



**XXIVth World
Road Congress
Mexico 2011**
Mexico City 2011.

Linear settlements and safety issues along highways in India: A case for Integrated Approach for Highway Development

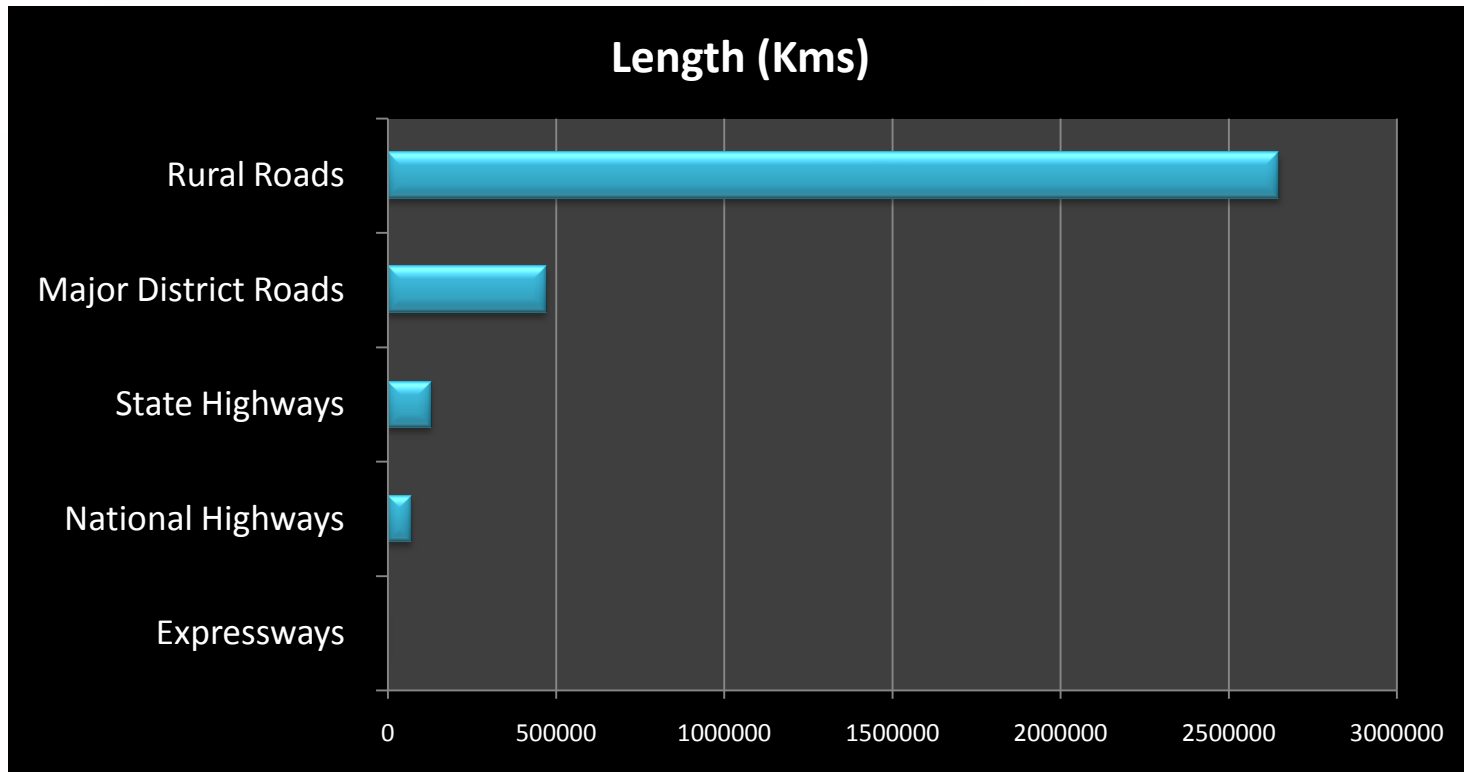
Prof. A.K.Sharma

- School of Planning and Architecture
- Director
- profanilsharma@yahoo.com



INDIAN ROAD NETWORK

Total Length - 3.4 million km



*** Roads intake – 85% of Passenger &
- 65% of freight traffic**



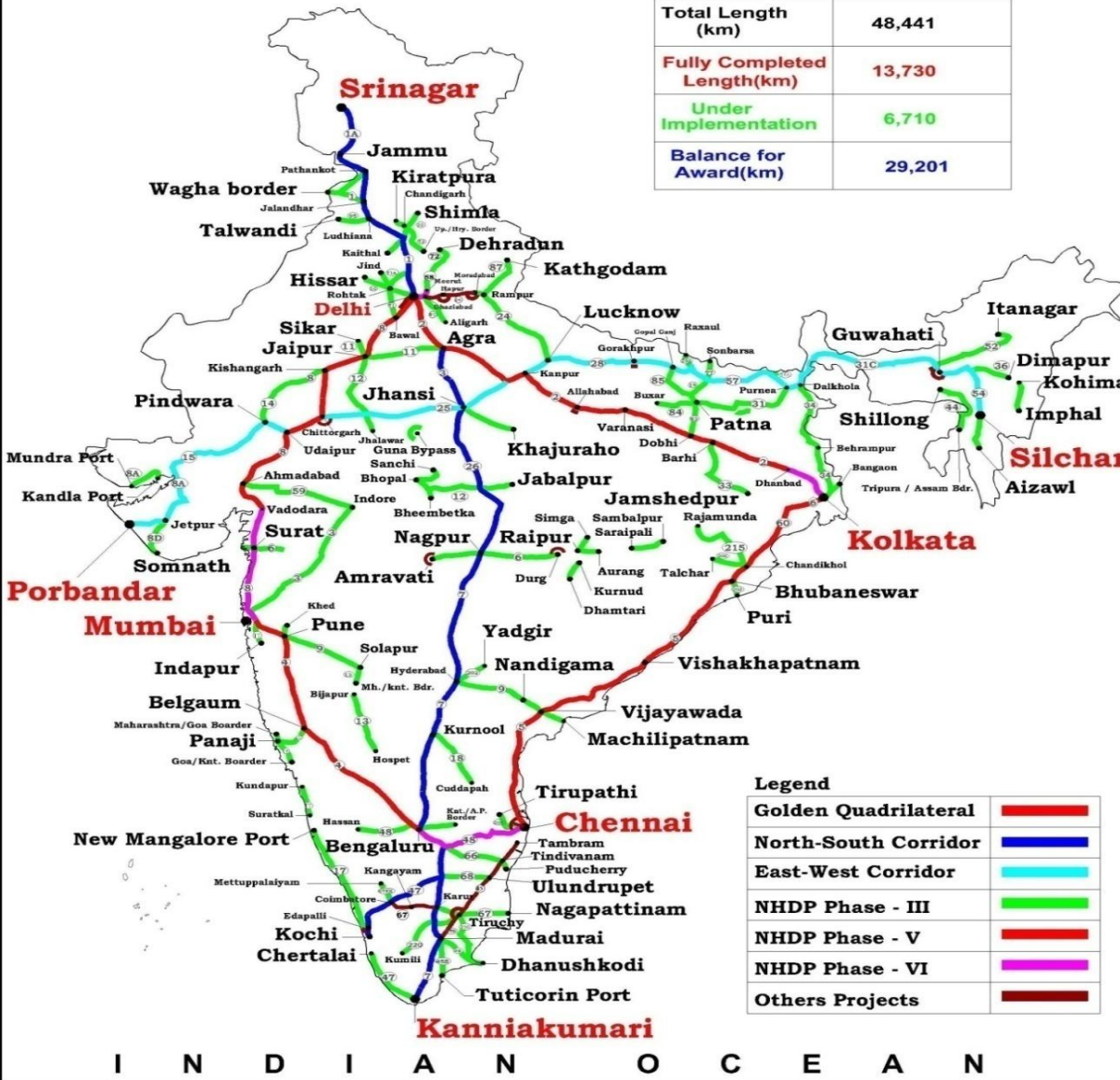
ROAD IMPROVEMENTS IN INDIA

- + National Highways Development Project (NHDP)**
 - 4-laning of 24,000 km (40%) of NHs in Phases I, II & III
 - 6-laning, Expressways, Ring roads, Bypasses etc
 - Investment of about US\$ 80 billion in next 7 years
- + Prime Minister's Rural Development Project (PMGSY)**
 - Access through all weather roads for
 - Habitation with 500, in plains
 - Habitation with 250, in hills
 - Investment of about US\$ 29 billion in next 7 years
- + National Urban Renewal Mission (JNNURM)**
 - Infrastructure improvement for rejuvenation of Indian cities.
 - Investment of about US\$ 20 billion in next 7 years



NATIONAL HIGHWAYS DEVELOPMENT PROJECT

Total Length (km)	48,441
Fully Completed Length(km)	13,730
Under Implementation	6,710
Balance for Award(km)	29,201



Legend

Golden Quadrilateral	
North-South Corridor	
East-West Corridor	
NHDP Phase - III	
NHDP Phase - V	
NHDP Phase - VI	
Others Projects	

National Highways Development Project (NHDP)

Being implemented by National Highways Authority of India (NHAI)

