address by Justice Adarsh Kumar Goel



Sharing of views by Justice J.R. Midha



Launch of Road Safety Anthem



Dignitaries on the dais for one of the technical session during the Conference



Presentation by Mr. Balraj Bhanot

Conference in January, 2023



Sharing of views by DG (RD) Mr. Ravi Prasad



Sharing of views by Mr. R.K. Pandey



Sharing of views by Prof. Manoranjan Parida



Speakers of the technical session during the Conference



Sharing of views by Padmashri Dr. Subroto Das



Participants at the Conference

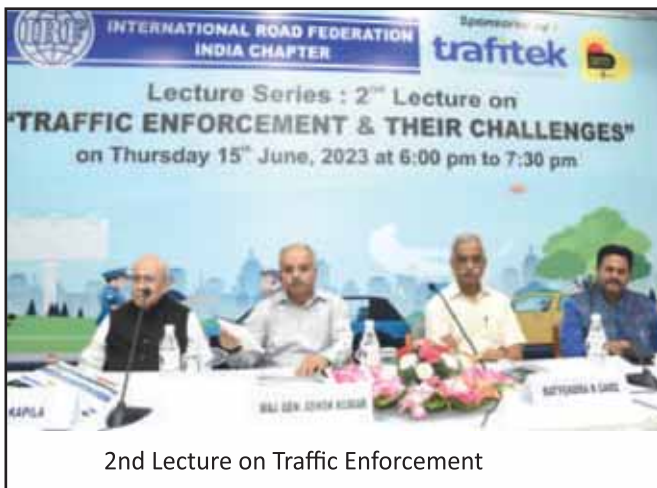
IRF - IC Lecture Series



IRFIC Inaugural Lecture on School Zone Safety



IRFIC President Lt. Gen. Harpal Singh Ji delivering the Keynote Address



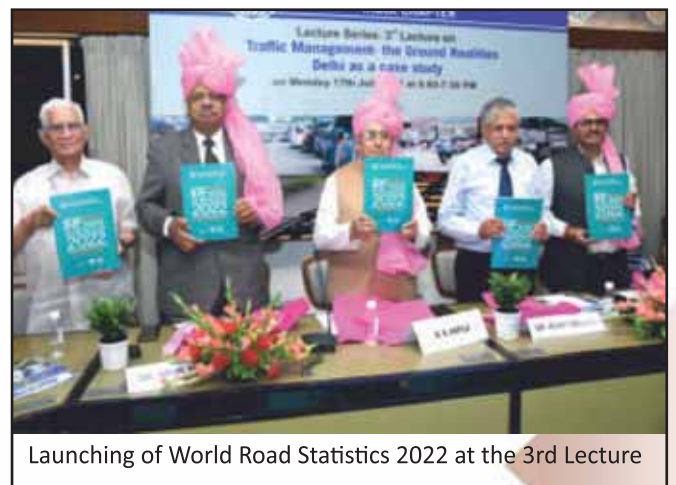
2nd Lecture on Traffic Enforcement



Address by the Guest Speaker Mr. Satyendra Garg, IPS (Retd.)



Presentation by Guest Speaker Dr. Rohit Baluja at the 3rd Lecture on Traffic Management

