Road Safety Guidelines

for the Asian and Pacific Region

4.13

ROAD SAFETY RESEARCH

Asian Development Bank

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Road safety research is needed to clarify the current situation in terms of priorities and problem areas, as research provides the framework of knowledge against which policy decisions can be taken and countermeasures devised. Accurate and comprehensive accident data is required to provide a base comparison for identifying problems, evaluating any changes, and assessing the effectiveness of any countermeasures adopted. Consequently, improving the accident database is frequently one of the first priorities when seeking to establish a road safety research program.

Due to the complex nature of road accidents and the many different sectors involved in the operation of road safety, local research is required to provide a scientific and objective approach to reducing the suffering and losses caused by road accidents. This is usually best carried out by specialist researchers in universities or road research institutes, but can also be done by others with an interest in road safety. Much research has been undertaken internationally in road safety and many of the findings of such research can be of value to researchers and practitioners in all countries.

Efforts should be made to identify the factors involved in road accidents and to monitor effectiveness of any countermeasures implemented. Of particular importance is the development and monitoring of low-cost engineering countermeasures so that immediate improvements can be made at known hazardous locations.

PRIORITY ACTIONS NEEDED

1. Identify and prepare a consolidated list of all road safety research undertaken in the country and the researchers and institutes involved.

2. Target future research at accepted priority areas or in improving the accident data system if accident data is inadequate to provide an accurate baseline assessment of the road safety situation.

3. Coordinate research with the national road safety council (NRSC) and the lead road safety agency in the country to ensure road safety research is relevant and findings can be applied.

Road safety research has proven beneficial in documenting the road accident problem and has provided the means to develop and evaluate countermeasures. It has contributed greatly to the accident reduction in industrialized countries.

1 INTRODUCTION

These sector guidelines on "Road Safety Research" are from a set of *Road Safety Guidelines for the Asian and Pacific Region* policymakers, developed as part of a regional technical assistance project (RETA 5620: Regional Initiatives in Road Safety) funded by the Asian Development Bank (ADB).

Road safety research is the scientific and objective study of road and traffic systems with the aim of reducing the suffering and losses due to road accidents. It has three main objectives:

1) greater understanding of the situation and the identification of problem areas;
2) development of countermeasures for problem areas; and
3) the evaluation of the effectiveness of any remedial action undertaken.

These sector guidelines outline why road safety research is needed, a possible framework for research, the stages of development, and the benefits and examples of good practice.

2 WHY IS ROAD SAFETY RESEARCH NEEDED?

The study of the causes and prevention of road accidents is justifiable not only on humanitarian grounds, as road accidents are a major cause of death and injury, but also on an economic basis, as road accidents are known to amount to between 1 percent and 3 percent of a country's gross domestic product (GDP) per annum.

Earlier work in the Asian and Pacific region by the authors included reviewing all aid-funded (multilateral and bilateral) and (national or local) road safety research in the Asian and Pacific region.

It was found that, apart from a few notable exceptions, relatively little research had been undertaken by countries in the region. Furthermore, while the international agencies were providing substantially increased support for funding specific safety projects or ensuring that major highway or urban transport projects contained a safety component, relatively little funding was provided for pure research. One notable exception has been the United Kingdom's (UK's) Overseas Development Administration (ODA), which for more than 20 years has funded much of the Transport Research Laboratory's (TRL) road safety work in developing countries.

As motorization is increasing, dramatically so in many Asian countries, road accident numbers are bound to increase and the need for road safety research will become stronger. Measures that have been successful in developed countries may not always be as successful in the developing world because of the different social culture and economic circumstances in developing countries. It is, therefore, necessary to carry out country-specific research to identify measures that may be useful in the developing world.

3 KEY COMPONENTS

3.1 Program Content

Road safety research in developed countries is usually carried out in a number of parallel streams. Typical sectors of activity and their aims are usually as follows:

1) **accident data:** to develop and apply accident analysis in order to improve the background knowledge that shapes decisions relating to road safety and traffic engineering;

2) **road users:** to develop and apply human performance characteristics and behavior patterns in different traffic situations in order to improve the background knowledge that shape decisions concerning vehicles and traffic environment, and measures relating to road users, particularly drivers, pedestrians, and cyclists;
3) **roads:** to develop and apply methods that will facilitate the achievement of the desired standard in the planning, design, construction, and operation of roads; and
4) **vehicles:** to develop and apply methods for studying vehicles and vehicle components in different traffic situations, in order to improve the background knowledge that shapes codes concerning vehicles, vehicle components, and the traffic environment.

