



**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

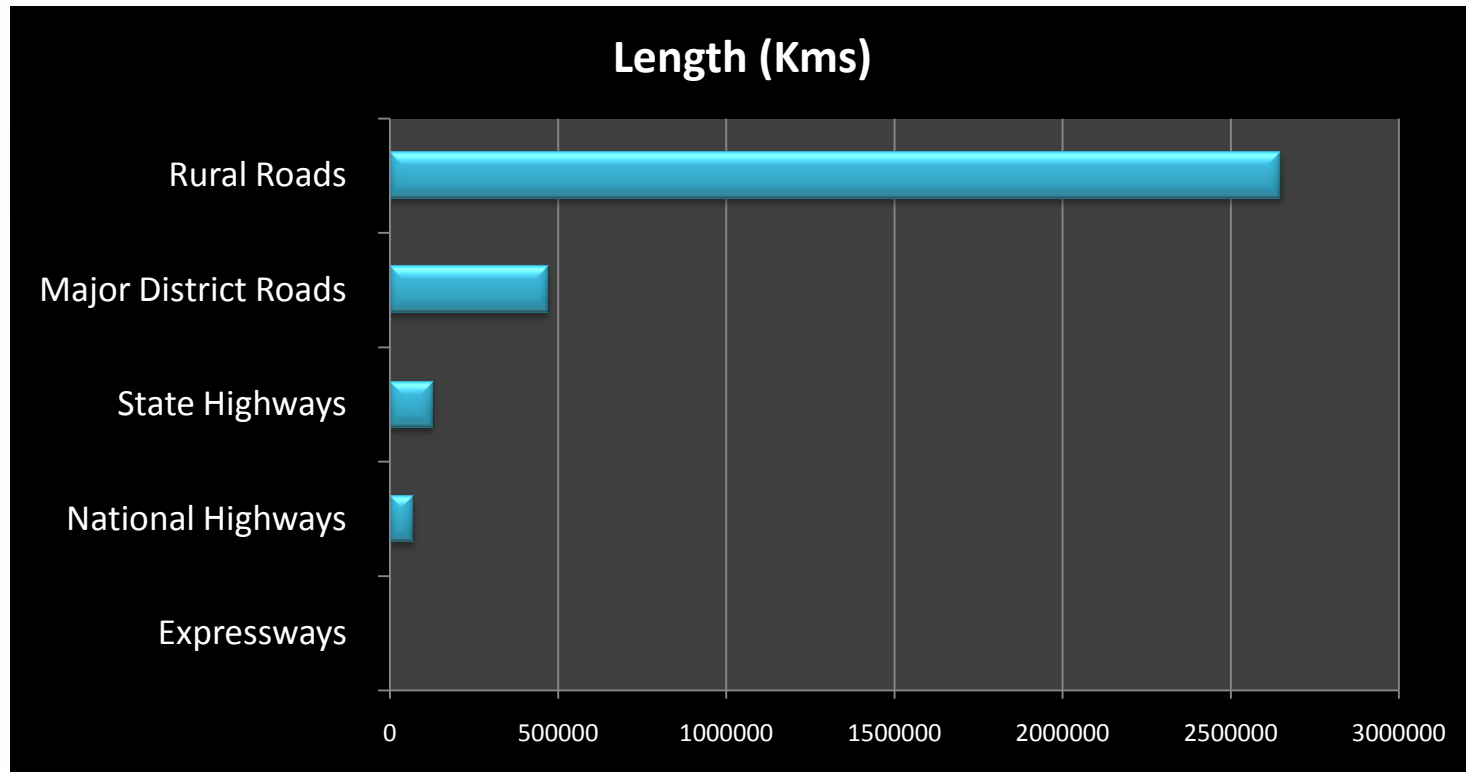
Prof. A.K.Sharma

- 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