



Road Safety in India: Challenges and Opportunities*

The present report was designed to analyze the traffic safety situation in India, and to identify countermeasures for areas in which the total harm caused by crashes can be substantially and readily reduced. The first part of the report provides a comprehensive analysis of the current traffic safety situation in India. According to official statistics, 105,725 people were killed in road traffic crashes in India in 2006 (NCRB, 2007). The situation in India has worsened in recent years. Traffic fatalities increased by about 5% per year from 1980 to 2000, and since then have increased by about 8% per year for the four years for which statistics are available. This is attributable partly to an increase in the number of vehicles on the road, and partly to the absence of a coordinated official policy to control the problem. The fatality rate has increased from 36 fatalities per million persons in 1980 to 95 fatalities per million persons in 2006.

Children age 14 years and younger comprise only 7% of the fatalities, though their share in the population is 32%. The proportion of fatalities in the age groups 15-29 and greater than 60 years is similar to their representation in the population, but the middle-age groups 30-44 and 45-59 are over represented by about 70%. The low representation of children (2 fatalities per 100,000 persons) is curious because a significant number of children walk and bicycle to school unescorted, both in urban and rural areas. In comparison, children account for 4.4% of the total fatalities in the U.S., and 20% of the total population

Temporal factors

For the country as a whole, monthly variations are not substantial, but hourly variations are. The fatalities remain relatively constant and high during working hours, and low during early hours of the morning. Data from Delhi shows that despite the fact that nighttime exposure is likely to be substantially lower than daytime exposure, nighttime crashes account for a large proportion of fatalities. Second, trucks have high involvement in both daytime and nighttime. Third, buses feature prominently from about 07:00 until about 21:00. Fourth, the proportion of unknowns is substantial, especially during nighttime. Peaks between 10:00 and 15:00 are similar for motorized and non-motorized users, the night-time peaks are not. Motorized users have a relatively high number of crashes between 22:00 and 01:00, while non-motorized users do not. This could be because of the differential exposure of these two groups at night, higher speeds of vehicles at night due to low density, and/or higher frequency of driving under the influence of alcohol at night. Evidence for increased use of alcohol comes from a hospital study in Delhi where 29% of the riders of motorized two-wheelers admitted to alcohol consumption before the crash. In Bangalore, a hospital-based study showed that alcohol was involved in 22% of nighttime crashes, and that 35% of randomly checked drivers on the road at night were under the influence of alcohol.

Road users killed in traffic crashes

Proportions of road users killed in the late 1990s in the cities of Mumbai and Delhi and selected highway locations show that car occupants were a small proportion of the total fatalities. Pedestrians, bicyclists, and motorized two-wheeler riders accounted for 60-90% of all traffic fatalities. This pattern is very different from that obtained in all high-income countries.

*Excerpts from: Dinesh Mohan, Omer Tsimhoni, Michael Sivak, Michael J. Flannagan UMTRI-2009-1, January 2009, pp 1-62. Ann Arbor MI: University of Michigan Transportation Research Institute. Full text available at: [http://web.iitd.ac.in/~tripp/DM_UMTRI-2009-1\[1\].o.pdf](http://web.iitd.ac.in/~tripp/DM_UMTRI-2009-1[1].o.pdf)

Analysis of state-level data

Fatality rates per million population increased between 1991 and 2006 in most regions except in the northeastern hilly states and the city of Delhi. The increase was 50% or more in 11 states and union territories. In 2006 the 5 highest fatality rates were recorded in Pondicherry, Goa, Haryana, Dadra & Nagar Haveli, and Tamilnadu. Fatalities rates increased by 50% or more in Nicobar Islands, Andhra Pradesh, Himachal Pradesh, Dadra & Nagar Haveli, Daman & Diu, Himachal Pradesh, Jammu & Kashmir, Kerala, Mizoram, Orissa, and Tripura. Intercity roads.

Accurate estimates for non-motorized road user share on Indian roads are not available, but the data from the study done in the late 1990s gives the following ranges: 4-25% on four-lane divided highways and 9-39% on two-lane highways. The construction of four-lane divided highways (without access control) does not seem to have reduced fatality rates, and vulnerable road users still account for a large proportion of fatalities. High incidence of fatal rear-end crashes suggests a general lack of visibility with a possible contribution of poor conspicuity of parked vehicles. There is a clear case for redesign of intercity roads with separation of slow and fast modes. The needs of road users on local short distance trips will have to be accounted for to reduce the probability of head-on crashes (due to drivers going the wrong way on divided highways) by provision of continuous service lanes and safe road crossings at convenient distances. Solutions for many of these issues are not readily available, and research studies are necessary for the evolution of new designs.

