



# Enhancing Safety on Indian Highways: Mitigating Visual Obstructions Caused by Divider Plantations

Aditya Veer Gautam, Anurag Kumar<sup>2</sup>, Shivangi Dixit, Rajneesh Kumar  
Faculty of Engineering and Technology, Rama University  
avgautamiitb@gmail.com

## Abstract:

India's highways, characterized by their ever-increasing traffic volume and diverse mix of vehicles and pedestrians, necessitate robust safety measures. While the environmental and aesthetic benefits of planting trees in highway dividers are undeniable, these plantations can create significant visual obstructions, particularly at locations where dividers are interrupted to allow vehicles to make U-turns or cross the road. This paper delves into the impact of such visual obstructions on road safety in India and proposes practical solutions to mitigate the associated risks.

DOI Number: 10.48047/nq.2021.19.9.NQ21175

NeuroQuantology 2021; 19(9): 1026-1029

1026

## Introduction:

Indian highways are witnessing an exponential rise in traffic volume. This surge, coupled with the presence of a diverse range of vehicles and pedestrians on the roads, creates a complex traffic environment that demands prioritizing safety. While the practice of planting trees in highway dividers is widely appreciated for its contribution to environmental sustainability and beautification, concerns regarding its impact on driver visibility at crucial points, like U-turns and median openings, are growing. This paper addresses the challenges posed by visual obstructions caused by divider plantations and proposes a multi-pronged approach to enhance safety on Indian highways without compromising environmental well-being.

## The Alarming Reality of Road Accidents in India

According to the Ministry of Road Transport and Highways (MoRTH), India accounts for the

highest number of road fatalities globally, with over 1.5 lakh deaths reported in 2019 alone. [1] These statistics paint a grim picture, highlighting the urgent need for stricter regulations, improved infrastructure, and enhanced driver education to improve road safety. Among the various factors contributing to road accidents, one concerning aspect is the prevalence of accidents occurring at U-turns and median openings.

## Limited Visibility at U-turns: A Recipe for Disaster

U-turns are a necessary provision on highways, allowing vehicles to make a turnaround manoeuvre. However, the presence of overgrown trees or dense shrubs in the divider can significantly restrict the view of oncoming traffic for drivers attempting a U-turn. This limited visibility creates a dangerous situation, increasing the likelihood of head-on collisions or accidents with vehicles traveling in the opposite direction.



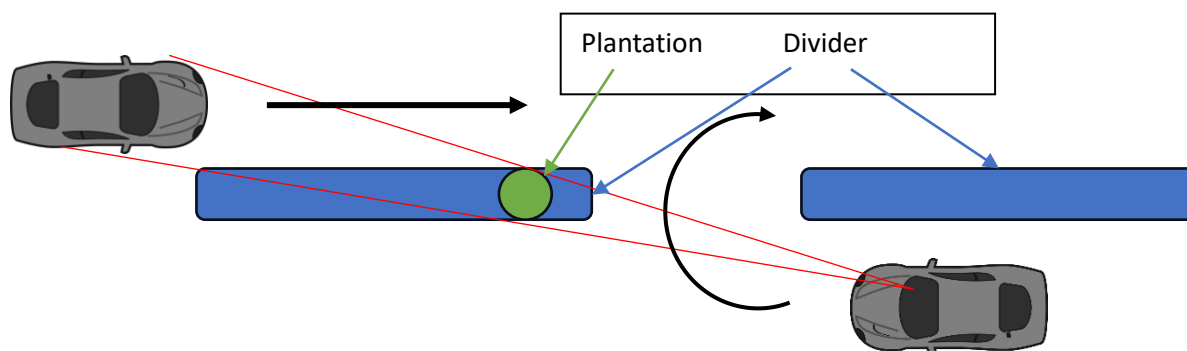


Fig 1 A schematic view of vehicle taking U -turn and its view obstruct by plantation on divider

### Data Scarcity: A Roadblock to Effective Solutions

Unfortunately, there is a dearth of comprehensive data in India specifically focused on the number of accidents caused by visual obstructions due to divider plantations. While the official statistics from MoRTH categorize accidents based on factors like cause (over-speeding, drunk driving) and location (rural/urban), data pinpointing the role of divider plantations in U-turn/median opening accidents is scarce. This lack of data makes it challenging to quantify the exact impact of visual obstructions and hinders the development of data-driven solutions.

### Global Road Safety Scenario and Learnings

While data specific to the Indian context might be limited, examining the global road safety scenario can offer valuable insights. A 2020 World Health Organization (WHO) report on road safety highlights that U-turn maneuvers are a contributing factor in a significant number of road accidents globally. [2] The report emphasizes the importance of clear sightlines at U-turn locations and recommends implementing measures to enhance driver visibility. International best practices and successful strategies adopted in other countries can inform the development of effective solutions for India.

### A Multi-Pronged Approach to Mitigating Risks

To effectively address the safety concerns associated with visual obstructions caused by divider plantations, a multi-pronged approach is necessary. This approach should encompass the following key strategies:

#### 1. Selective Plantation and Strategic Design:

- **Choosing low-growing or dwarf tree species:** Species like ornamental shrubs, palm trees, or flowering plants with a limited growth trajectory can be opted for in the vicinity of U-turns and median openings. This ensures minimal obstruction of the driver's view.
- **Staggered Plantation:** Planting trees in an alternating pattern, rather than creating a continuous wall of foliage, improves visibility along the divider.
- **Maintaining Safe Distances:** A minimum distance should be mandated between trees and the edge of the divider to ensure clear sightlines for drivers. Following these guidelines during the initial plantation and implementing regular maintenance practices are crucial.