**



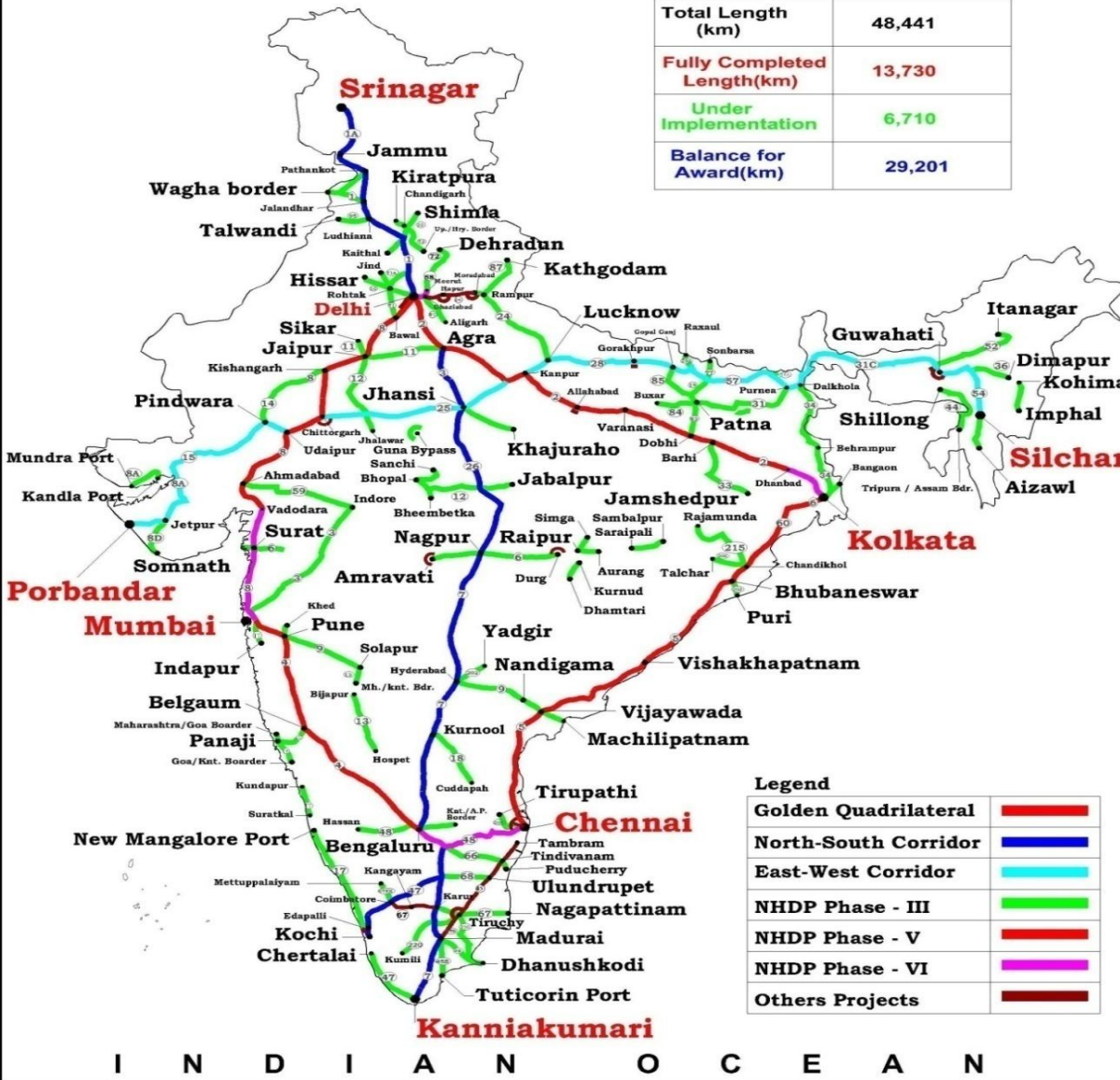
ROAD IMPROVEMENTS IN INDIA

- + 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)

