

# **ROAD SAFETY IN SNOW BOUND AREAS: BRO PERSPECTIVE** **BY PROJECT VIJAYAK**

## **INTRODUCTION**

1. Highways and roads have long been regarded as the physical symbol by which a country's progress may be measured. The Indian road network is one of the largest in the world. However along with the distinction of having one of the largest road networks, India also has dubious distinction of having the largest number of road accidents in the world. India accounts for nearly two percent of the world's roads but 11 percent of total accidents which occur in the world. Road accidents kill almost 1.5 lakh people annually in India, which causes avoidable distress to families of the victims besides unwarranted drain on the economy. In this backdrop road safety is a national concern. As per the consortium of Delhi IIT and DMITS, commissioned by MoRTH to estimate the socio-economic costs of road accidents, the total estimated socio-economic cost of road accidents reported by India in 2018 was Rs 1,47,114 crores which was equivalent to 0.77% of the nation's GDP.

2. Thus, road safety cannot be overemphasised. Towards that end, Border Roads Organisation has taken it upon itself to establish a Centre of Excellence on Road Safety and Awareness to undertake road safety audits and spread awareness on the subject within the masses, exploiting the large expanse of deployment of BRO personnel in remote and inaccessible areas within the country. As a lead, Project Vijayak which is deployed in Ladakh and experiences very heavy precipitation with temperatures dipping to minus 30 degree Centigrade was nominated to share measures to enhance road safety in snow bound areas.