The sectors covered in these guidelines are involved in virtually every transport problem and so offer a convenient framework against which to develop comprehensive research and development programs. When considering the general area of road safety, problems in each sector can be used to suggest specific areas for comprehensive research work in this field, as shown in Figure 1.

3.2 Staffing and Funding

A road safety research unit ideally needs several members interacting to ensure a critical mass working together and maximizing the research's potential impact on road safety policy. In India, the Indian Institute of Technology (IIT) has seven experienced staff members working in road safety, while the Central Road Research Institute in New Delhi has about ten road safety researchers.

Training needs should be covered by university courses, short in-house courses, and overseas training. A career path is also needed to ensure road safety researchers are motivated to remain in the field. Several research institutes around the world have been privatized in recent years and the uncertainty of continued work has consequently affected workers' morale. Funding is synonymous with political support and is required to ensure appropriate staffing and resources are available for road safety research. Funding must also be consistent and reliable to allow research adequate development time.

At TRL, one third of the total turnover of approximately £32 million (US$51 million) per annum is allocated to road safety research. However, road safety research is not always adequately funded even in developed countries. In the United States (US), transport advisory boards argue that the road safety research budget should be increased by 50 percent because, in terms of years of productive life lost, road safety research receives only one eighth that of heart disease and only one seventeenth of that allocated to cancer.

3.3 Dissemination and Application

Road safety research is not an end in itself and findings need to be shared, discussed, and applied in order for the full benefits to be realized. Failure can provide as many lessons as success and, despite the inevitable disappointment and reluctance when such failures occur, research institutes should publicize all results. Most research institutes, such as the Central Road Research Institute in India, publish annual reports that summarize the research and development work for the previous year[1]. IIT recently produced a review of its injury control research efforts[2] that spanned the years 1991-1995. Research findings can also be disseminated through seminars and training courses, and through international conferences.

Research findings should be integratable into transport policy, which requires a close working relationship with the traffic police and road engineers.

4 STAGES OF DEVELOPMENT

In order to develop an effective road safety research capability, a country needs to proceed through a number of stages. The major milestones and the activity involved in the development of road safety research are typically as follows:

1) **identify previous research conducted.** Early road safety research tends to be conducted by individuals from the academic or medical sector and will need to be centrally collected and organized. Individuals and organizations, most likely engineering universities or teach-

ing hospitals, should be listed on a central database;

2) **target priority areas identified and ensure reliable accident database.** An objective and scientific approach to road safety requires an accurate and comprehensive accident database. Road safety research's first objective of problem assessment requires scrutinization of accident data for accuracy before they can be used. While the accident data system is being improved, other perceived key areas such as pedestrians or nighttime accidents can be addressed;

3) **NRSC/lead road safety agency to guide research and promote dissemination and application of findings.** Road safety research needs to be incorporated into any action plan or strategy developed with research focus reflecting the lead agency's priorities;

4) **effectiveness of road safety remedial measures evaluated by road safety researchers.** Road safety research should be promoted and expanded by undertaking evaluation work of road safety remedial measures, both foreign funded and locally financed;

5) **establish links with other road safety research institutes in other countries.** While research findings are not always transferable, the lessons learned and approaches used should help minimize instances of "reinventing the wheel," which countries cannot afford. Annual research publications lists should be circulated between research institutes, and twinning arrangements and exchange programs developed;

6) **solicit private sector commissioned road safety research.** More than half the countries surveyed indicated no central government funds were available for road safety research. Transport-related industries, i.e., insurance companies and automobile manufacturers, need to be targeted for research funding. Road safety research will need to be directly relevant; and

7) **establish (within an existing institute) a road safety research center with full-time researchers.** Road safety research will eventually need to be undertaken by specially trained professionals.

5 BENEFITS AND EFFECTS

Road safety research produces many benefits, which can be categorized into the following main divisions listed below. Specific examples of these benefits are also provided.

5.1 Problem Assessment

Before developing any action plan, an accurate assessment of the road safety situation is required. Road safety research objectively evaluates the data available and appraises the relative situation with respect to accident trends, high-risk road user groups, etc., while also identifying any data deficiencies. While the police will be responsible for tallying reported road accident numbers and casualties, research should query the accuracy of such figures and what they indicate about the national and local road safety situation.

