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for Economic Cooperation
and Development

Urban Road Safety

Module 5b

Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities

Update 2017

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OVERVIEW OF THE SOURCEBOOK

Sustainable Transport: A Sourcebook for Policy-Makers in Developing Cities

What is the Sourcebook?

This *Sourcebook* on Sustainable Urban Transport addresses the key areas of a sustainable transport policy framework for a developing city. The *Sourcebook* consists of 32 modules mentioned on the following page. It is also complemented by a series of training documents and other material available from http://www.sutp.org (and http://www.sutp.cn for Chinese users).

Who is it for?

The *Sourcebook* is intended for policy-makers in developing cities and their advisors. This target audience is reflected in the content, which provides policy tools appropriate for application in a range of developing cities. The academic sector (*e.g.* universities) has also benefited from this material.

What are some of the key features?

The key features of the *Sourcebook* include:

- A practical orientation, focusing on best practices in planning and regulation and, where possible, successful experiences in developing cities.
- Contributors are leading experts in their fields.
- An attractive and easy-to-read, colour layout.
- Non-technical language (to the extent possible), with technical terms explained.
- Updates via the Internet.

How do I get a copy?

Electronic versions (pdf) of the modules are available at http://www.sutp.org or http://www.sutp.cn. Due to the updating of all modules print versions of the English language edition are no longer available. A print version of the first 20 modules in Chinese language is sold throughout China by Communication Press and a compilation of selected modules is being sold by McMillan, India, in South Asia. Any questions regarding the use of the modules can be directed to sutp@sutp.org or transport@giz.de.

Comments or feedback?

We would welcome any of your comments or suggestions, on any aspect of the *Sourcebook*, by e-mail to sutp@sutp.org and transport@giz.de, or by surface mail to:

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Further modules and resources

Additional resources are being developed, and Urban Transport Photo CD-ROMs and DVD are available (some photos have been uploaded in http://www.sutp.org – photo section). You will also find relevant links, bibliographical references and more than 400 documents and presentations under http://www.sutp.org, (http://www.sutp.cn for Chinese users).

Modules and contributors

(i) *Sourcebook Overview and Cross-cutting Issues of Urban Transport* (GTZ)

Institutional and policy orientation

1a. *The Role of Transport in Urban Development Policy* (Enrique Peñalosa)
1b. *Urban Transport Institutions* (Richard Meakin)
1c. *Private Sector Participation in Urban Transport Infrastructure Provision* (Christopher Zegras, MIT)
1d. *Economic Instruments* (Manfred Breithaupt, GTZ)
1e. *Raising Public Awareness about Sustainable Urban Transport* (Karl Fjellstrom, Carlos F. Pardo, GTZ)
1f. *Financing Sustainable Urban Transport* (Ko Sakamoto, TRL)
1g. *Urban Freight in Developing Cities* (Bernhard O. Herzog)

Land use planning and demand management

2a. *Land Use Planning and Urban Transport* (Rudolf Petersen, Wuppertal Institute)
2b. *Mobility Management* (Todd Litman, VTPI)
2c. *Parking Management: A Contribution Towards Liveable Cities* (Tom Rye)

Transit, walking and cycling

3a. *Mass Transit Options* (Lloyd Wright, ITDP; Karl Fjellstrom, GTZ)
3b. *Bus Rapid Transit* (Lloyd Wright, ITDP)
3c. *Bus Regulation & Planning* (Richard Meakin)
3d. *Preserving and Expanding the Role of Non-motorised Transport* (Walter Hook, ITDP)
3e. *Car-Free Development* (Lloyd Wright, ITDP)

Vehicles and fuels

4a. *Cleaner Fuels and Vehicle Technologies* (Michael Walsh; Reinhard Kolke, Umweltbundesamt – UBA)
4b. *Inspection & Maintenance and Roadworthiness* (Reinhard Kolke, UBA)
4c. *Two- and Three-Wheelers* (Jitendra Shah, World Bank; N.V. Iyer, Bajaj Auto)
4d. *Natural Gas Vehicles* (MVV InnoTec)
4e. *Intelligent Transport Systems* (Phil Sayeg, TRA; Phil Charles, University of Queensland)
4f. *EcoDriving* (VTL; Manfred Breithaupt, Oliver Eberz, GTZ)

Environmental and health impacts

5a. *Air Quality Management* (Dietrich Schwela, World Health Organization)
5b. *Urban Road Safety* (Alan Ross, Krsto Lipovac, IRSC; John Fletcher, TRL; Jacqueline Lacroix, DVR; David Silcock, GRSP)
5c. *Noise and its Abatement* (Civic Exchange Hong Kong; GTZ; UBA)
5d. *The CDM in the Transport Sector* (Jürg M. Grütter)
5e. *Urban Transport and Climate Change* (Holger Dalkmann, Charlotte Brannigan, C4S; Benoit Lefevre, Angela Enriquez, WRI)
5f. *Adapting Urban Transport to Climate Change* (Urda Eichhorst, Wuppertal Institute)
5g. *Urban Transport and Health* (Carlos Dora, Jamie Hosking, Pierpaolo Mudu, Elaine Ruth Fletcher)
5h. *Urban Transport and Energy Efficiency* (Susanne Böhler, Hanna Hüging)