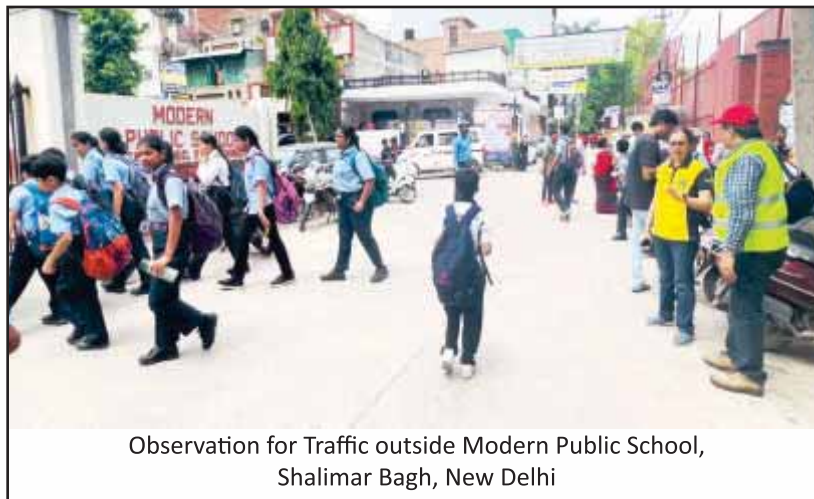


Launching of World Road Statistics 2022 at the 3rd Lecture

IRF-IC School Zone Safety Program



School Zone Safety Audit at Modern Public School, Shalimar Bagh, New Delhi



Observation for Traffic outside Modern Public School, Shalimar Bagh, New Delhi



IRF Team with Mahavir Sr. Model School Representative for School Zone Safety Audit



School Zone Safety Checklist being filled up

About the Authors

Prof. (Dr.) P.K. Sarkar

Professor P K Sarkar was a former Professor & Head, Department of Transport Planning at School of Planning & Architecture and is presently a visiting faculty engaged in teaching and research and consulting work in the areas of Transport Planning, Intelligent Transport System and Road Safety at various institutes of repute. He has been actively involved as an expert on various consulting projects in areas of Transport Engineering, Planning, Transport Economics, Road Safety, and ITS.

Pramod P. Bhaskar

Mr. Pramod Bhaskar has more than 10 years of professional experience in the field of transportation engineering and road safety after completing post-graduation in Transportation engineering from NIT Surathkal, Karnataka. He is also a Certified Road Safety Auditor and has handled multiple Road Safety Assessment studies, Blackspot analysis and Rectification projects, Comprehensive Mobility Plan studies and Traffic management studies. Currently he is working as Traffic Engineer in Transportation Safety Division of 3M India.

Mohsin Khan A.U.

Mr. Mohsinkhan has more than 11 years of professional experience in the field of road safety. He is also a Certified Road Safety Auditor and has worked in various National Highway & Expressway projects across the Country. Currently he is working as a Senior Manager – Traffic Engineering in 3M India Ltd.

Prof. Manoranjan Parida

Prof. Manoranjan Parida is currently Director, CSIR-Central Road Research Institute. He was Deputy Director at IIT Roorkee before joining CSIR-CRRI. He received Pt. Jawaharlal Nehru Birth Centenary Award in the year 2004 from Indian Road Congress. He is Convener of Urban Roads & Streets Committee (H-8) of Indian Roads Congress, New Delhi.

Dr. Mukti Advani

Mukti Advani is Principal Scientist at CSIR-Central Road Research Institute, New Delhi. Her area of work includes Transportation Planning, Vehicular Pollution related aspects and Road Safety. She has contributed in more than 30 major projects including focusing on sustainable transport, transport planning, estimation of vehicular pollution, road safety, safety for school zones and non-motorised transport, etc. Present involvement is on projects like iRASTE, Trip Generation Manual for India, Impact of vehicular breakdown on pollution, etc. Presently she is executive board member of Transportation Research Group of India, Council Member of Indian Road Congress, Advisory committee at NATPAC, etc.

Dr. Ch. Ravi Sekhar

Dr. Chalumuri Ravi Sekhar is a Chief Scientist at CSIR-Central Road Research Institute, New Delhi. He has 25+ years of experience in Traffic Engineering and Transportation Planning. His research includes travel time reliability, route and mode choice modeling, ITS, GPS and GIS applications, and soft computing techniques like ANN. He earned his Doctoral degree from Kobe University in 2008 and has published 90+ research papers in national and international Journals on traffic and transportation engineering.