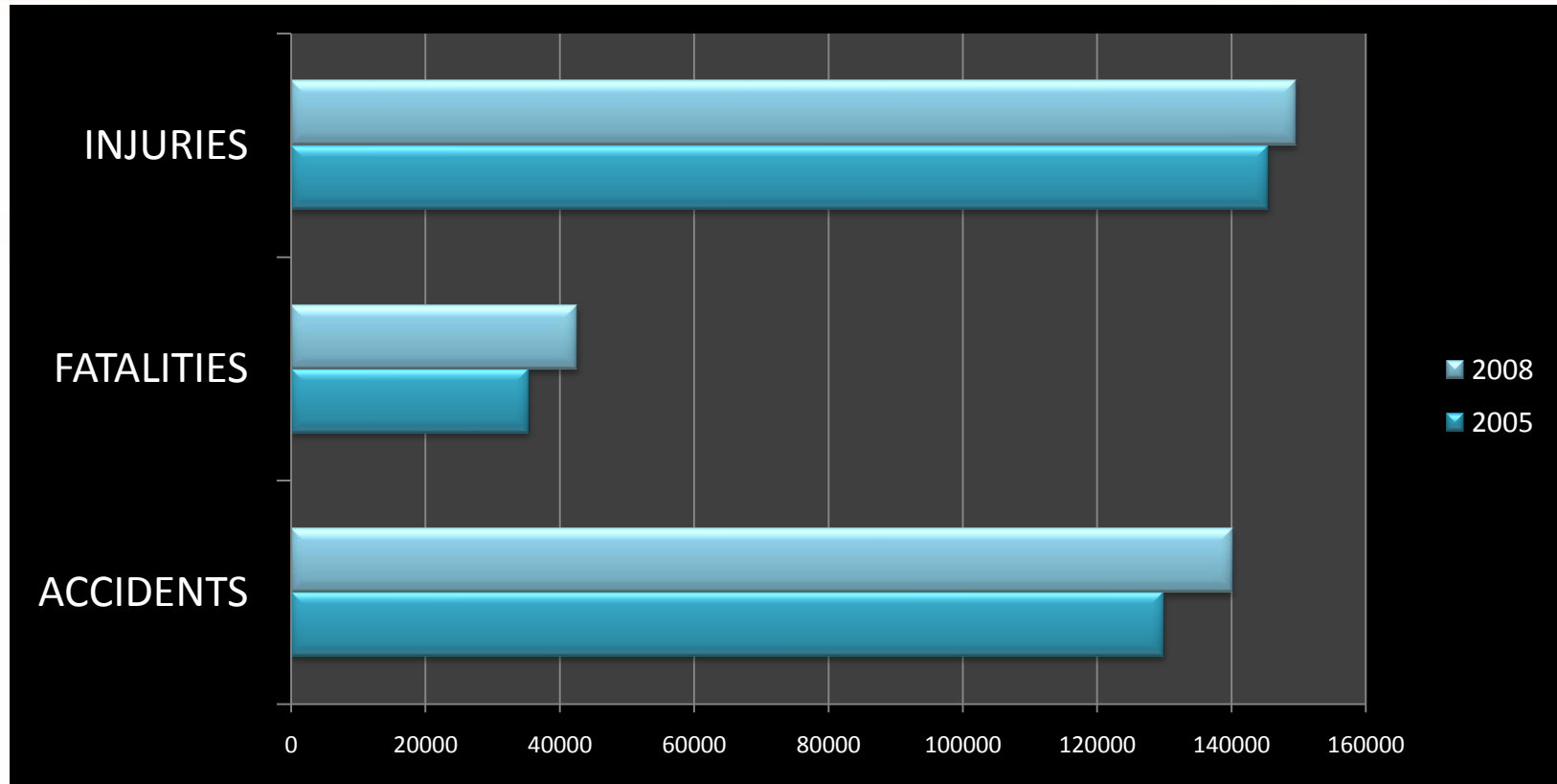


TRENDS IN GROWTH & SAFETY

- + Traffic growth on National Highways
 - 10-12 %per annum.
- + Appreciable increase in the number of fatalities despite geometric improvements.
- + Accidents causative factors
 - overloading,
 - oversized cargo loadings,
 - drunken driving and
 - exceeding speed limits,
 - highway deficiencies and
 - linear developments



TRENDS IN GROWTH & SAFETY



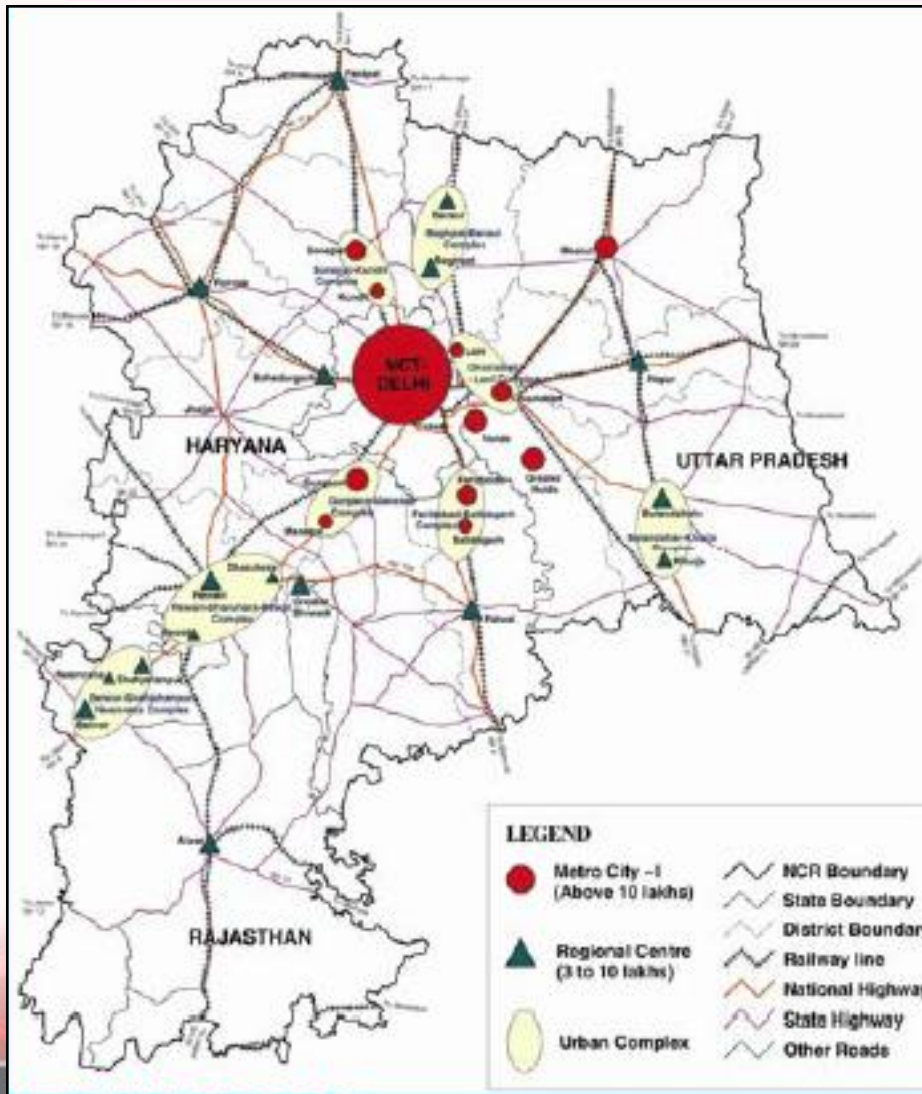
There is a nearly 6% increase in fatalities which are more than 120,000 now