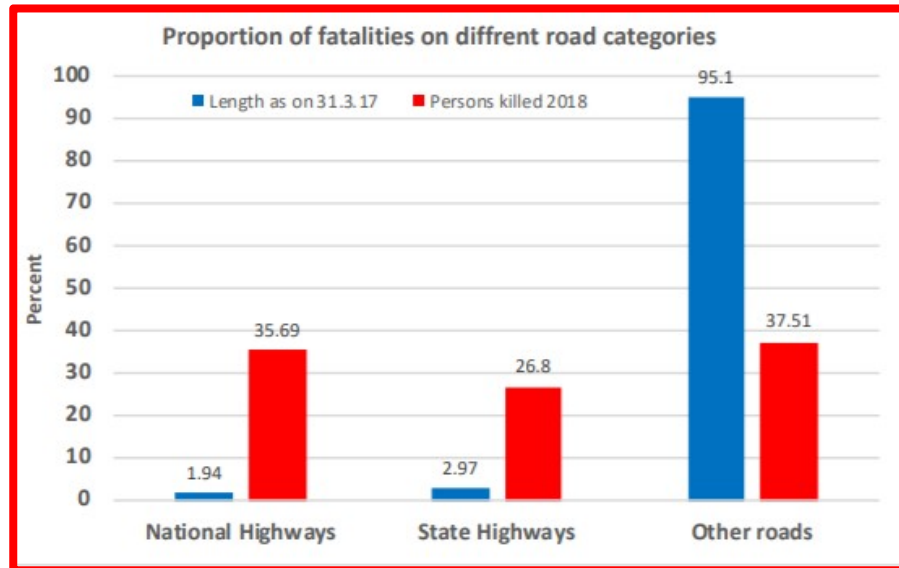
## **SCOPE**

3. The topic is covered in the following parts: -

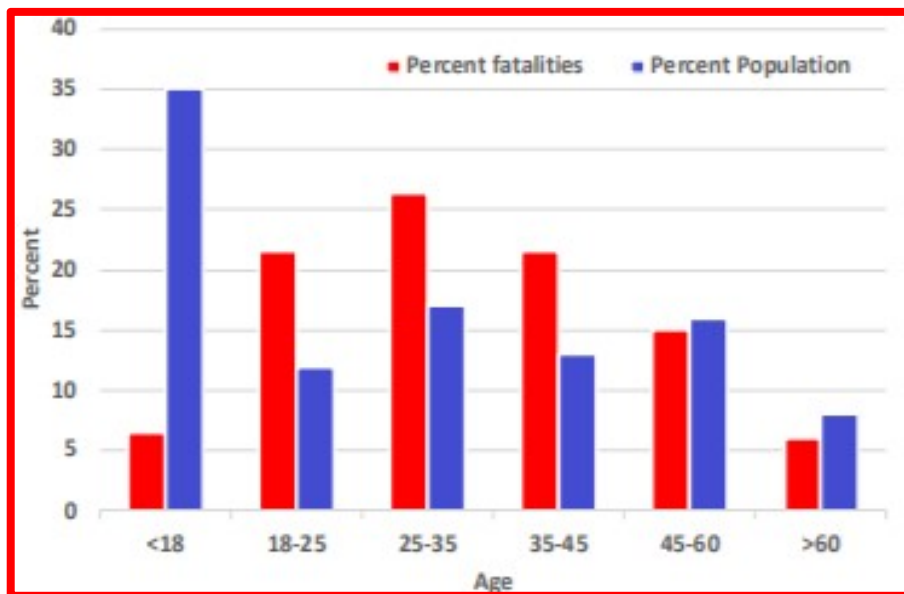
- (a) **Part 1**. Incidents of Road Accidents in Mountainous Regions of India
- (b) **Part 2**. Hazards of Driving in Snow Bound Areas
- (c) **Part 3**. Concept of Road Safety and Audit
- (d) **Part 4**. Actions at BRO Project Level
- (e) **Part 5**. Practical Tips for Drivers

## **PART 1: INCIDENTS OF ROAD ACCIDENTS IN** **MOUNTANIOUS REGIONS OF INDIA**

4. The statistics concerning road accidents are well articulated in the annual Road Accident report published by the Ministry of Road Transport and Highways (MoRTH) Government of India. The 2019 report has published its findings and certain interesting conclusions can be inferred from the report. Figure 1 depicts the proportion of fatalities on different road categories and Figure 2 depicts the percentage Fatalities in various age groups.



**Figure 1: Proportion of Fatalities on Different Road Categories**



**Figure 2:**

**Fatalities in Different Age Groups**

**Percent**

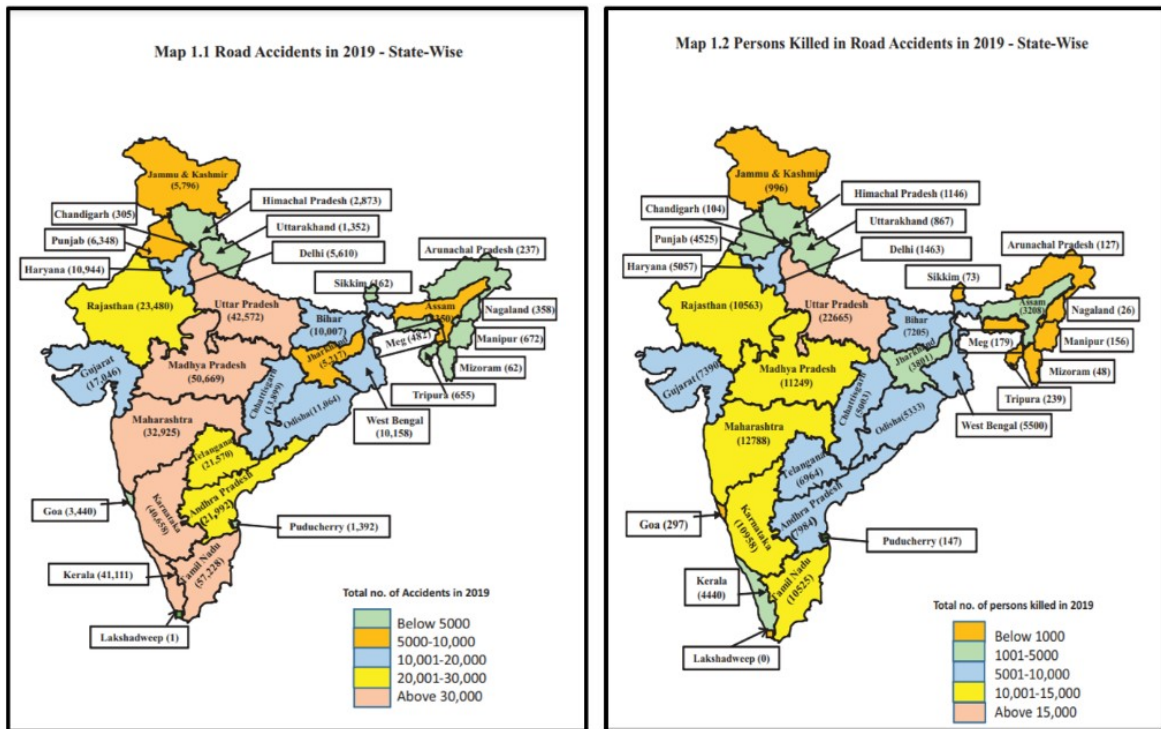
5. Certain important deductions from the data listed, are illustrated below:-