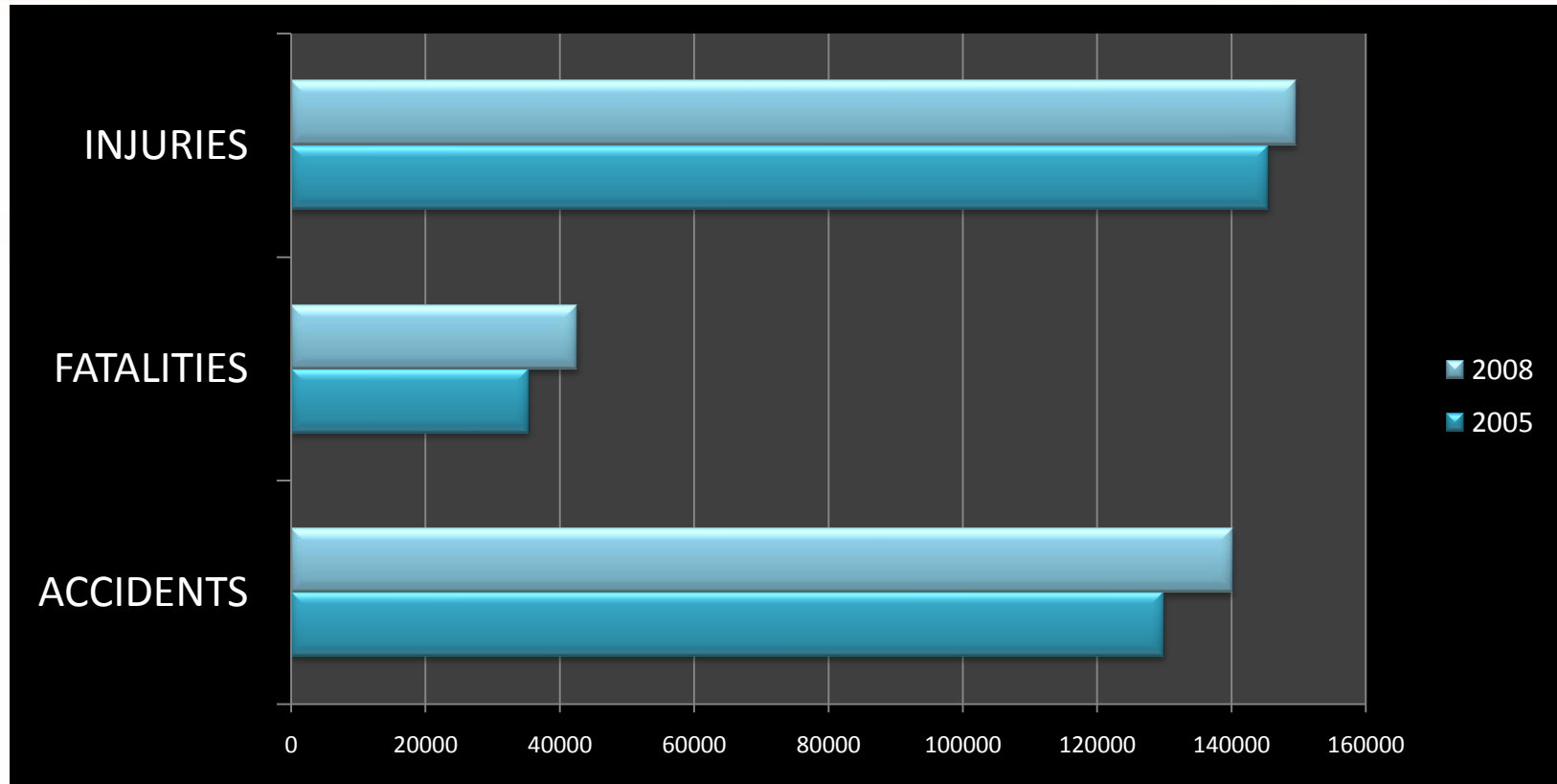


TRENDS IN GROWTH & SAFETY

- + 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



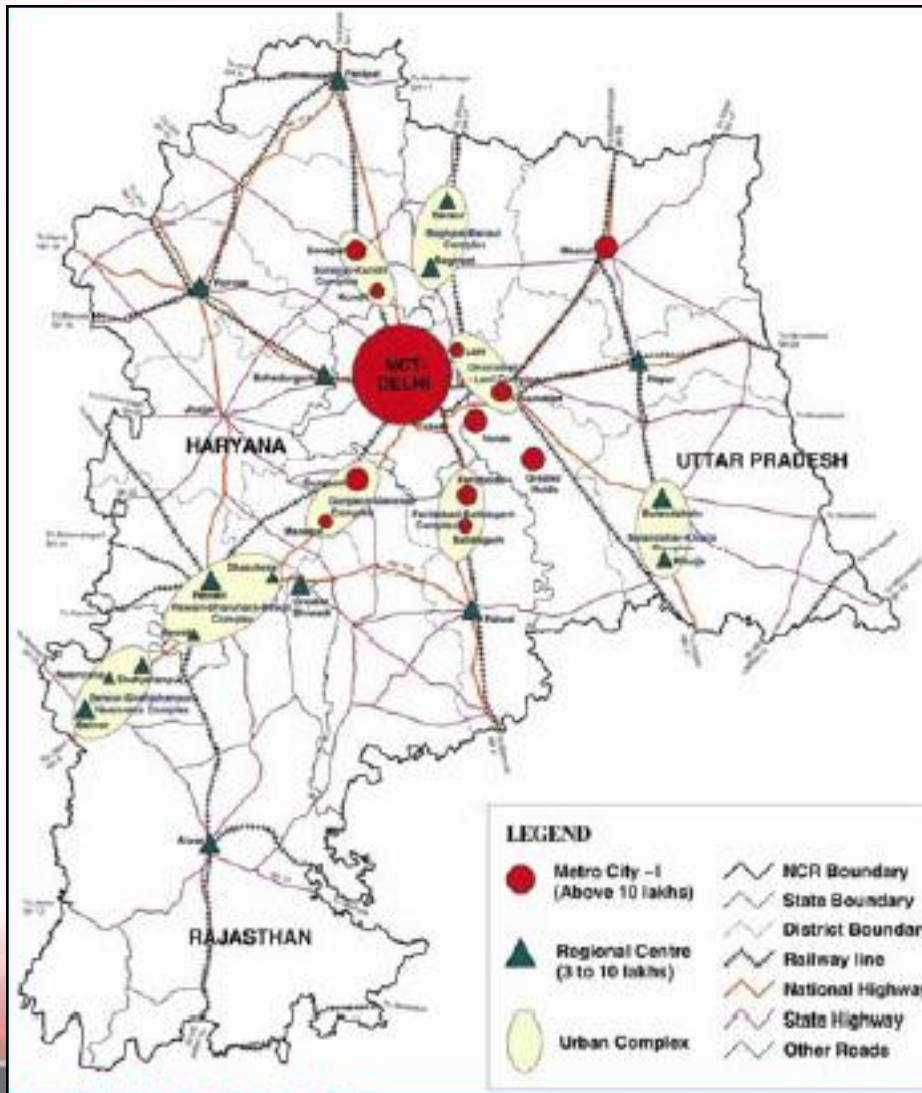
There is a nearly 6% increase in fatalities which are more than 120,000 now