#### 2. Robust Maintenance and Pruning Schedules:

- **Regular Trimming:** Establishing a cyclical schedule for trimming trees and shrubs is essential. This ensures they are maintained within the designated height and width parameters, preventing them from becoming overgrown and obstructing visibility.
- **Clearing Overgrown Vegetation:** Proactive measures should be taken to identify and remove any overgrown vegetation that impedes driver visibility at U-turns and median openings.
- **Balancing Pruning with Ecological Considerations:** The pruning schedule should be designed to minimize

disruption to the local ecosystem. Techniques like seasonal trimming and selective pruning can be implemented to achieve this balance.

### 3. Enhancing Visibility with Reflective Markers and Signage:

- **Strategic Placement of Reflectors:** Installing high-visibility reflective strips or delineators on the edges of divider breaches, particularly near U-turns and median openings, significantly improves nighttime visibility. These markers help drivers gauge lane positions and potential hazards even in low-light conditions.
- **Bright and Clear Signage:** Positioning bright and reflective signage that clearly warns drivers of limited visibility zones at U-turns and median openings is another crucial safety measure. These signs should be easily recognizable from a distance and use universal symbols that transcend language barriers.
- **Maintaining Reflective Markings:** The effectiveness of reflective markers and signage hinges on their proper maintenance. Regular cleaning and replacing faded or damaged signs are essential to ensure their continued functionality.

### 4. Leveraging Advanced Warning Systems Technology:

Incorporating advanced warning systems on highways with divider plantations can significantly improve safety, particularly on high-traffic roads. These systems provide real-time alerts to drivers approaching areas with reduced visibility.

- **Flashing Warning Lights:** Installing strategically placed flashing warning lights at median openings can effectively alert drivers of potential hazards and encourage them to proceed with caution.
- **Audible Signals:** Utilizing audible signals to warn drivers of limited sightlines ahead, especially during nighttime or low-visibility conditions, can provide an additional layer of safety.

- **Smart Technologies:** Exploring the potential of intelligent transportation systems (ITS) such as variable message signs (VMS) that can display dynamic warnings based on real-time visibility data can be a future-oriented approach. These signs can adjust messages based on factors like fog, rain, or time of day, providing drivers with the most relevant information.

### 5. Fostering Community Engagement for Sustainable Solutions:

Building a sense of ownership and responsibility within local communities regarding the safety of highways with divider plantations is crucial for long-term sustainability. This can be achieved through the following measures:

- **Community Awareness Campaigns:** Organizing educational campaigns to raise awareness about the importance of clear visibility on highways and the dangers posed by visual obstructions at U-turns. Engaging local schools, NGOs, and community leaders in these initiatives can amplify their reach.
- **Community Participation in Plantation and Maintenance:** Encouraging community participation in tree selection, planting, and maintenance activities for divider plantations fosters a sense of ownership. This can involve involving local communities in choosing suitable tree species and participating in controlled pruning programs under the guidance of horticultural experts.
- **Partnerships with Local NGOs:** Collaborating with local environmental NGOs can prove beneficial. These organizations possess expertise in sustainable plantation practices and can provide valuable guidance on selecting appropriate tree species and implementing eco-friendly maintenance techniques.

### Conclusion:

The safety of all road users on Indian highways must be a top priority. While divider plantations offer environmental and aesthetic benefits, the potential for visual obstructions that compromise safety cannot be ignored. By implementing a multi-pronged approach that combines selective plantation practices, robust maintenance schedules, enhanced visibility measures, and innovative technologies, it is possible to mitigate the risks associated with divider plantations. Furthermore, fostering community engagement can ensure the sustainability of these solutions and promote a collaborative effort towards creating safer highways for all.

### Moving Forward: A Call for Action

Addressing the issue of visual obstructions caused by divider plantations necessitates a collective effort. The following recommendations are essential for moving forward:

- **Comprehensive Data Collection:** The government, in collaboration with research institutions and road safety organizations, should prioritize collecting comprehensive data on accidents caused by visual obstructions at U-turns and median openings. This data will be instrumental in understanding the scope of the problem and guiding the development of targeted solutions.
- **Standardized Design Guidelines:** Developing and implementing standardized design guidelines for highway divider plantations is crucial. These guidelines should specify recommendations for tree species selection, planting layouts, and minimum sightline distances at U-turns and median openings.
- **Public-Private Partnerships:** Encouraging public-private partnerships for highway maintenance and incorporating private sector expertise in implementing advanced warning systems and intelligent transportation technologies can contribute significantly to enhancing safety.
- **Focus on Capacity Building:** Investing in capacity building programs for highway maintenance personnel and local communities is essential. Training programs on proper pruning techniques, the importance of maintaining reflective markers, and best practices for sustainable plantation management will empower stakeholders to contribute effectively. By prioritizing safety, adopting a data-driven approach, and fostering collaboration between various stakeholders, India can ensure its highways are not only aesthetically pleasing and environmentally sustainable, but also safe for all travellers.

### Bibliography:

- [1] Ministry of Road Transport and Highways (MoRTH), Government of India.
- [2] World Health Organization. (2020). Global Status Report on Road Safety. <https://www.afro.who.int/publications/global-status-report-road-safety-time-action>
- [3] Khanna, P. (2019). Road Safety in India: Challenges and Opportunities. *Journal of Transportation Engineering*, 145(6), 04019034.