(a) National Highways are only 1.94% in length of the total road network of the country, but these account for 35.69 % of the fatalities.

(b) 27% fatalities occur in the age group of 25 to 35 year old drivers, which constitute only 17% of the population. Thus, **the target population for spreading road safety awareness is very evident.**

6. Analyzing further into the location of road accidents in India, Figure 3 illustrates the State wise details of number of road accidents and number of persons killed in such accidents.

7. Since this paper is restricted to road safety in snowbound and mountainous areas, the paper has considered the number of accidents and fatalities in the hill states of J&K, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh. The results reveals the



Source: Road Accidents in India 2019: MoRTH

**Figure 3: State Wise Details of Number of Road Accidents and Number of Persons Killed**

mountainous and snow bound states account for only 2.32% accidents and 2.1% fatalities of the total number of accidents and fatalities in India in the year 2019. The percentage is restricted owing to limited movement of only essential vehicles during the extreme season. Thus, the figures have to be viewed in the right perspective. While the percentage is apparently less, however, 3209 fatal cases are avoidable.

## **PART 2: HAZARDS OF DRIVING IN SNOW BOUND AREAS**

8. The hazards of driving in mountainous and particularly snow bound areas are well documented and include the following :-

(a) **Sharp Bends and Turns.** Mountainous roads are characterised by sharp bends and turns with steep gradients. The same coupled with snow / frost makes driving vehicles in mountains challenging.

(b) **Slick roadway.** On onset of winters and snowfall the roads become slick with snow and ice and lead to a number of challenges in driving, which include the following conditions.

- (i) Increased chance of skidding.
- (ii) Increased stopping distance.
- (iii) Reduced visibility.
- (iv) Slower traffic.
- (v) Potential for hypothermia, if stranded.

(c) **Avalanches**. Accumulation of snow due to heavy snowfall can lead to triggering of avalanches on roads and consequently major casualties and losses. The avalanches mainly occur while the temperature rises and most vehicles prefer to move during the period.

(d) **Overloading of Bridges due to Snow Accumulation**. Due to heavy snowfall the bridges on roads become overloaded and would need to be cleared before regular traffic can pass.

9. The hazards of driving in mountainous and snow bound areas can be overcome by training the drivers, ensuring road safety measures and adhering to certain basic rules of driving in mountains and snow bound areas.

### **PART 3: CONCEPT OF ROAD SAFETY AND AUDIT**

10. The hazards of driving in snow bound areas, requires analyzing and formulating the concept of road safety which remains equally the responsibility of the road user and the constructing / maintenance agency. A routine safety audit in snow bound areas is a prerequisite to maintain high safety standards. The same is covered in subsequent paragraphs.

11. The BRO may not be able to actively influence the state of training of drivers, however, certain passive measures like raising road safety awareness campaigns through road signs, social media campaigns, road safety melas and other such like initiatives can prove productive in enhancing road safety.

12. The Concept of Road Safety with regards to the responsibilities of construction/ maintenance agency and that of the road user are as enumerated below: -

(a) **Characteristics of User Friendly Road.**

(i) The road should be correctly aligned and be as per the requisite IRC code.