City data

Delhi had the highest number of fatalities in 2006 (1,794). The top 10 in fatality rate per million population were Bangalore (162), Coimbatore (169), Kanpur (170), Vishakhapatnam (207), Lucknow (207), Chennai (208), Jaipur (233), Vijayawada (256), Faridabad (305), Meerut (307), and Agra(317). These cities are spread out all over the country and so culture could not be an important factor. The lowest rate was in Amritsar (33) and the highest in Agra (317), with an overall average of 142 fatalities per million persons for all these cities.

A comparison of the fatality rates per million persons between 2001 and 2006 shows that only eight of the 35 cities did not experience an increase in fatality rates. The highest increase was 550% in Asansol, with an overall average for all cities of 5.5% compound per year. This is quite an alarming situation, as at this rate the city death rate per million persons will be doubled in 12 years. Since a vast majority of the victims in these cities are vulnerable road users, one possible cause could be increases in vehicle speeds.

Conclusions

Based on the analysis above, we need to focus on six areas: (1) Pedestrians and other non-motorists in urban areas. (2) Pedestrians, other non-motorists, and slow vehicles on highways. (3) Motorcycles and small cars in urban areas. (4) Over-involvement of trucks and buses. (5) Nighttime driving. (6) Wrong-way drivers on divided highways. As indicated above, detailed data are not available to suggest specific measures for all road safety issues in the country. Therefore, there is an urgent need to revamp police data collecting procedures so that necessary information is available for scientific analysis.

The Transportation Research and Injury Prevention Programme (TRIPP) at the Indian Institute of Technology Delhi, is an interdisciplinary programme focussing on the reduction of adverse health effects of road transport. TRIPP attempts to integrate all issues concerned with transportation in order to promote safety, cleaner air, and energy conservation. Faculty members are involved in planning safer urban and inter-city transportation systems, and developing designs for vehicles, safety equipment and infrastructure for the future. Activities include applied research projects, special courses and workshops, and supervision of student projects at postgraduate and undergraduate levels. Projects are done in collaboration with associated departments and centres at IIT Delhi, government departments, industry and international agencies.





Mr. Sanjeev Sahai

Mr. Sanjeev Sahai is an IAS Officer whose wide ranging experience includes the formulation of a regulatory framework for infrastructure development. He was a Robert McNamara Fellow at Princeton University and is presently Managing Director, Delhi Integrated Multi-model Transit System (DIMTS)

To begin smack in the middle, you once said that the BRTS (Bus Rapid Transit System) was an instance of land reform. Could you please explain what exactly you meant?

I do maintain that this is a clear example of urban land reform because the BRT System has given land to the landless; by that I mean the pedestrians and the cyclists. The BRTS as it is conceived and operated, has dedicated lanes for pedestrians, cyclists, buses, and other vehicles like cars, motorized two and three wheelers, etc. There is in this system a recognition of the need for equity in mobility on the road, no matter, the mode of locomotion; the BRTS works not only in Delhi but in other countries the world over because it takes a holistic view that is inclusive while prioritizing road users according to their vulnerability.

That is the simple reason why the BRTS has made transportation more comfortable and safe for the under privileged sections of society. It also acknowledges the fact that this attempt at equity in urban land use for mobility and transportation is part of a larger issue of land reform as a whole. It establishes, for the first time, in actual practice of town planning and city development, the close linkage between urban land use patterns and mobility; it is for these and other such complex reasons that I said that the BRTS was an example of urban land reform. As such, in our country, land reforms have been carried out only in two states: Kerala and West Bengal. This itself is an indicator of how tough it is to for us to break away from the feudal mindset of the past. It is a long haul and we must be prepared to wait and right the wrongs of the past in both, the rural and urban sectors of our country.



Given that we have mixed land use and heterogeneous traffic in our urban areas, we need to aim for a transport system that is safe, sustainable and inclusive. If in this attempt at participative equity, certain under-privileged sections are unable to voice their preferences, it becomes the responsibility of the others to speak up for them. This becomes imperative when we recognize that only by addressing the needs of the vulnerable road using majority will traffic as a whole become safer and smoother, including the mobility of cars and motorized two wheelers. All forms of transport (underground or above ground) like metro and sky rail also require a feeder transport system at grade level.