Case study:
**Linear Development along National
Highways around Delhi**



Linear Development along National Highways around Delhi



Development around Delhi

- + **Delhi, is** connected with five intercity Highways i.e. **NH-2, NH-8, NH-24, NH-10, and NH-1.**
- + These highways Promoted linear growth as the adjoining states developed new townships along the highways and used these highways as intra urban roads to provide accessibility to the resident population.
- + **Nearly 5.0 to 6.0 million people were residing in towns located along the highway in 2001. However, the number would have doubled since then.**



Development around Delhi



Development around Delhi

- + NH-2 four laned stretch from Badarpur to Mathura (162kms) passes through 4 small cities and many large villages resulting in the existence of 52 junctions and several road side facilities,**
- + On an average an intersection occurs at 1.5 kms and a presence of a rural habitat.**
- + A presence of a major urban settlement is observed at a distance of 20-25 kms and a village occurs at an average distance of 3.5 kms.**



NH-2 stretch from Badarpur to Mathura



- The **linear development covers the entire stretch of the highway** and all the developments draw a direct access from the inter city highway.
- The **development is only 500 m deep** followed by agricultural uses.



NH-2 stretch from Badarpur to Mathura

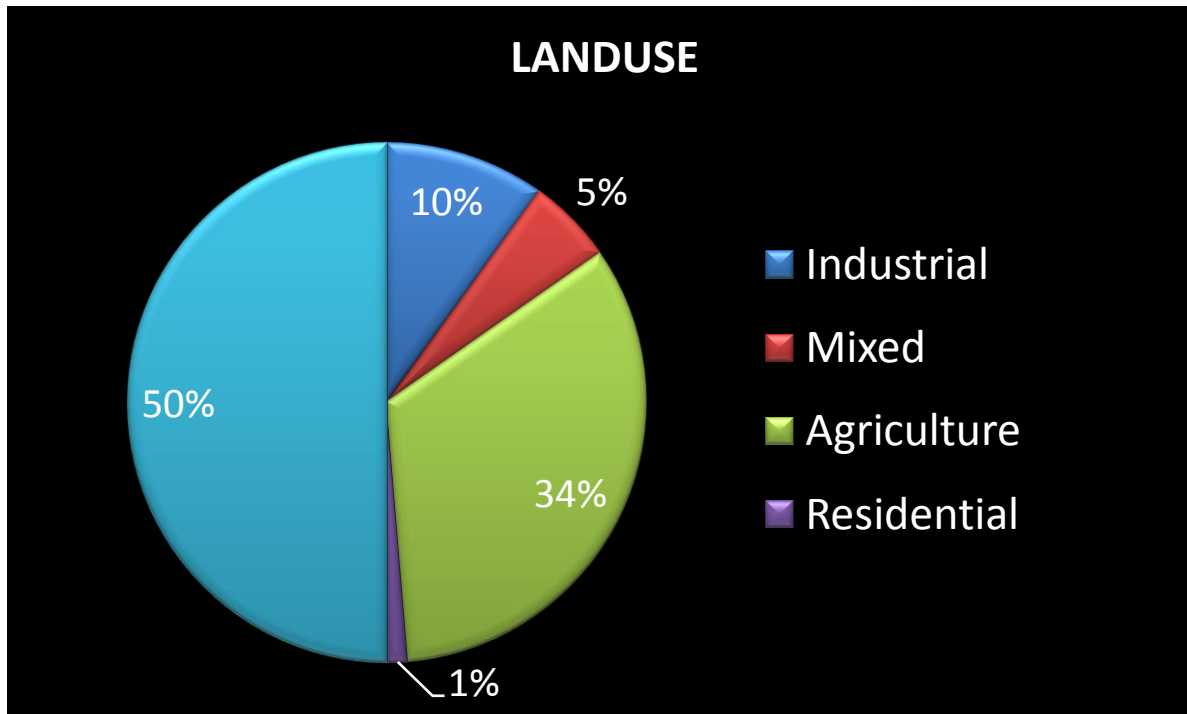


Linear Development
Along Highway



NH-2 stretch from Badarpur to Mathura

+ The **land use** along the project road is :



+ **More than one incident per km occur on the highway:** adversely affect the performance, and enhance accident occurrence possibilities.