Much of the early overseas road safety research work undertaken by TRL's Overseas Centre was instrumental in documenting the growing problem of road accidents in developing countries. Despite low levels of motorization, accident rates were found to be many times greater (per vehicle) than in motorized countries (see Figure 1).

Road accident casualties tended to affect the younger population to a much greater extent (partially due to the age distribution) and pedestrians were found to comprise a much larger proportion of road accident casualties than in countries with a much higher rate of motorized vehicle travel.

These findings of high accident rates and the vulnerability of pedestrians and children have influenced road safety policies around the world and helped determine subsequent road safety research and policy in developing countries.

To address the lack of accurate and comprehensive accident data, TRL's Overseas Safety Research Team developed a Microcomputer Accident Analysis Package (MAAP)[1,2] which is now either in use or being tested by the relevant authorities in many developing countries around the world as well as in several UK police authorities.

Countries, provinces, or research institutions can modify the standard data collected on each road accident according to their own needs.

5.2 Development of Countermeasures

A good accident data system also enables safety authorities to plan effective countermeasures and campaigns. It also serves as a research aid to enable problem areas to be identified, and remedies devised and tested in a scientific manner. To encourage the latter, the TRL MAAP package has been offered free to developing countries under license on condition that the results are made available to TRL for research.

In the area of road environment, many measures have been developed related to road traffic management and increased understanding of road user behavior. These include improved junction design techniques, urban safety management studies, and better road surfaces. The most significant results of research, however, are perhaps linked to issues such as seat belt wearing and reduction in drinking and driving. The financial benefits of these research studies are listed below in Section 5.4.

5.3 Evaluation

Good intentions do not guarantee successful results and road safety countermeasures and programs need to be evaluated to determine their effectiveness, particularly in relation to cost. International resource scarcity requires that all resources be used effectively.

The *Annual Report* of TRL 1992/1993 provided an estimate of the monetary benefits obtained from examples of its research work. These were selected as places where it was considered possible to place value on most of the benefits. These estimates were understandably approximate and were expressed as the monetary benefits to the community in the year of the *Annual Report*. Benefits from UK road safety research-based projects are shown below and provide an illustration of the value of carrying out effective research programs:

	Cost of research (as at 1993) £ million	***Annual benefit £ million***
Seat belt wearing	*8.5*	*650*
Junction accident studies	*1.1*	*5*
Urban safety management schemes	*5.3*	*17*
Drink and drive studies	*3.0*	*60*
Road texture and accident rate	*15.0*	*15*

The production cost of the highly-acclaimed safety-conscious road design guide for developing countries, *Towards Safer Roads*[3], has been estimated at £250,000 (US$400,000) while the annual benefits from the safe design could reach £10 million (US$16 million) per annum.