Manoj K. Gupta

As a Civil Engineer with deep experience of over 40 years, Mr. Manoj Kumar Gupta served as Engineer-in-chief of UP PWD. He also served as Chief Engineer, UPEIDA, Lucknow and played key role in timely completion of Purvanchal Expressway (341Km) and Bundelkhand Expressway (296 Km) and framing of Ganga Expressway (594 Km) DPR. He is a member of Indian Road Congress and fellow member of Institution of Engineers (India). He was conferred upon distinguished Alumni Award – 2021 during centenary celebration of Alma Mater HBTI, Kanpur.

Dr. S. Velmurugan

Dr. S. Velmurugan is presently working as Chief Scientist and Head, Traffic Engineering and Road Safety Division at CSIR - Central Road Research Institute (CRRI), New Delhi. He has completed **his Ph.D. in Transportation Systems Engineering at IIT, Bombay in March, 1995**. He possesses more than about 29 years of experience in traffic engineering, road safety and transportation planning and transport economics. He was instrumental in the formulation / revision of 18 IRC publications during the last 12 years and has coordinated RSA projects (over 9000 kms) sponsored by World Bank, NHAI, State PWDs. He is the CSIR-CRRI Coordinator for 15-day Certification Course on “Road Safety Audit and Other Road Safety related Aspects.”

Amit S. Kumar

Amit, a passionate advocate for road safety, currently leads the international marketing efforts at Netradyn. He has been honored with invitations to speak at prestigious forums, including MSME CII, Indian Chemical News, [The Economic Times-EV Forum](#), etc. With an extensive background in multinational organizations like IBM, Oracle, and Tecnotree, Amit brings a wealth of experience in collaborating and guiding companies through their Digital Transformation journeys. His expertise has been acknowledged through numerous accolades, including a notable project accomplished in collaboration with the Kenya National Chamber of Commerce & Industries.

Dr. Indrajit Ghosh

Dr. Indrajit Ghosh is an Associate Professor in the Transportation Engineering Group, Department of Civil Engineering, Indian Institute of Technology (IIT) Roorkee, India. He obtained his B.E. in Civil Engineering in 2003 from IEST Shibpur, West Bengal. He did his M.E. in Highway and Traffic Engineering from the same institute in 2005. He completed his second Masters Degree in Transportation Engineering from Wayne State University, Detroit, Michigan, USA, in 2008, followed by his PhD in 2010. Dr. Ghosh is an International Standing Committee Member of the Traffic Control Devices Committee (ACP55), Transportation Research Board (TRB), National Academies, Washington D.C., USA. Dr. Ghosh has been an active member of different International Professional bodies, namely, Institute of Transportation Engineers (ITE), American Society of Civil Engineers (ASCE), Transportation Research Group (TRG) of India, etc.

P.K. Banerjee

P.K. Banerjee is the Executive Director of Society of Indian Automobile Manufacturers (SIAM). He is an alumnus of Indian Institute of Technology, Mumbai, having more than 30 years in automobile industry experience. He has extensively worked in different capacities of engineering development, localization, advance technologies, certification testing, regulations and standard formulation roles in multi-national companies namely Toyota, Daewoo and Tata Motors. On behalf of the auto industry, he represents in various policy, regulations and standards committees of National and International levels. He has been conferred the “**Order of Rio Branco**”, an honorific order of Brazil by the Government of Brazil for his contributions in the field of Bioenergy.

Arun Lakshman

A management professional, Mr. Arun Lakshman has an extensive experience of 42 years in various functions of Automotive Industry. He was involved in management and network development of MSIL's IDTRs across India. He was also involved in Product Planning, After sales service, Logistics and Quality control in Maruti Suzuki India Limited. Post his stint with MSIL, he worked for Automotive Skills Development Council as Industry Expert (Transport) and was responsible for forming standards of driving domain alongwith other associated job roles like toll operator etc. He also worked as Project Head for establishing Centre for Automotive Excellence for Swarn Lata Motherson Trust.