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

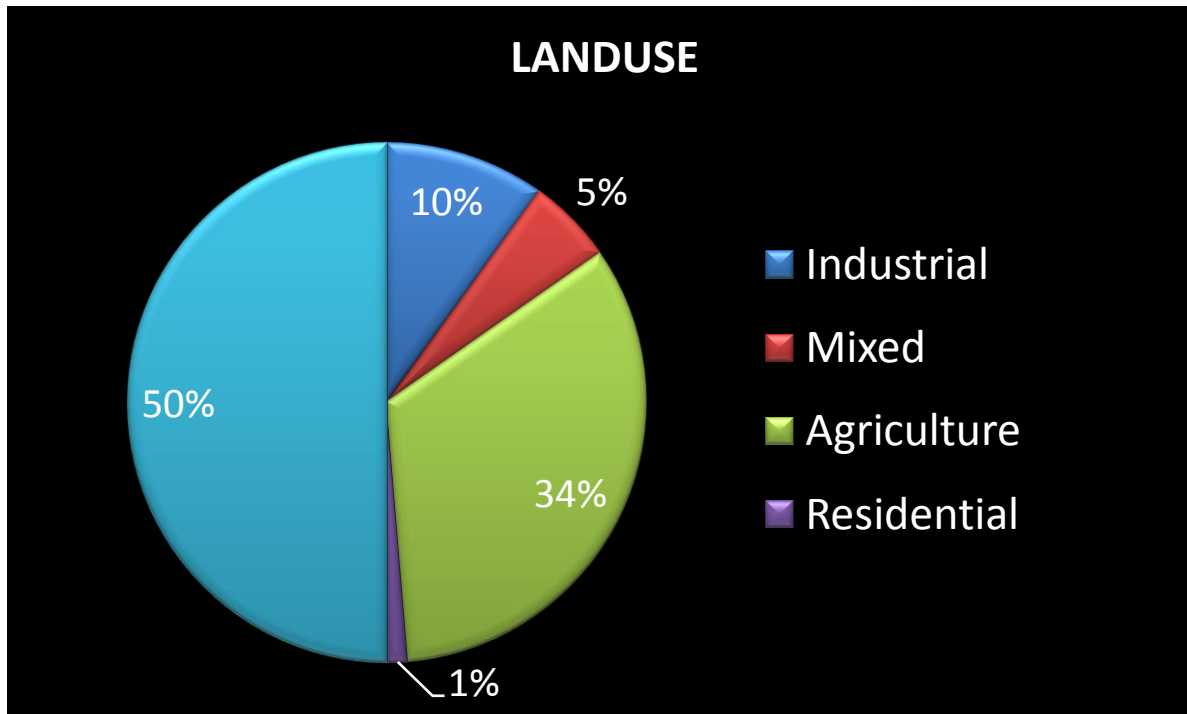


Linear Development
Along Highway



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

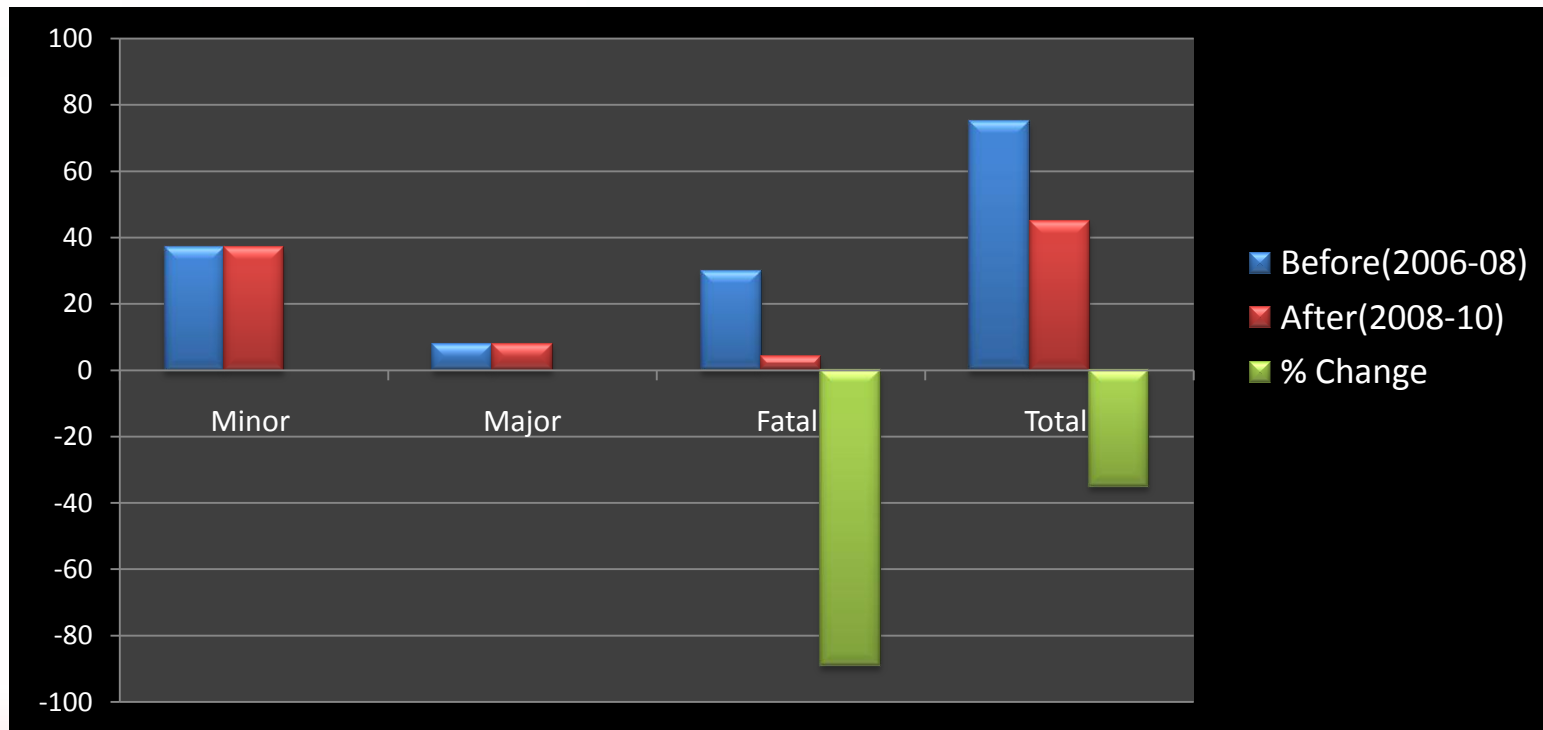


Change of Grade along NH-1, Panipat Elevated Corridor



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