This is where the (BRTS) Bus Rapid Transit System comes in. Apart from dedicated lanes for pedestrians, cyclists, cars and buses, the BRTS is within the reach of every citizen. I would like to introduce shaded walkways and an efficient electronic information system about bus schedules; when the system is in full swing, these buses should not be over-crowded. The demand for these bus services seem to be growing in direct contrast to the metro feeder bus system which seems to work more as an independent bus system rather than a feeder system. As I see it, the ticketing, the scheduling and the driving of all surface public transport, like buses, should be part of the integrated multimodal transport system in Delhi, namely the DIMTS. We could even partner other such ventures in other cities and they could benefit from our experience.

Operationally, it is my considered opinion, that there are a number of authorities working, with the best of intentions, at cross purposes with each other: transport as a subject is with the Delhi government; land and land-use is with the DDA (Delhi Development Authority); traffic is with the police; paratransit is with the MCD (Municipal Corporation of Delhi); a lack of coordination in this mix, makes for inefficiencies in time, money and other resources. If we all pull together, in the same direction, I am sure we can achieve sustainability, environmentally, economically and operationally.

You have yourself earlier mentioned the various agencies in Delhi that are at odds with each other. In this context do you think the DIMTS in moving towards realizing its vision for a fully integrated transport system for the city?

As I mentioned earlier, the various elected and nominated bodies seem to have different views on transportation and DIMTS is pushed into an advisory role. Even well informed and good advice is of some use only if the recipient is ready to act on it. If things are to mesh properly on the ground there must be an institutional arrangement such that all bodies



DIMTS (Delhi Integrated Multimodal Transport System) has been established to promote and manage the Integrated Multimodal Transport System (IMTS) in Delhi. What is your vision for DIMTS?



give of their best without duplication or overlap. It would perhaps be best if government were to make policy and leave the implementation to the various institutions. For instance, I do feel that DIMTS should be operating the buses in the BRTS and not the DTC (Delhi Transport Corporation). As of now, the way things are, ticketing and driving of buses in the BRTS is with the DTC while the maintenance of the BRTS corridor has been given to us. It is being said that the Delhi UMTA (Urban Mass Transit Authority) is coming up with new legislation covering just such issues which is expected to result in the foundation of a single transport authority.

What is the administrative structure of DIMTS for managing various projects?

We are not government nor are we a public sector organization. We have a managerial set-up which functions under the Board of Directors like any other company in the corporate sector. We are owned on a fifty-fifty per cent basis by the Delhi government on the one hand and the IDFC (Infrastructure Development Finance Corporation) on the other. Accordingly we have the required flexibility to hire the best and brightest. Our executives are paid according to their work-performance and those who are not up to the mark have to look elsewhere for a professional berth. By the same token, procedurally we are not hamstrung as often happens with the government. It would be best perhaps if the government held on to all its assets and passed on all the operation and maintenance work of the BRTS to us.

What projects/programmes have you put in place as part of your management of the BRTS? What targets and monitoring mechanisms do you envisage?

The truth of the matter is that the BRTS is completely new to India. We understand from international practice too, that invariably, the BRT as a system needs fine tuning over a period of time; and these necessary mid-course corrections in answer to a feedback loop, are very largely the effects of local conditions; so much so, that different cities have different problems even if they are in the same country. In India, there is no city-wise audit of new projects and processes like the BRTS. We have initiated moves to make sure that the BRTS corridor is kept clean and free of any obstacle or obstruction; breakdown of vehicles are attended to immediately. New rumble strips and flappers have been introduced to make sure there are no mishaps. We have already introduced, PIS (Passenger Information System) and GPS (Global Positioning System) systems that would make for a safer and smoother ride for the commuters on the BRTS. Our target is one hundred per cent safety – zero crashes. Speed has been brought under control in the BRT corridor and is constantly monitored; there are marshals in place to help the vulnerable road users and direct the rest of the traffic as required.





News

Impacts of urban sprawl and commuting: a modelling study for Italy.