Dr. Navdeep Asija

Dr. Navdeep Asija is a civil engineer, road safety expert, and social activist from Fazilka, Punjab, India. Holding a Ph.D. degree in road safety from the Indian Institute of Technology Delhi, is currently the Traffic Advisor to the Government of Punjab and the Director of the Punjab Road Safety and Traffic Research Centre, With a pioneering role in the car-free movement and promotion of non-motorized transport, he established India's first car-free zone and advocates for the "right to walk" as part of the "right to life" under Article 21 of the Constitution of India. He is the founder of the dial-a-cycle rickshaw concept known as Ecocabs and won the 2011 National Award of Excellence by the Ministry of Urban Development, Government of India.

Parveen Kumar

Parveen Kumar is pursuing his doctoral research on the crash analysis of low-volume rural roads at the TRIPC, IIT Delhi. Before joining IIT Delhi, he earned his bachelor's degree in civil engineering and Master's degree in Highway Safety Engineering and also served as visiting faculty at DCRUST Murthal. He is a certified road safety auditor and worked on different state PWD audit projects.

Pooja Bajaj

Pooja Bajaj is a Socio-Civic Change maker in the Road Safety domain, and a TEDx Speaker. She is an avid Solo motorcyclist who has covered 25 states across India. Post her accident in 2019, she decided to take up the cause of Road Safety. She organizes workshops for slum and lesser privileged women and children to educate and create awareness. She is also working as a peer counselor to help accident victims and family members to deal with Post Traumatic Stress Disorder. She has been a United Human Rights, Karnataka women president for 4 years and now runs her own foundation, the Pooja Bajaj Foundation who works to further the cause of women empowerment and road safety.

Dr. Amit Gupta

Dr. Amit Gupta is a Professor, Division of Trauma Surgery & Critical Care, J.P.N. Apex Trauma Center, All India Institute of Medical Sciences, New Delhi. He is also a Fellow, American College of Surgeons, Royal College of Surgeons (Glasgow), Chairman, Asian Collaboration for Trauma, Academy of the Asian Collaboration for Trauma and Executive Member, Indian Society for Trauma and Acute Care.

Ritu Bissa

Ritu has combined working experience of about 15 years during which she has worked in the area of management consulting helping clients across industries with strategy implementation and performance implementation. Post which she moved to head the risk management function with a shipping company. She is associated with Good Mind (HumSafer) to help on business strategy. She also loves to drive and is passionate about road safety which the core objective of HumSafer. In her free time she indulges in reading & research and painting.

Akhilesh Kumar Srivastava

Mr. Akhilesh Srivastava is a globally known digital and innovative leader with path breaking e-governance projects like FASTag, e-Tendering platform, ODR Portal, Citizen-Centric Multiple Highway Information applications and Mobile Apps, Geo-Fencing of National Highways, etc. He is currently leading the **World Economic Forum's** initiative in India **Road Safety 2.0**. Road Safety 2.0 is **“Shaping the Future of Road Safety in India”** with a technology-driven approach and creating a human-centric road ecosystem, where technology compensates for human limitations and saves lives by improving road safety. He is also a Road Safety Ambassador of IRF internationally.

Dr. Samson Mathew

Dr. Samson Mathew is a distinguished Professor of Civil Engineering, specializing in Transportation Planning, Traffic Engineering, and Road Safety. With an impressive academic background, including a B. Tech. Degree from the University of Kerala, an M. Tech. Degree and Ph.D. from the University of Calicut, he has made significant contributions to the field. Currently serving as the Director of KSCSTE – National Transportation Planning and Research Centre (NATPAC), he brings extensive expertise to his role. Dr. Mathew has published numerous papers, guided several postgraduate and Ph.D. scholars, and successfully completed various projects sponsored by esteemed organizations. His dedication and professional involvement extend to his membership in prestigious institutions, where he actively contributes to the development of guidelines and committees. With an international perspective, he has also undertaken academic visits to several countries.