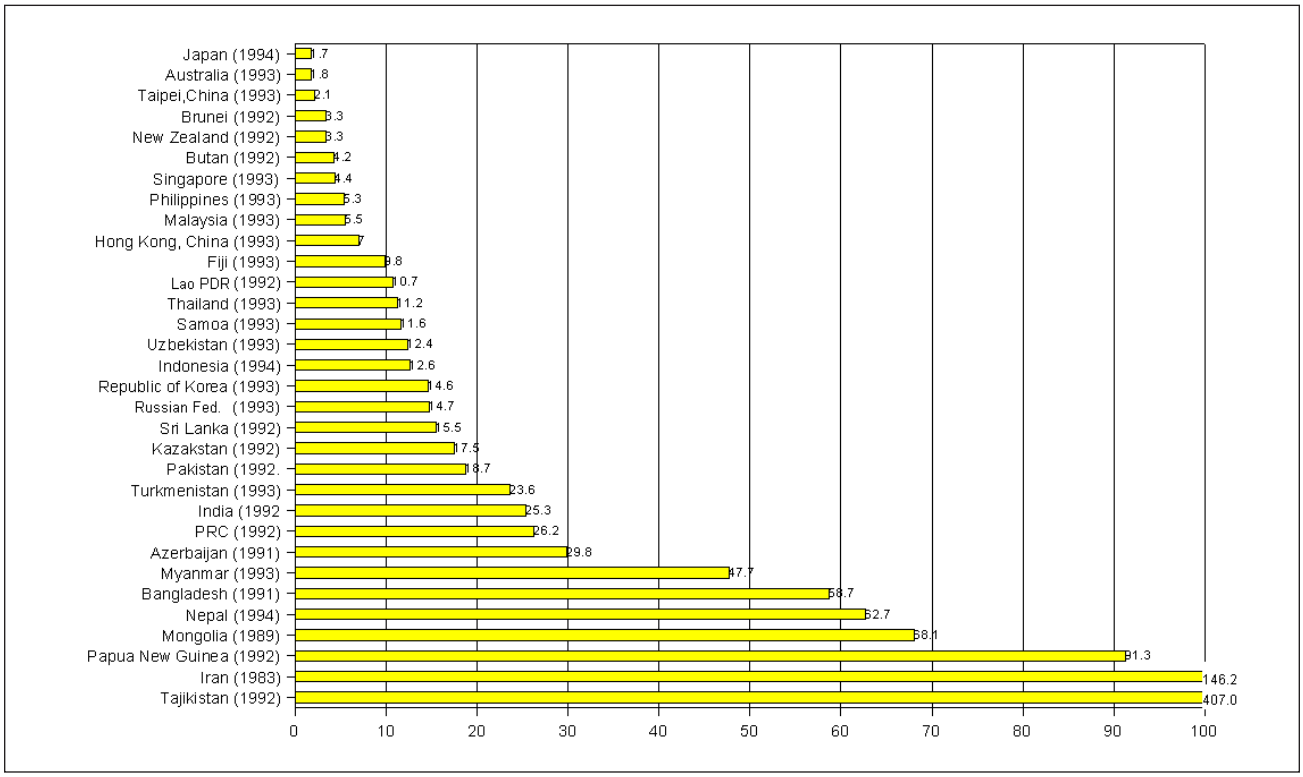
5.4 Scientific Approach

Because of the complexity of road accident causation factors, the many organizations involved, and the emotional nature of road accidents, there is temptation to embark on policies and countermeasures that are visible but superficial and with little ultimate effect on the level of road safety. Road safety research should help road safety policy to be based on an objective and informed basis. Indeed, without relevant local research it is likely that countries wishing to invest more resources in road safety will look only at results from other countries and may well adopt measures inappropriate for their own conditions, thereby wasting those valuable resources. Effective road safety research provides the framework against which informed decisions can be made, and it is essential that every developing country should have some local research activity on road safety issues to aid decision making.

6 EXAMPLES OF GOOD PRACTICE

National transport research centers exist in a number of countries within the region covered by the ADB and United Nations Economic and Social Commission for Asia and the Pacific (UN/ESCAP). Most of these spend a reasonable proportion of their time and budget on safety-related issues. In particular, the following locations can be identified and are gaining wider recognition for their work in the safety field:

- **Central Road Research Institute**, New Delhi, India;
- **Institute for Road Engineering**, Bandung, Indonesia;
- **Korean Transport Research Institute**, Seoul, Republic of Korea;
- **Institute Kerja Raya Malaysia**, Kuala Lumpur, Malaysia; and
- **National Transport Research Centre**, Islamabad, Pakistan.



Source: RETA project data.

Figure 1: Fatality rates in developing countries (deaths/10,000 vehicles).

Although details are not available on all of these organizations, the following few examples illustrate that some excellent research work and potential exists in the region.

1) The **Central Road Research Institute's** traffic and safety environment unit was established in 1986, as an offshoot of the traffic and transport department in order to give road safety greater emphasis. The main objective of the Institute's road safety research was to create road safety awareness among the decision makers in India, with much of the early work dedicated to the analysis of accident data.

Economic constraints have now led the Institute to focus research efforts into areas where funding is available, either from the public or private sector. The Ministry of Surface Transport gave the Institute a grant in the early 1990s to provide traffic police training and private sector firms have cosponsored and jointly organized research into driver testing (visual and psychophysical assessment systems).

At present, the Institute's road safety research covers a wide range of areas, including nonmotorized vehicle safety, motorcycle helmet usage, design standards and construction practices, medians, road safety education and safety in schools, and driver evaluation methods.

2) The **Institute of Road Engineering** was founded in 1984 as the primary research organization for research in the highway sector in Indonesia, and six years later, it began collaborating with SweRoad in road safety research. Its early work in the identification of hazardous locations led to the realization that the improvement of the accident database was its first priority.