NH-8 stretch from Delhi to Gurgaon



Linear Development
Along Highway



NH-8 stretch from Delhi to Gurgaon

Linear Development
Along Highway



NH-1 Stretch On Delhi - Panipat



Local
Traffic

Safety interventions

Possible solutions



CASE-AREA-I

National Highway-1, Panipat Elevated Corridor



Change of Grade along NH-1, Panipat Elevated Corridor

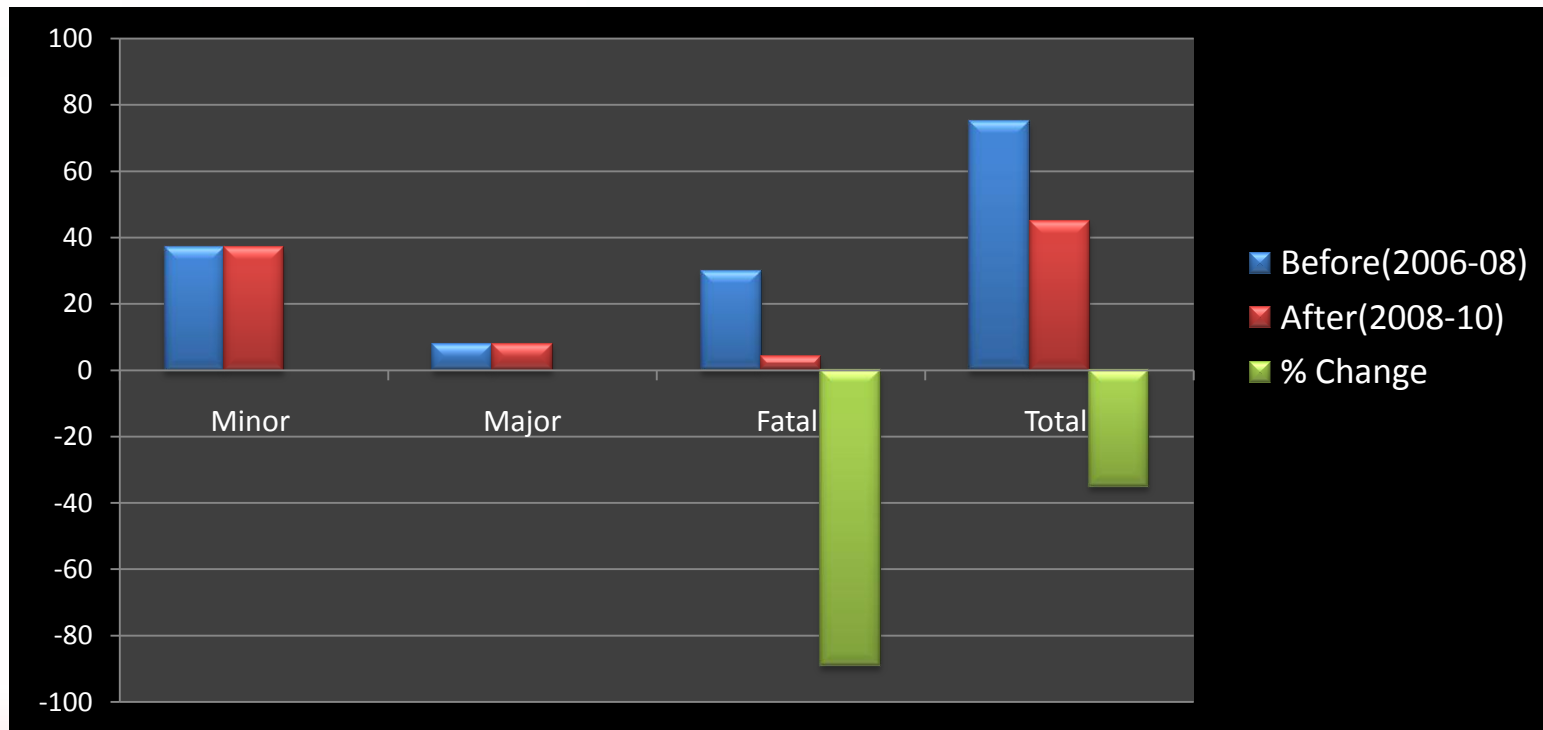


Change of Grade along NH-1, Panipat Elevated Corridor



Change of Grade along NH-1, Panipat Elevated Corridor

- + The change of grade along NH-1 near linear settlements has reflected an appreciable drop in fatal accidents .



The minor and major accidents have occurred due to the non provision of VRU related facilities