(ii) Effective sight distance is very critical in mountains and snow bound areas. The aspect is extremely essential and should be ensured.

(iii) Appropriate gradient and curve as mandated should be ensured.

(iv) The road should have appropriate road sign markings and safety features which include appropriately marked crash barriers as per the relevant IRC code.

(v) In case of existing roads, accident prone areas and black spots must be identified and mapped. Corrective measures must be instituted to ensure appropriate road safety.

(vi) The road design should include good geometrics, rough pavement surface, appropriate cross drainage measures and camber, Non Frost Susceptible Sub Base (NFSSB) and protective measures like crash barriers, retroreflective marking etc.

(vi) Distraction free trafficability should be ensured by the construction agency.

(b) **Characteristics of Road Friendly Users.**

(i) Adherence to traffic rules is the foremost prerequisite for safe driving. In snow bound areas it assumes even greater importance, since the chances of accidents are compounded due to inclement weather, poor visibility and skidding due to frosting / icing on the road surface.

(ii) Awareness of road safety infrastructure and measures undertaken by the local administration like medical aid post (ambulance), recovery posts and location of Highway Police Patrol etc should be readily known to the drivers.

(iii) There is no substitute to good driving skills viz changing of gears, unwanted braking, appropriate use of 4x4, driving with snow chains etc.

(iv) Background knowledge of local attributes of inhabitants, culture, flora and fauna will always be helpful prior to undertaking the journey.

13. **Road Safety Audits.** To ensure road safety the project must institute certain measures/ audits are imperative. These could be classified as follows: -

(a) **Routine Measures.** These measures would include addressing the defects developed in existing road infrastructure by carrying out regular maintenance and repair. A regular bridge safety audit should also form part of routine checks.

(b) **Periodical Measures.** These measures include repairing the road infrastructure well in advance to nullify emerging blackspots. Establish logistic support spaces and tools for regulating and monitoring traffic like highway patrol cars and ambulances. Finally raise awareness among local population towards road safety awareness and instituting preventive measures for tentative road hazards.

(c) **Long Term Measures.** These could include measures to address shortcomings in road geometrics, if any, enhance width of freedom for vehicle movement, establish alternate ways / solutions for black spots, if any, establish informative / warning sign / boards, if any. Constructing avalanche mitigation structures in avalanche prone zones to avoid serious mishaps and loss of life are equally important to improve road safety.

#### **PART 4: ACTIONS AT PROJECT LEVEL**

14. Certain other actions which must be instituted by the project, include the following:-

(a) **Preparatory Actions.** Certain actions which must be initiated by the project prior to the onset of winters includes the following :-

(i) Ensure protective works at known slide locations.

(ii) Clear cross drainage works.

(iii) Ensure serviceability of snow clearance equipment.

(iv) Activate detachments, stocking & repositioning of equipment.

- (v) Coordinate recovery, ambulance, highway patrolling and communication with local administration & army formation.
  - (vi) Interaction with local weather broadcasters & SASE.
- (b) **Action during Snow.**
- (i) Issue advisory for traffic regulation.
  - (ii) Real time notification of road status.
  - (iii) Detachments to be prepared & equipped for relief & rescue operations, casualty evacuation, receiving stranded passengers and providing emergency care.
  - (iv) Remain in communication with SDRF/ NDRF for coordinated emergency response.
- (c) **Action post Snowfall.**
- (i) Resume clearance from multiple attack points, as soon as possible.
  - (ii) Regulate movement of vehicles as threat of avalanches usually coincides with the convenient time for movement of traffic.
  - (iii) Calibrated movement needs to be ensured as road alignment is generally not visible due to snow and blizzards.
  - (iv) Re-establish detachments as far forward as possible, to ensure coordinated response for snow clearance.
  - (v) Re-establish mobile communication in coordination with the service provider.