S.K. Nirmal

Mr. Sanjay Kumar Nirmal is presently Secretary General of Indian Roads Congress. He joined MORTH in 1986 and rose to the position of Director General (Road Development) & Special Secretary and superannuated on 31 Oct, 2022. He is recipient of Pt Jawaharlal Nehru medal for outstanding contribution to Highway profession awarded by IRC. He has been given Lifetime Achievement Award from Indian Geospatial Society-Delhi Chapter. He was also given the Eminent Engineering Personality Award by the Institution of Engineers Delhi Chapter. He is Recipient of best Technical Paper in India Award - IRC Medal in 2019 & again in 2022. He is Executive committee Member of PIARC (World Road Association), Paris, France. He is Fellow Member Indian Roads Congress and Fellow Member of Institution of Engineers.

Ravi Choudhary

Ravi Choudhary, B.Eng.(Civil) is an international Road Safety Expert practitioner, a Safe System champion with 35 years experience in Asia and Africa. He extensively conducts tasks of Road Safety Audit, assessment, crash data analytics, blackspot treatment, training of engineers and sensitisation of school-children, as well as technical advisory tasks for strategic Road Safety initiatives. He is a certified Lead Auditor ISO-39001 Road Traffic Safety Management Systems from the British Standards Institution, certified Road Safety Expert from CSIR-CRRI India. He was a private sector invitee delegate at the Global Ministerial Conference on Road Safety at Stockholm in March 2020.

Prof. Ankit Gupta

Dr. Ankit Gupta presently serves as Associate Professor & Ministry of Road Transport and Highways (MoRTH) Chair Professor in the Department of Civil Engineering at the Indian Institute of Technology (Banaras Hindu University). His experience is in pavement maintenance and performance modeling, mechanistic analysis and design of pavements, traffic flow modeling and safety. He is associated with various national and international societies such as the American Society of Civil Engineers, RILEM, APSE, International Society for Concrete Pavements, UK based World Conference on Transport

Research Society, Eastern Asian Society for Transportation Studies (EASTS), Indian Roads Congress, Institute of Urban Transport, Indian Geotechnical Society, iSMARTi, etc. During the last several years, he has been guiding/mentoring several undergraduate, postgraduate and PhD students, researchers, engineers, and practitioners.

Prof. Satyajit Mondal

I am presently working as an Assistant Professor in the Department of Civil Engineering at the National Institute of Technology Patna. I obtained a doctoral degree in Civil Engineering (Transportation Engineering) from the Indian Institute of Technology (BHU) Varanasi and Master of Engineering degree in Civil Engineering (Highway and Traffic Engineering) from IEST, Shibpur. Before joining NIT Patna, I worked as a Postdoctoral Researcher at IIM Ahmedabad. My areas of expertise include Traffic and Pedestrian Flow modeling, Road Safety and blackspot Solutions, Highway Infrastructure Design, and Transportation Safety.

P. Sujatha

P. Sujatha is an M.Tech CSE and MA in Psychology. She has a rich experience of 15 years in teaching undergraduate and post graduate technical students in the field of Computer Science and Engineering.

Prof. P.K. Sikdar

Prof. (Dr.) P.K. Sikdar, FIE(I), FCILT, FNAE, is Advisor, International Road Federation (India Chapter), while he is a President at ICT Pvt Ltd. He is former Professor of Civil Engineering and Dean at Indian Institute of Technology (IIT), Bombay. Dr. Sikdar is also Former Director, Central Road Research Institute (CSIR-CRRI), New Delhi.

Prof. Shrinivas Arkatkar

Dr. Shrinivas S. Arkatkar is currently working as ‘Associate Professor’ in the Civil Engineering Department at Sardar Vallabhbhai National Institute of Technology (SVNIT Surat). Recently, he is also appointed as ‘Adjunct Professor’ at the Department of Civil Engineering, Ryerson University, Ontario, Canada. His research interests are as follows: (i) traffic flow modeling and simulation, (ii) traffic operation and management, data collection using new technologies, (iii) intelligent transportation systems (ITS) (iv) transportation systems planning, design, and operation, (v) public transportation and sustainable transportation, and (vi) road safety and simulation.

