Traffic Planning: Designing safer roads

Using in-depth crash investigation data

By

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# Road Length and Accidents in India

## Table: Length of Road and Number of Persons Killed

<table>
<thead>
<tr>
<th>Category of Road</th>
<th>Length of Road(^1) (km)</th>
<th>Number of Persons Killed(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Highway</td>
<td>79,116 (1.51%)</td>
<td>45,612 (33.2%)</td>
</tr>
<tr>
<td>State Highway</td>
<td>169,227 (3.24%)</td>
<td>40,768 (29.6%)</td>
</tr>
<tr>
<td>Other PWD Roads</td>
<td>10,66,747 (20.39%)</td>
<td></td>
</tr>
<tr>
<td>Rural Roads</td>
<td>31,59,639 (60.39%)</td>
<td>51,192 (37.2%)</td>
</tr>
<tr>
<td>Urban Roads</td>
<td>464,238 (8.53%)</td>
<td></td>
</tr>
<tr>
<td>Project Roads</td>
<td>3,10,955 (5.94%)</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>52,31,922 (100%)</strong></td>
<td><strong>137572 (100%)</strong></td>
</tr>
</tbody>
</table>

- National and State highways constitute around 5% of roads but contribute to over 60% of fatalities.

## Source:

1. Basic Road Statistics of India 2012-13, Ministry of Road Transport and Highways (MoRTH).
2. Road Accidents in India – 2014, Transport Research Wing, MoRTH.
This method of analysis of road accident causes is incorrect. Over represents driver error as the main cause of accident.

Source: Road Accidents in India – 2014, Transport Research Wing, MoRTH.
Need to change the method of analysis

"The conventional approach" \(\times\) NO!

Venn diagram analysis \(\checkmark\) YES!

Venn diagram analysis requires a thorough examination of the crash.
Road Accident Sampling System - India
Innovation: The RASSI Methodology

Since 2008, JPRI has developed the technical skills and methodology for crash investigations in India.
Sustainability: Public Private Partnership

- Accident Notification Support
- Financial and Technical Support
- Crash Data/Analysis Reporting
- Engineering Data for Vehicle Safety Development

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SAFE Annual Convention
A scientific community for a safer India

Sampling Locations
- Kolkata, West Bengal
- Ahmedabad, Gujarat
- Pune, Maharashtra
- Coimbatore, Tamil Nadu

RASSI Founder & Coordinator

RASSI Consortium Members

- Currently collecting in-depth data on 450 to 500 crashes per year.
- RASSI 2020 target: 1000 crashes per year from 8 to 10 locations.
- Development and evolution of statistical techniques for representativeness of RASSI sample data to all of India.
Venn Diagram Example:
142 Fatal Pedestrian Accidents in Kolkata City

Infrastructure has 100% influence on the occurrence of fatal pedestrian accidents

Infrastructure (100%)

Poor Pedestrian Infrastructure

Bus and truck run overs

Vehicle (100%)

Human (81%)

0%
Fatal Pedestrian Accident
Fatal Pedestrian Accident
Pedestrian crossing - Counter measures

Counter measures:
1. Refuge island for pedestrians.
2. Improvements in crossing infrastructure.

Contributing Infrastructure Factors:
• Pedestrian crossing distance > 20m.
• Lack of pedestrian crossing infrastructure.
• Road markings and signage.
Pedestrian footpath design

Theory being put into practice.

National Highways in India

<table>
<thead>
<tr>
<th>Number of lanes</th>
<th>As on 31st March 2013¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single/Intermediate Lane</td>
<td>19,330 (24.43%)</td>
</tr>
<tr>
<td>Two-lane</td>
<td>40,658 (51.39%)</td>
</tr>
<tr>
<td>Four-lane and above</td>
<td>19,128 (24.18%)</td>
</tr>
</tbody>
</table>

Over 75% of National Highways in India are single or two lane roads.

Overtaking is the most common cause of crashes on undivided roads.

Source: 1. Basic Road Statistics of India 2012-13, Ministry of Road Transport and Highways (MoRTH)
Undivided Roads: *Counter measures*

Wide centreline treatment incorporating median rumble strips.

Opposing lanes of traffic separated by flexible posts

Central hatching

Source: toolkit.irap.org
New roads in India are still not safe.
Gaps-in-median

Source: https://www.linkedin.com/pulse/20141118070414-112545392-designing-u-turns
Sight distance and vision obstruction

Earlier condition of the same location with bushes obstructing driver vision on the left-hand curve.

Present condition of location with bushes cleared facilitating better driver vision on the left-hand curve.
An example right outside the hotel

Gap-in-median and vision obstruction.
Objects in the median and road side.
Poorly designed intersections
Sharp road curvature
Speed breakers – do not follow standards

The yellow box is indicating a speed breaker. Can you see it?
Narrow Shoulders towards road side

Car ran into parked trailer. Part of the trailer is parked on the roadway.
### Highways and Expressways: *Design issues*

<table>
<thead>
<tr>
<th>Crash Characteristics</th>
<th>Highways¹</th>
<th>Expressways²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most Affected Road Users (Top 3)</td>
<td>Pedestrians Two wheeler riders Car occupants</td>
<td>Car occupants Truck occupants Pedestrians</td>
</tr>
<tr>
<td>Contributing Infrastructure Factors</td>
<td>• Undivided roads • Gaps-in-median and intersections • Sharp curvatures • Poor road marking and signage • Poor pedestrian infrastructure • Work zones</td>
<td>• Narrow / No shoulders. • Object impacts. • Road side steep slopes. • Vision obstruction. • Sharp curvatures. • Inadequate warning of parked/breakdown vehicles.</td>
</tr>
</tbody>
</table>

**Sources:**
Sleepy drivers – Infrastructure solution

- Nearly 30% of road accidents on Mumbai Pune Expressway initiated due to sleepy drivers.

- Continuous longitudinal rumble strips on the road side shoulders have proven effective in many countries.
Conclusion

• Road design is a significant factor influencing the occurrence of accidents and injuries on Indian roads.

• Venn diagram analysis needs to be applied for a better understanding of road accident contributing factors.

• Lack of road design and traffic engineering expertise in India.
  ▪ Functional pedestrian infrastructure in urban areas.
  ▪ Road geometry based on speed and channelization of traffic.
  ▪ Driver sight distance and reaction time.
  ▪ Vehicle deceleration rate and turning radius.

• Huge requirement of capacity building.
Thank You

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