Urban sprawl, with its wide dispersion of metropolitan areas and the spread of cities with high consumption of scarce resources, is a relatively recent phenomenon in Europe. In our paper, we have focussed attention on the impacts that sprawl exerts on the transport system of cities...The results show that, during the decade 1981–1991, the impact of mobility has increased in Italy by up to 37%. This increment has been generated by a marked shift of modal choices towards private motorised travel modes: namely, the automobile...This phenomenon, in which we see people defending their private benefit, often disregarding the collective one, would require a more thorough analysis...Less compact and mixed-use cities result in higher impacts, since the greater dispersion of activities in sprawl increases automobile dependency and makes it necessary to spend more time travelling between activities. Yet, car use itself also encourages sprawl. It requires large amounts of land for transportation facilities and makes the development of the urban fringe much easier. Furthermore, our results suggest that, as the segregation of productive and residential activities increases with sprawl, workers need to travel longer and the self-containment capacity of cities is hampered...Sprawl, with its low densities and spatial segregation of productive and residential activities, contributes to move job opportunities to peripheral areas...Congestion, instead, seems to have transport service, people have no choice but to drive to these jobs.

Travisi, C. M., Camagni, R., & Nijkamp, P. (2010). *Impacts of urban sprawl and commuting: a modelling study for Italy*. *Journal of Transport Geography*, 18, 382-392.

Shaping urban transport policies in China: Will copying foreign policies work?

While policy consultation based on best practices is popular, it is important for us to remember that context matters in policy diffusion. There are certainly lots of beneficial lessons China can learn from the world as the country deals with the negative impacts of rapid urbanization and motorization. But the similarities of urban development across historical and socio political backgrounds may conceal important context differences that can make direct policy transfer unsuccessful... If Chinese cities adopt cordon pricing, but the cordoned area is too small, congestion outside of the area will not be alleviated, and could be aggravated due to diverted traffic... There is little sign that either the optimal or second-best pricing schemes will work effectively in the near future in Chinese cities... Overall, NPQ (New plate quota) is less effective in Chinese cities and potentially welfare reducing (i.e., producing net social cost). It cannot eliminate the uncertainty of vehicle fleet growth... A recent example is the special odd–even license plate restriction used in Beijing during the 2008 Olympics... However, given the very rapid income and auto ownership growth in China, the long-run effectiveness of driving bans is questionable. Even if few drivers are buying a second car to circumvent the driving ban, new drivers will fill up the road quickly. The concern over regressivity of the policy is very clear, given wealthy people will be more capable of circumventing the restriction... Overall, modeling the foreign concept of P&R (park and ride) in Chinese cities is not only a less effective way to provide transit collection service than some transit or non-motorized options, but also a subsidy to wealthy drivers making short-distance trips that are particularly polluting...Based on the analyses of four urban transport policy examples, this paper suggests that institutional and structural differences can significantly influence policy performance, thus demanding the attention of policy makers in China. ...As a country with much fewer per capita land resources, China should put a high priority on the efficiency of parking policy. Of course, the most appropriate and urgent parking policies that Chinese cities need to consider may be different from those adopted elsewhere.

Wang, R. (2010). *Transport Policy*, 17, 147-152.

International Course

The Transportation Research and Injury Prevention Programme (TRIPP) at the Indian Institute of Technology, Delhi organized a seven day International Course on Transportation Planning and Safety from 4-11 December 2009 at the Indian Institute of Technology Delhi. The course was co-sponsored by the Volvo Research and Education Foundations, INRETS, France, Ministry of Urban Development, World Health Organisation, Bajaj Auto Ltd. and the Ministry of Road Transport and Highways. The course (an annual feature for the last 19 years), was attended by 61 participants from 8 countries. The faculty members included Anoop Chawla (IIT Delhi), Christer Hyden (Lund University, Sweden), Dinesh Mohan (IIT Delhi), Farida Saad (INRETS, France), Geetam Tiwari (IIT Delhi), Harald Zellmer (Autoliv, Germany), Hermann Knoflacher (Technical University of Vienna, Austria), Janusz Kajzer (Chalmers University, Sweden), Marie-Chantal Jayet (INRETS, France), Mathew Varghese (St. Stephen's Hospital, Delhi), Nicole Muhrad (INRETS, France), Puneet Mahajan (IIT Delhi), Shrikant Bangdiwala (University of North Carolina, USA), Sudipto Mukherjee (IIT Delhi), Sylvain Lassarre (INRETS, France).



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