CASE-AREA-II

Chennai Bypass

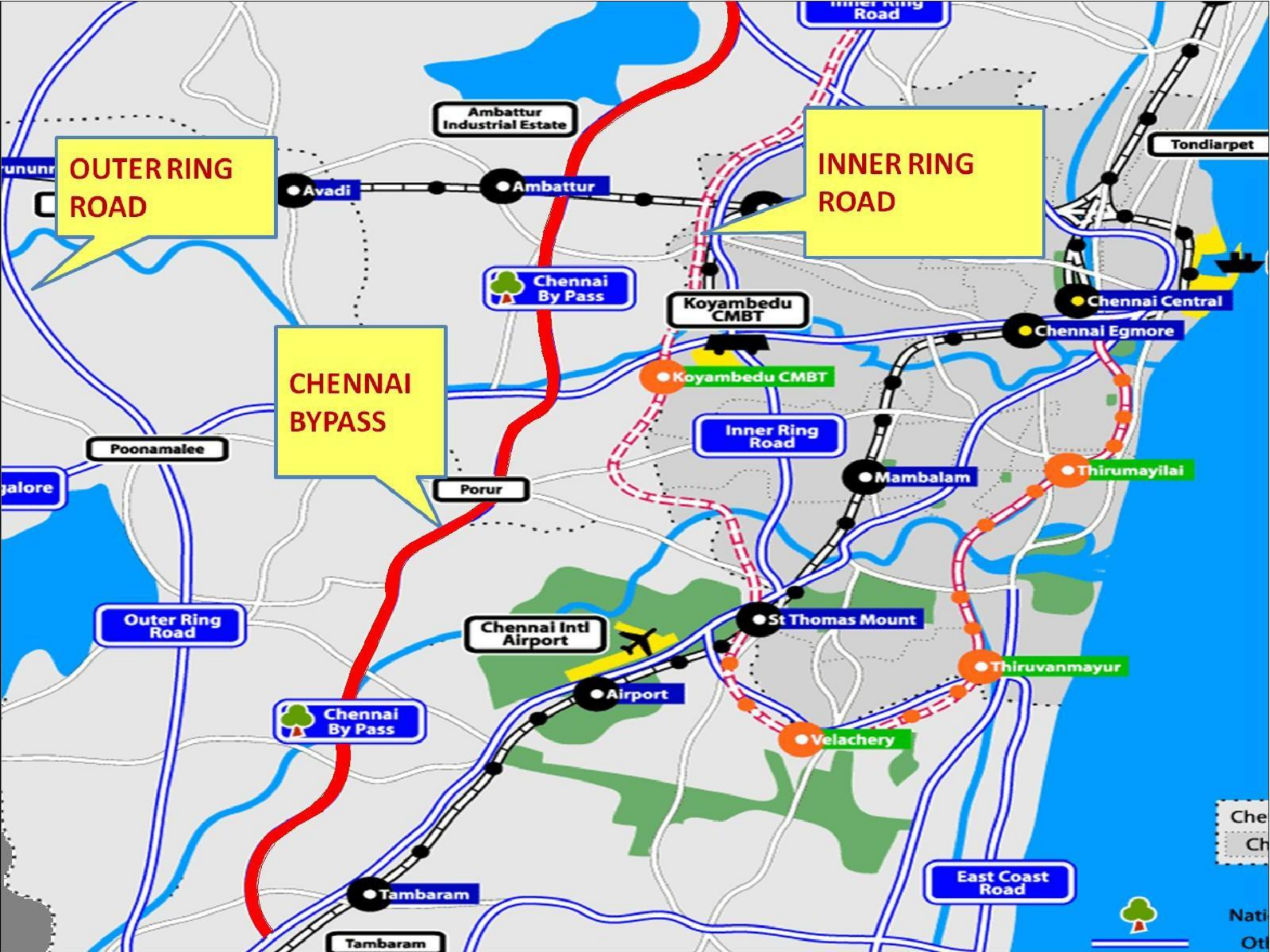


CHANGE OF ALIGNMENT - Chennai Bypass

➤ Developed to provide an access control link between the two National Highways - NH-45 and NH-4, so as to segregate the local and regional traffic.

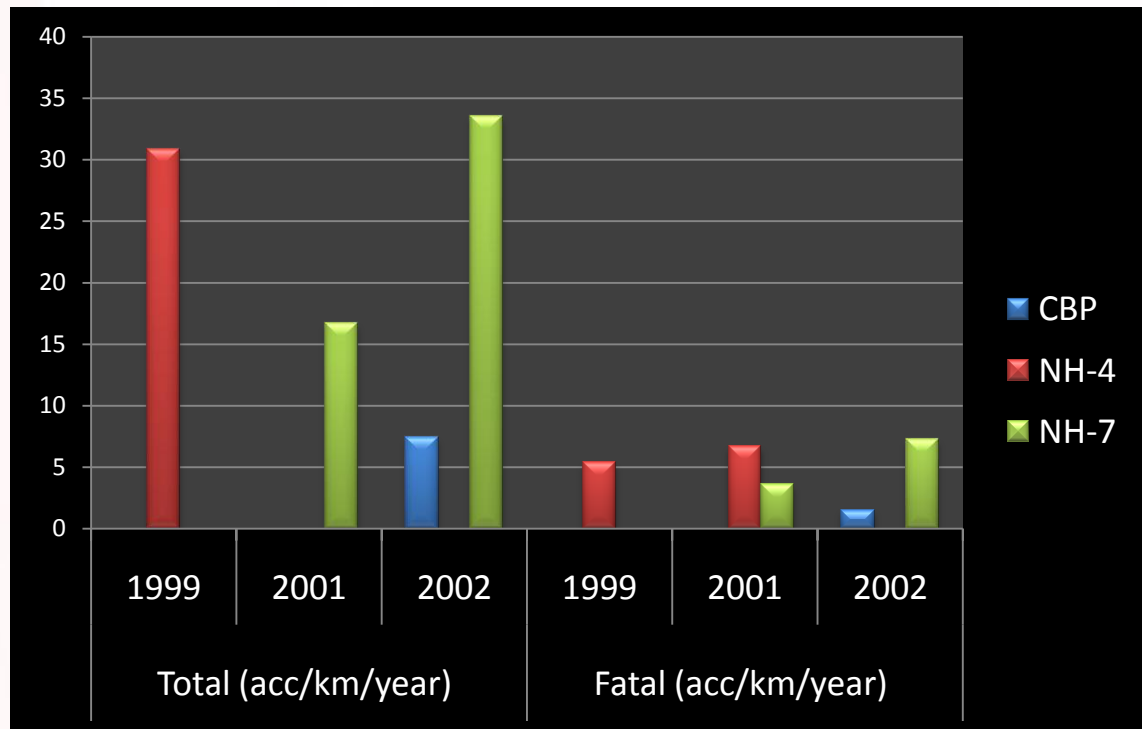
➤ Chennai bypass has reduced the burden on inner ring road in Chennai on account of better level of service offered





Change of alignment - Chennai Bypass

Accident data compared with NH-4 and NH-7 on the basis of accident rate/km/year and fatal accident rate/km/year shows that rates are much lower.