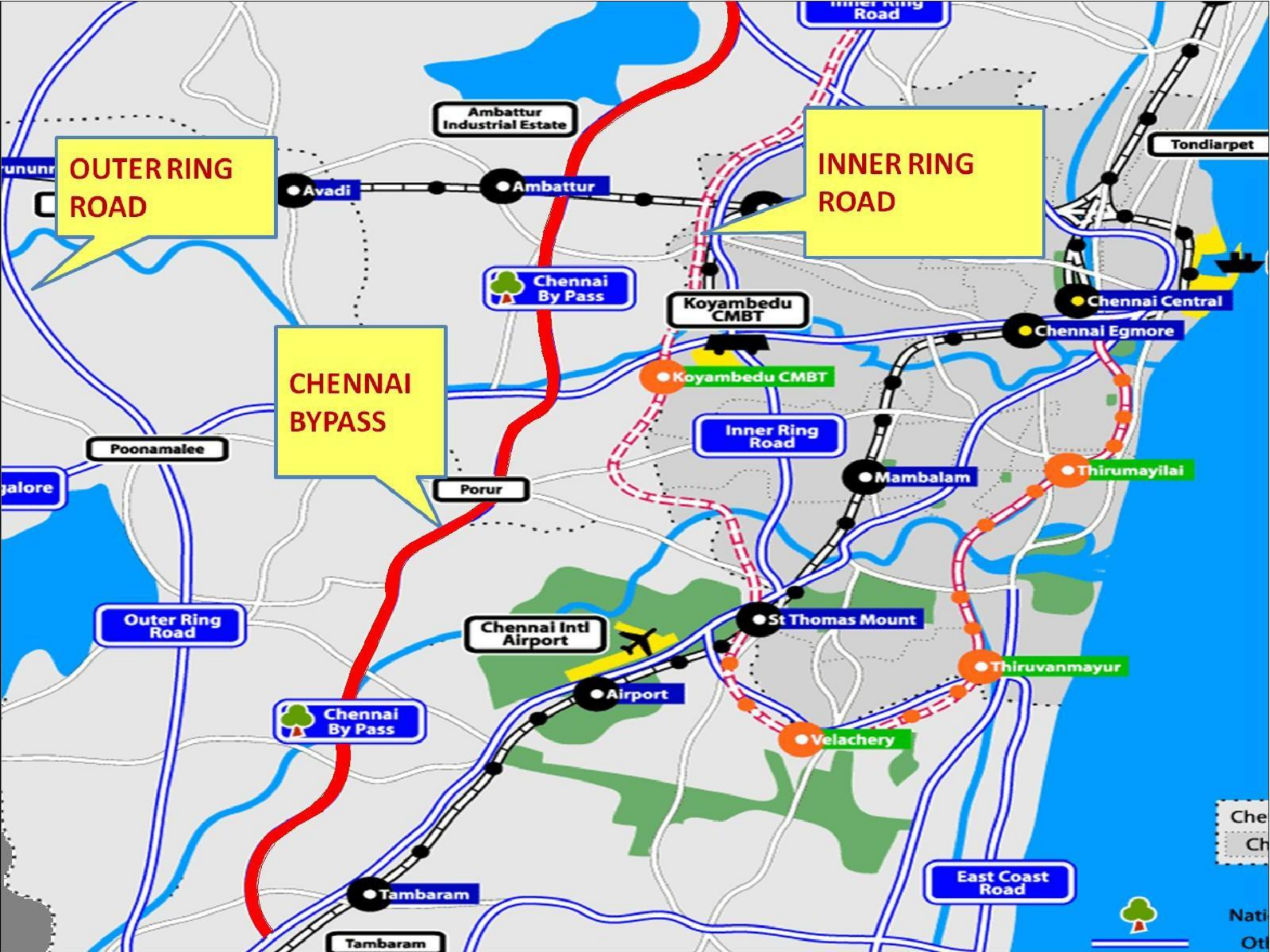


CHANGE OF ALIGNMENT - Chennai Bypass

➤ 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





OUTER RING ROAD

INNER RING ROAD

CHENNAI BYPASS

Ambattur Industrial Estate

Tondiarpet

Avadi

Ambattur

Chennai By Pass

Koyambedu CMBT

Chennai Central

Chennai Egmore