### **PART 5: PRACTICAL TIPS FOR DRIVERS**

15. When temperatures dips below freezing point, driving conditions can become treacherous, with the risk of ice or snow on the roads increasing manifold. The Road Safety Authority (RSA) has the following 'Top Safety Tips' for motorists driving on snow and ice:-

- (a) **Get a Grip.** Remember your only contact with the road surface is your tyres so it's vital that they are up to the task in icy and snowy conditions. Check tyres, including spare wheel, and replace them if the tread depth falls below 3mm. Check that tyres are inflated to the correct tyre pressure. Lack of grip can occur even on treated roads so drive slowly in the highest gear possible, manoeuvre gently and avoid harsh braking. Replace tyres, if necessary.
- (b) **Make Sure you Can See.** Clear your windows and mirrors before you set out, carry a screen scraper and de-icer. Do not use hot water on the windscreen, as it can crack the glass. Replace windshield wiper blades if necessary. De-mist the inside of your windows thoroughly. Make sure your windshield washer system works and is full of an anti-icing fluid. Remember too that heavy snowfall will reduce visibility! Watch out for grit/salt spreaders and snow ploughs. The glare from the sun can be dazzling in the winter when the sun is low in the sky, so wear sunglasses in these conditions.

- (c) **Check and use Your Lights.** Use your dipped headlights so that others will see you. Make sure your headlights and taillights are all in working order, replace broken bulbs. Make sure lights are clear of snow.
- (d) **Gently does it.** Manoeuvre gently, slow down and leave extra distance between you and the vehicle in front. Too much steering is bad and avoid harsh braking and acceleration. Use the highest gear possible to avoid wheel spin. Select a low gear when travelling downhill especially if through bends. Falling snow, fog, rain, or hail will reduce visibility. Do not hang on to the tail lights of the vehicle in front of you as it can give a false sense of security. When you slow down, use your brakes so that the brake lights warn drivers behind you.
- (e) **Watch out for "black ice".** If the road looks polished or glossy it could be, "black ice" one of winter's worst hazards: Black Ice is difficult to see! It is nearly transparent ice that often looks like a harmless puddle or is overlooked entirely. Watch out for black ice, especially in sheltered / shaded areas on roads, under trees and adjacent to high walls.
- (f) **Give yourself a brake.** If you get into a skid, you need to know if your vehicle has ABS (Anti-Lock Braking Systems). After you 'Step' on the brake the ABS begins cycling — you will feel pulses in the pedal or hear the system working. It's easy to properly use antilock brakes: **Remember - Step, Stay and Steer. Step on the pedal. Stay on the pedal. Steer around the obstacle.** (A warning: A little bit of steering goes a very long way in an emergency). For vehicles without ABS, you'll have to rely on the old-fashioned 'Cadence Braking' system: Push the brake pedal until the wheels stop rolling, then immediately release the brake enough to allow the wheels to begin turning again. Repeat this sequence rapidly. Your goal is to have the tyres producing maximum grip regardless of whether the surface is snow or ice.
- (g) **Be Prepared.** In prolonged icy or snowy driving conditions, it is advisable to carry a tow rope, spare fuel, spare tyre, a shovel, appropriate footwear in case you have to leave your vehicle i.e. boots, a hazard warning triangle, first aid kit (in good order), a working torch, car blanket, additional clothing and some food and water also carry a mobile phone and spare, fully charged, battery (if you don't have a car charger). In preparation for driving, you should also give someone an estimated time of arrival at your proposed destination.
- (h) **Get Informed.** Listen to local weather and traffic reports.
- (j) **Stay at Home.** The best thing to do in extremely bad weather is to stay off the road. Take heed of warnings not to go out. This leaves the emergency services free to deal with real emergencies instead of rounding up stranded motorists.

## **CONCLUSION**

16. Road safety is a critical aspect of road infrastructure development in our country. Although the incidents of accidents in mountainous and snowbound areas of our country are relatively small compared to the rest of the country, it must be BRO's endeavour to build user friendly road infrastructure aspires for zero accident goals. This paper has attempted to chart practical concepts and responses to the challenges of road safety, addressing both the road user and road maker responsibility for safe driving in the mountainous and snow bound areas of our country.