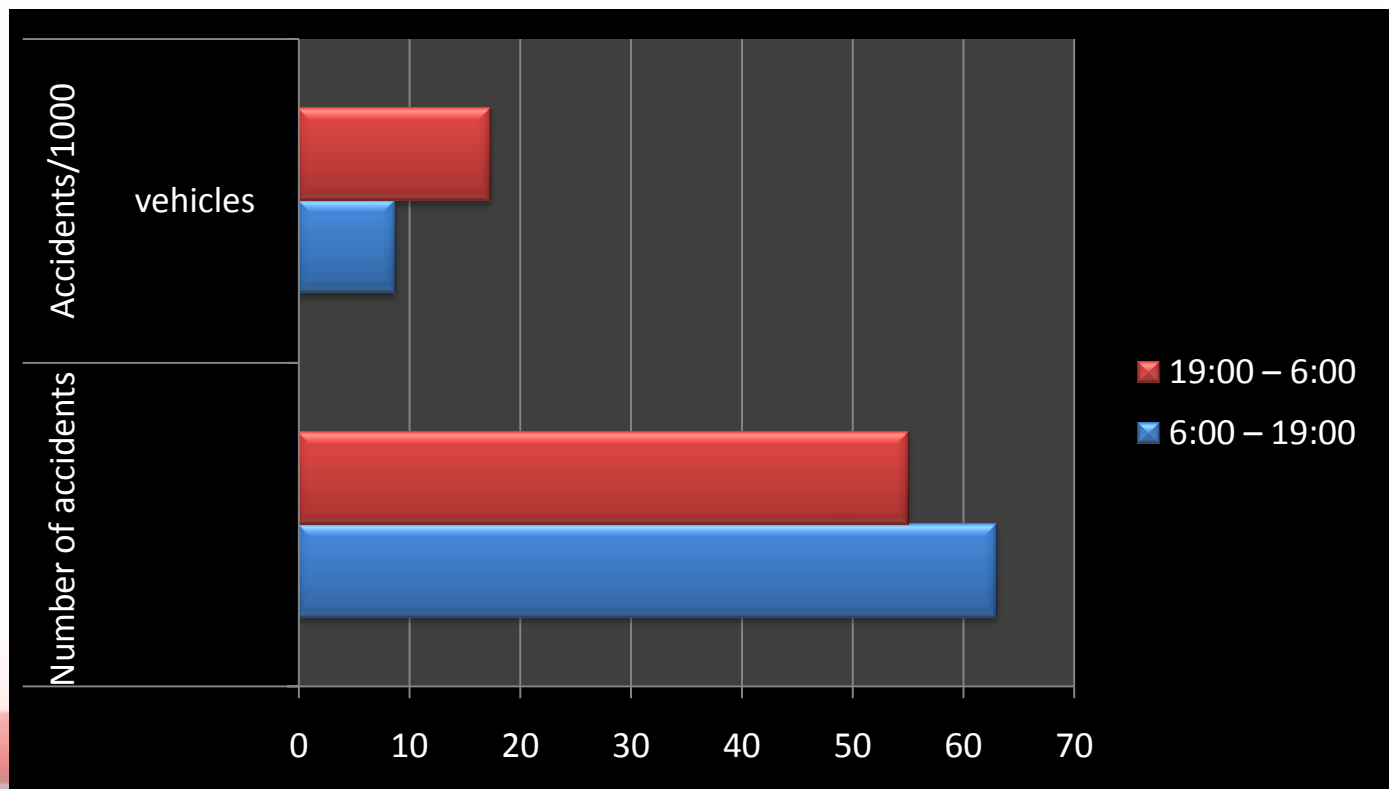


The higher safety levels achieved due to the higher operational performance of Chennai Bypass.



Change of alignment - Chennai Bypass

- **Accidents per 1000 vehicles** at night are double than of the day indicating the need of proper street lighting along the bypass.



SAFETY ISSUES & REMEDIAL MEASURES

❑ SAFETY ISSUES.

- Heterogeneity of traffic.
- Differential operating speeds of HCV and LMV.
- Problem of parking /stopping on shoulders/carriageway.

❑ MEASURES

- Segregation through service roads.



SAFETY ISSUES & REMEDIAL MEASURES

❑ SAFETY ISSUES.

➤ Cross sectional inadequacies restricting errant vehicles to regain control, lead to collision with street furniture

➤ In adequacy of signage posing hazards on the high speed highways

❑ MEASURES

➤ Provision of proper signs and crash barriers



SAFETY ISSUES & REMEDIAL MEASURES

□ SAFETY ISSUES.

- Right Turning Traffic creating conflicts and increasing travel length.
- Width deficiencies in merging lanes from dual carriageway to undivided carriageway .

□ MEASURES

- Right Turning protection lanes and hazard markings.



SAFETY ISSUES & REMEDIAL MEASURES

❑ SAFETY ISSUES.

- Inadequate provisions of crossing facilities for pedestrian and other slow moving vehicles
- Absence of well planned road user facilities forcing vehicles to park on main highway

❑ MEASURES

- Adequate and need based facilities



CASE-AREA-III

ITS Intervention



ITS interventions NH-8 (Delhi-Jaipur Highway)

Accidents are more in the built up stretches than in the rural ones.



ITS interventions NH-8 (Delhi-Jaipur Highway)

Installation of ATMS for safety enhancement

- The **ATMS includes**
 - emergency telephone system,
 - variable message sign system,
 - CCTV,
 - Traffic classification system,
 - meteorological system,
 - mobile radio system,
 - traffic control centre
 - power backup for 24x7 power supply