It adapted TRL's MAAP system, but the Indonesian version known as 3-L (Lahta Laka Lantas) has been introduced in only a few areas of Indonesia. While the Institute continues to seek Government commitment for introducing the 3-L system nationwide, it also aims to continue its work in evaluating the effectiveness of remedial measures at hazardous locations and accident costing updates, as well as developing road safety audit capability.

The Institute is keen to enter into collaboration agreements with nearby countries and is part of a twinning arrangement with the Bangladesh Road Research Laboratory and TRL.

In addition, a number of universities in the region has a reputation for carrying out valuable road safety research. These include:

Bangladesh University of Engineering and Technology, Dhaka, Bangladesh;
University of Bangalore, Bangalore, India;
IIT, New Delhi, India;
Accident Research Unit, University Pertanian, Serdang, Malaysia; and
Chulalongkorn University, Bangkok, Thailand.

As with the research institutes, detailed information is not available on specific activities in all of these teaching institutions. However, the research being undertaken at IIT is particularly extensive so it is summarized below to illustrate the quality and range of research being undertaken in teaching centers.

IIT's Centre for Biomedical Engineering was recognized for its outstanding work in the field of injury control when it was established as one of the world's 13 World Health Organization (WHO) collaborating centers in 1991. The Institute has targeted the area of vulnerable road users and has undertaken research into vehicle design (safer fronts), motorcycle helmet design, and emergency medical assistance. It has also conducted much research into accident reporting and has developed an accident report form that has been recommended by the Indian Roads Congress. In mid-1995, the Institute proposed the establishment of a transportations systems research program with staff from the transportation planning and engineering department, statistics, biomechanics, and safety engineering. It envisioned the research program to be self-sufficient within three years of starting, with half of the funding expected to come from industry and the other half from public sector contracts, including aid agencies.

All of the above organizations can be praised for undertaking valuable road safety research, but, in general, funding from their respective governments has been limited. Limited resources reinforce the need to share information and to avoid cases of duplication.

Plate 1: MAAP in use.

Over the past two decades, TRL has collaborated on research with several countries; including Egypt, Indonesia, Malaysia, Pakistan, and Papua New Guinea, while the Republic of Korea has sent several road safety researchers to work at TRL.

Both TRL and the Road Engineering Association of Asia and Australasia (REAAA) have produced lists of references relevant for widespread usage in the developing world. In addition to the development of MAAP, ODA has sponsored the previously mentioned *Towards Safer Roads in Developing Countries*, a compilation of best practice, in safety-related engineering matters suitable for developing countries. Following its publication in 1991, it has rapidly become the standard reference work for road safety engineering in developing countries. REAAA has compiled a valuable inventory of road safety resources for developing countries that provides many references as well as contact names and addresses. As is the case with *Towards Safer Roads*, the REAAA inventory is free of charge (see Appendix A).

TRL has also had formal and informal close working relationships with several of the research institutes in the Asian and Pacific region. This has led to staff exchanges and collaborative research. Such contacts and links are an effective way to stimulate and develop road safety research activities in developing countries.

The Institute of Transport Economics in Norway has also (as part of its overseas research programs) produced several standardized publications for regional use in Southern Africa, including a highway code, a road traffic signs manual, a road traffic model statute, and a manual for learner drivers. Although these were produced for application in Africa, they form useful basic documents, for the region. There is a need to consolidate and disseminate such information and research results among Asian and Pacific countries and recommendations are being made within ADB and UN/ESCAP regional studies on how this could best be done.

7 REFERENCES AND KEY DOCUMENTS

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4. Hills, B. L., and C. J. Baguley. 1993. "Accident Data Collection and Analysis: the Use of the Microcomputer Package MAAP in Five Asian Countries": Proceedings of the Asian Road Safety Conference, Kuala Lumpur, Malaysia, October 1993.
5. REAAA. 1992. *Road Safety Resources for Developing Countries*. Victoria, Australia: Australian Road Research Board, Ltd.
6. TRL. 1991. *Towards Safer Roads in Developing Countries*. UK: TRL.

Road Safety Guidelines for the Asian and Pacific Region

The guidelines cover 14 individual sectors affecting road safety, with four introductory chapters and four appendices. Information is presented in a series of freestanding documents that can be extracted for distribution and discussion.

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