Prof. CSRK Prasad

Prof. CSRK Prasad has 33 years of teaching and research experience. He has guided 262 Dissertation works and 7 PhDs. Prof. Prasad has carried out seven externally funded R&D projects as principal investigator and associated with another 2 projects. He has established MOUD Centre of Excellence on Urban Transport. He acquired expertise in several areas of Transportation Engineering, such as travel demand modeling, Mass Transportation planning, Traffic Engineering, ITS, Road Safety, Low Volume Roads. He has published 138 papers in journals and conferences.

Dr. Mahaboob Peera K.

Dr. Mahaboob Peera has obtained his M.Tech. and Ph.D. from NIT Warangal. He has investigated the influence of land use characteristics on Road Safety. He is presently working as a faculty member in a private engineering college.

Padmashri Dr. Subroto Das

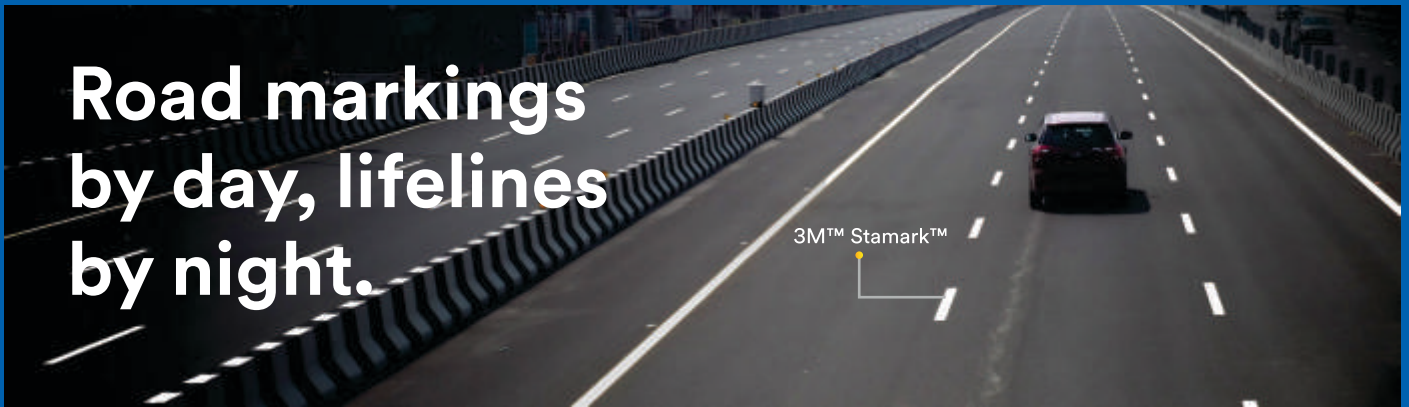
Dr Subroto Das, winner of one of India's highest civilian awards, *Padma Shri* for his work on Highway Trauma Care, co-founded Lifeline Foundation along with his wife, Sushmita (after surviving a life-threatening accident in August, 1999 on one of India's busiest highways), with the aim of reducing the 1,50,000+ annual highway deaths in India. The only Indian to be honoured with the Asian EMS Lifetime Achievement Award by the Asian EMS Council in 2015, The Times of India calls Dr Das "*the country's best known EMS expert*". He works at the cross-roads of EMS (Emergency Medical Services), Public Health, Public Safety, Trauma Care and Industrial Medicine and have been associated with a number of projects support by the NITI Aayog and the Economic Advisory Council to the Prime Minister (EAC-PM).

Anilkumar D. Shimpi

Anilkumar Shimpi, M.Phil in Environmental Science, Diplomas in Industrial Safety and Industrial Management and a Certified CSR Professional is a Lead Auditor in ISO 14001:2015, ISO 45001:2018 and ISO 9001:2015. His key areas of expertise include Planning, Documentation, Training and Auditing in Environment and Safety. He has a good experience and knowledge of implementing Environmental and Safeguard Policies of IFC, World Bank, ADB, CDC, IDFC, etc.