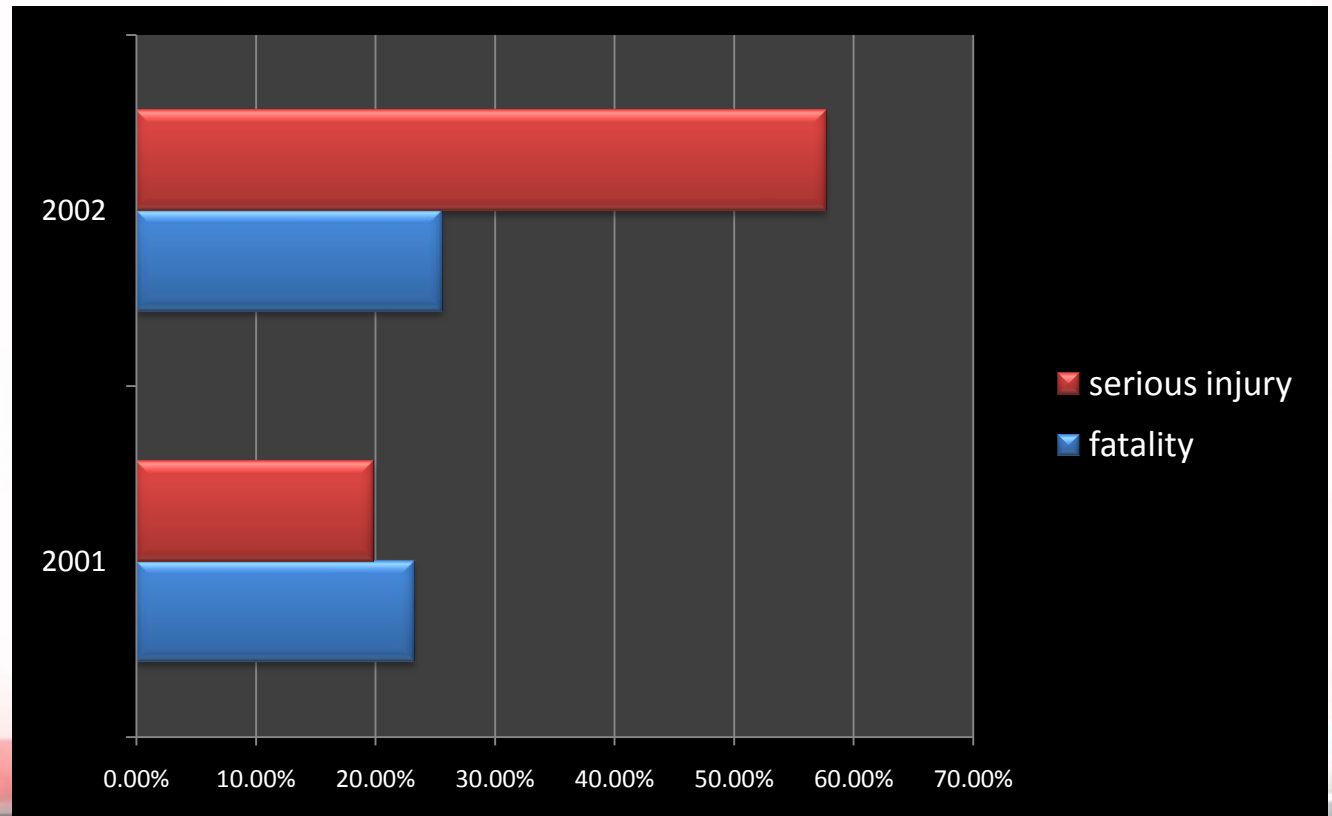


Courtesy NH



ITS interventions NH-8 (Delhi-Jaipur Highways)

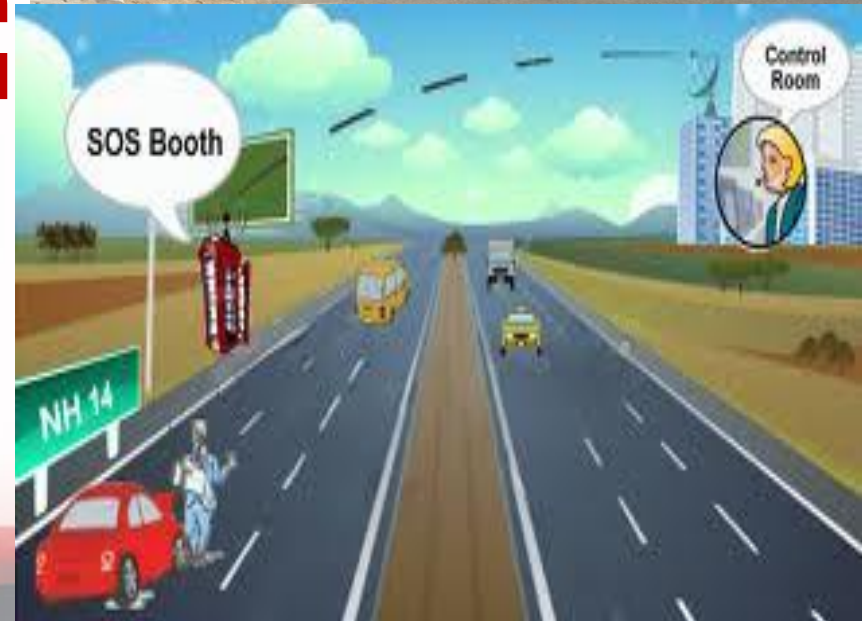
- ATMS installation resulted in reduction of fatality and serious injury in 1st year & 2nd year when compared with the figures before and after.



ITS interventions NH-8 (Delhi-Jaipur Highway)

- Numbers of major traffic jams reduced from 276 in 2000-01 to 88 in 2001-02

- 70%of the accidents from Nov.01 to Sept 02 indicate high level of usage by the road users.**



Conclusion

Significant safety enhancement can be achieved through

- improvement of road geometry,
- Segregation of local and through traffic
- Proper use of technology
- Conscious approach in design to meet the needs of vulnerable road users .
- **Development of expressways/high speed roads**
- Integrated land use planning approach
- Segregation and way side facilities to prevent the re-occurrence of linear development.



**Thank
You**