Koyambedu CMBT

Inner Ring Road

Poonamallee

Porur

Mambalam

Thirumayilai

Outer Ring Road

Chennai Intl Airport

St Thomas Mount

Thiruvanamayur

Chennai By Pass

Airport

Velachery

Tambaram

East Coast Road

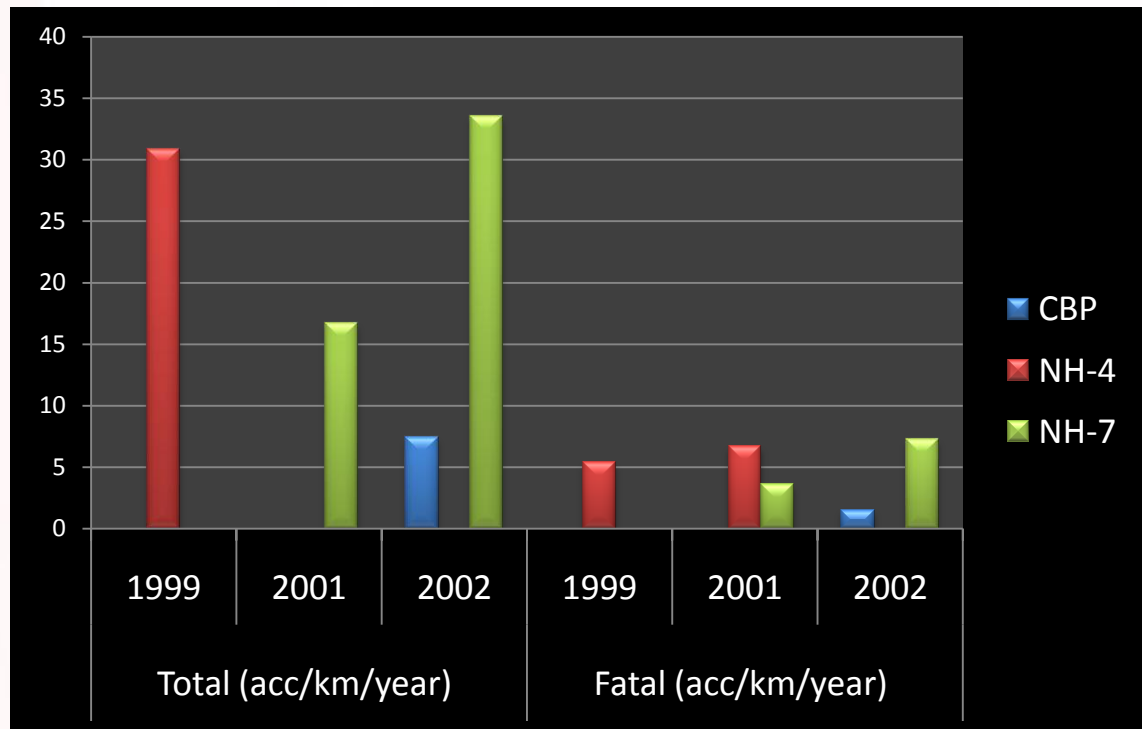
Tambaram

Chennai

National

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.