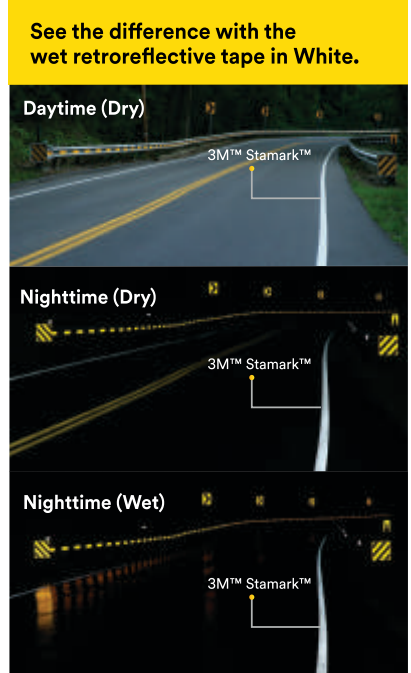
Road markings by day, lifelines by night.



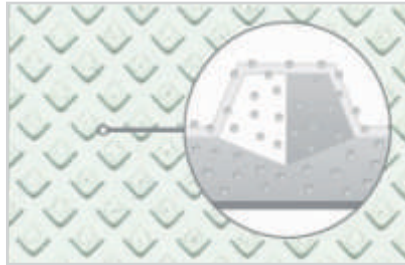
On bright, sunny days, driving is smooth sailing. But what happens on dark nights? In India, 41%¹ of road accidents occur at night. The chances of a crash increase, especially with rain.

Road marking visibility plays a major role in helping drivers navigate, stay in their lanes, and get home safely. For optimal road safety, it is critical to choose all-weather road marking solutions that help keep drivers safe all day and night.

Not all markings are created equal. To reflect light, conventional road markings are embedded with retro-reflective glass beads. However, when it rains, these glass beads are covered with a film of water that causes light to scatter.



As a result, conventional road markings, that use standard glass beads, virtually disappear on stormy nights.

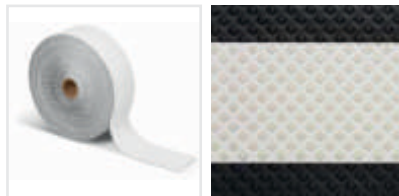


Enhanced technology – using different optics for different conditions.

Safety solutions engineered with 3M science.

To optimize road markings for wet and dark road conditions, 3M™ Stamark™ High Performance Pavement Marking Tape Series 380AW contains unique microcrystalline ceramic beads with refractive index 1.9 and 2.4. The result?

Road marking solutions that provide exceptional visibility, in various weather conditions. Whether the roads are dry, slick from an earlier downpour, or flooded from an ongoing storm, drivers can safely navigate roads with 3M solutions.



3M™ Stamark™ Contrast Tape with black edges provides superior day time visibility on concrete roads.

There's a lot on the line.

Applying road markings may be one of the last things you do when completing your road project, but they're a first step in helping to improve safety, reduce crashes and save lives.

Using 3M science, help families get home safely – day or night, rain or shine.

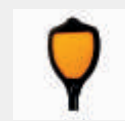
Using 3M's superior retroreflective technology, check out our other road furniture solutions:

3M™ Raised Pavement Marker (RPM)



4X more reflective than minimum MoRTH requirements

3M™ Flexible Median Marker



Fluorescent Type XI sheeting provides excellent visibility

3M™ Solar Raised Pavement Marker



Provides 360 degree and 800m minimum visibility

3M™ Standard Delineator



Combines superior product design with Type XI DG³ Sheeting to offer long-distance visibility



Scan the QR code to watch a video about 3M's road safety solutions

Source:
1 MoRTH Annual Report on Accidents 2021



3M Transportation Safety Division
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INTERNATIONAL ROAD FEDERATION (INDIA CHAPTER)

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