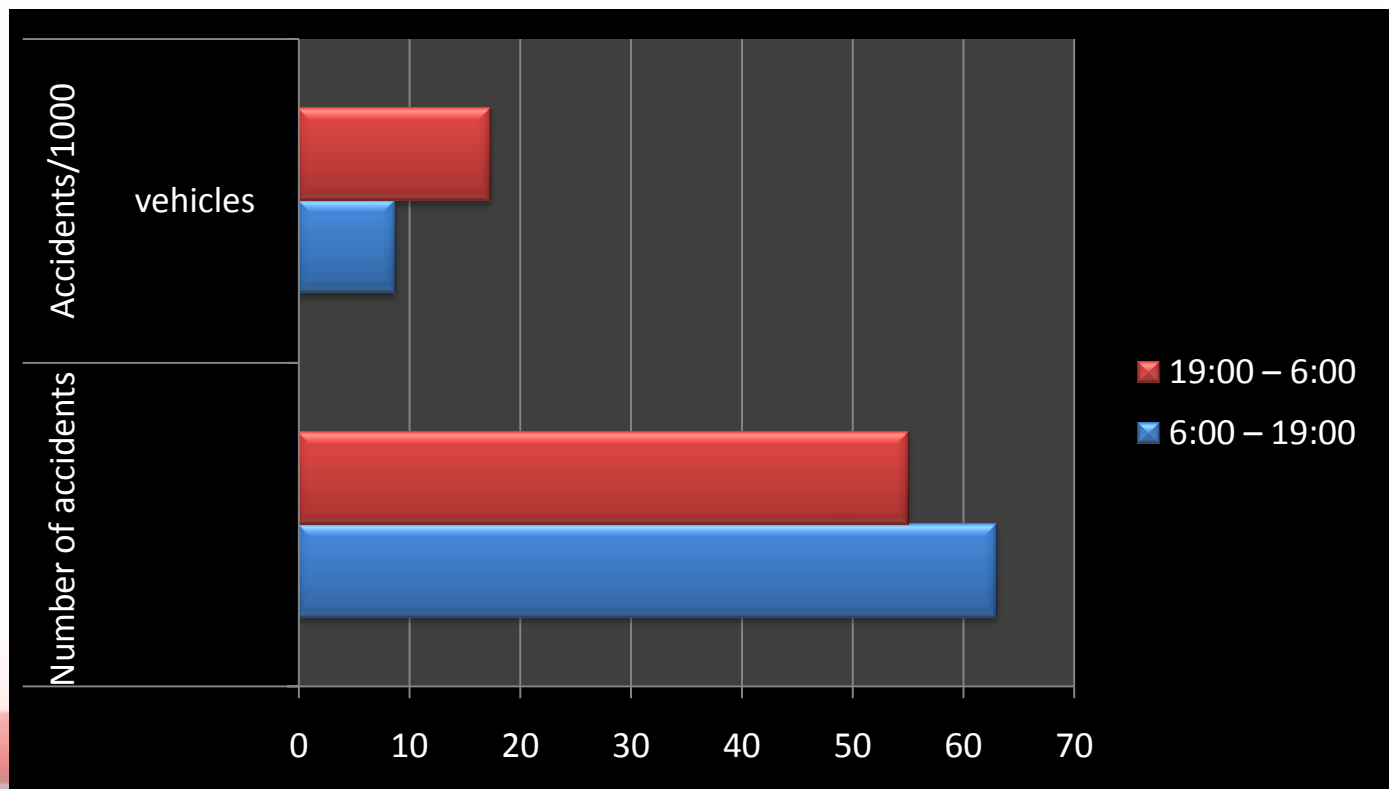


The higher safety levels achieved due to the higher operational performance of Chennai Bypass.



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/carrageway.

❑ 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

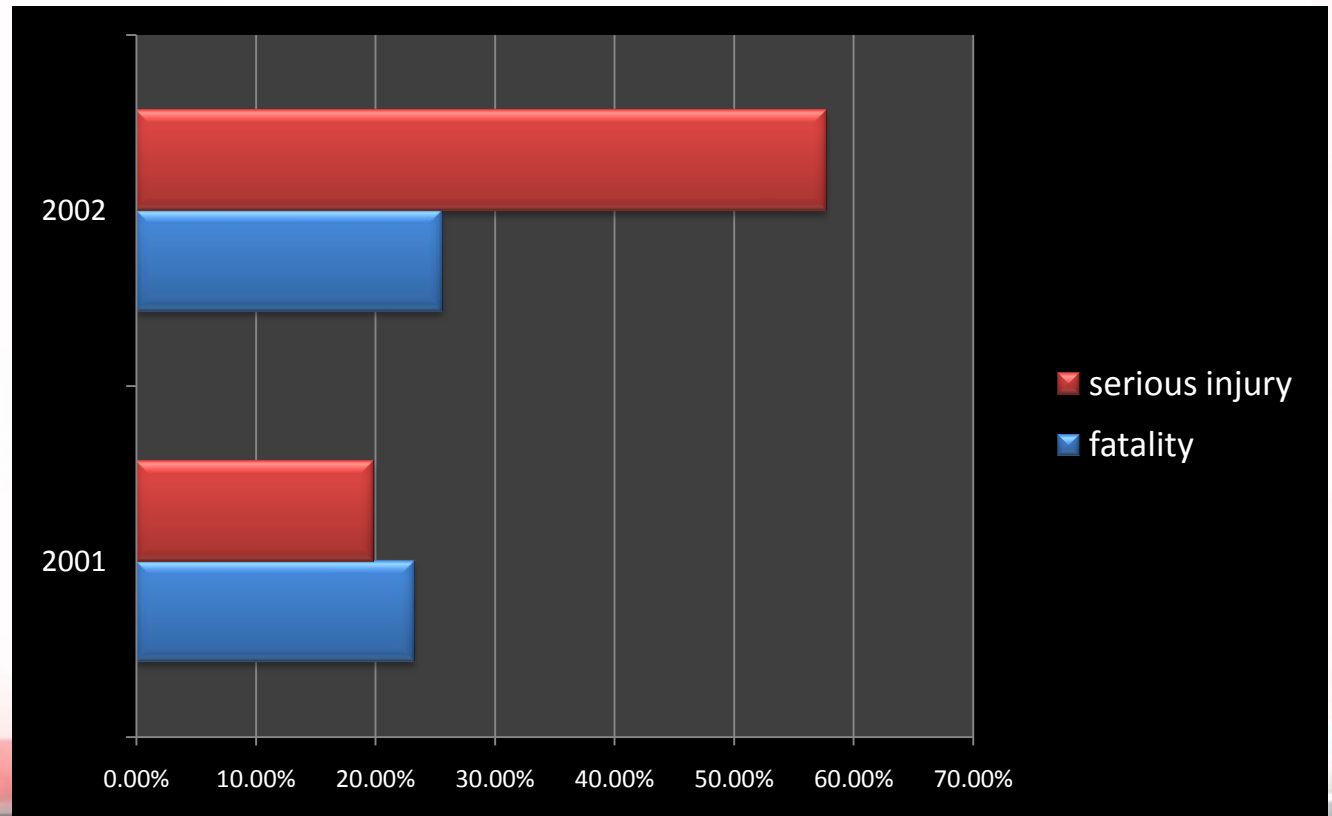


Courtesy NH



ITS interventions NH-8 (Delhi-Jaipur Highways)

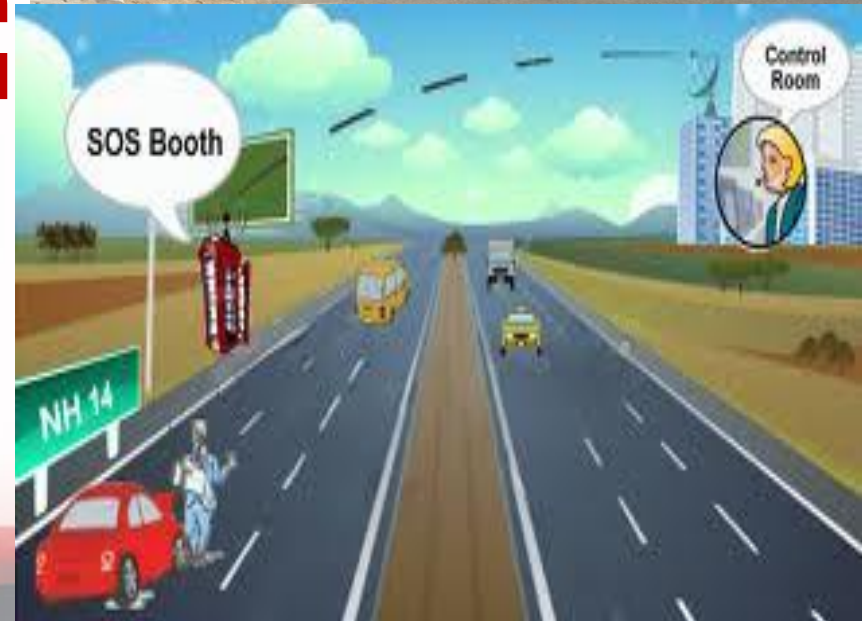
- ATMS installation resulted in reduction of fatality and serious injury in 1st year & 2nd year when compared with the figures before and after.



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**