Resources

6. *Resources for Policy-makers* (GTZ)

Social and cross-cutting issues on urban transport

7a. *Gender and Urban Transport: Smart and Affordable* (Mika Kunieda; Aimée Gauthier)

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About the authors

Transport Research Laboratory (TRL), Berkshire, UK. Main author from TRL has been John Fletcher, Senior Road Safety Researcher.

The ***German Road Safety Council (DVR)*** was founded in 1969 as a non-profit organisation. The objective of the organisation is to support measures aimed at improving the traffic safety of all road users. The main emphasis is given to issues related to engineering, education, legislation and enforcement. DVR coordinates the different activities of its members, develops programs and adapts them to new challenges and research findings.

The ***Global Road Safety Partnership (GRSP)*** is an informal network of businesses, civil society organisations and relevant government departments. GRSP members have been identifying ways in which they can act together to improve road safety globally. The International Federation of Red Cross and Red Crescent Societies host the GRSP Secretariat at its headquarters in Geneva, Switzerland. GRSP aims to find more effective and innovative ways of dealing with road safety in developing and transition countries. Through a comprehensive approach to road safety, GRSP partners collaborate and coordinate road safety activities. This approach aims to build the capacities of local institutions and enhance the ability of professionals and communities pro-actively to tackle safety problems.

Author of the updated module

The International Road Safety Centre (IRSC) is a "**not for profit**" organisation based in Belgrade, Serbia to support low and middle income countries (LMICs) in their efforts to improve road safety in all 5 pillars of the UN Decade Action. It trains officials and organisations in road safety issues and in management development and implementation of National and Local Road Safety Action Plans and programmes. Trainer Courses are offered at IRSC or through partner organisations in country and training materials including textbooks, guidelines, manuals and lecture modules for universities to teach students in all 5 pillars are available from IRSC;
(more details from http://www.irscroadsafety.org).

Module 5b

Urban Road Safety

Update 2017

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1. Introduction

Rapid urbanisation in developing countries presents tremendous challenges to the transport systems of expanding cities if they are to meet the access and mobility needs of their communities and provide them with a sustainable, safe and healthy environment. Urban populations in developing countries are currently growing rapidly and by 2017 the majority of people even in low and medium income countries will be living in urban areas (WHO Global Health Observatory). To meet this expansion, many developing world cities are increasing the capacity of their road networks, but this is often at the expense of the safety of the vulnerable road users.

As a result, many people die and are injured unnecessarily in road crashes with the consequential social economic and health burdens imposing heavy constraints on sustainable development.

In 2013 around 1.25 million people died around the world as a consequence of road crashes and about 50 million persons received non-fatal injuries, about half of these are vulnerable road users (pedestrians, cyclists and motorcyclists) and many of these casualties happen in urban areas (WHO 2015). Road crashes now cause economic losses of up to 5 % of GDP in low and middle income countries (LMICs). More than 90 % of road deaths occur in LMICs, where the death rates (21.5 and 19.5 per 100 000 population respectively) are double those for high-income countries. Globally road traffic crashes are now leading cause of death among all those aged 15–29 years (WHO 2015).

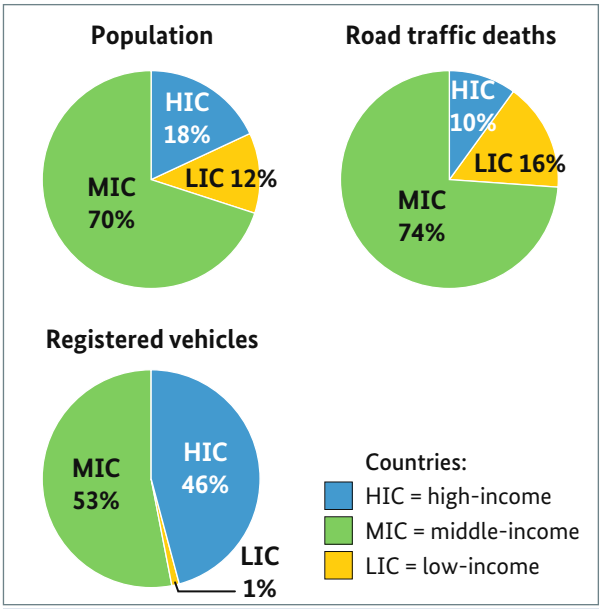


Figure 1: *Populations, road deaths and registered vehicle by income group.*
Source: WHO Global status report on road safety, 2015

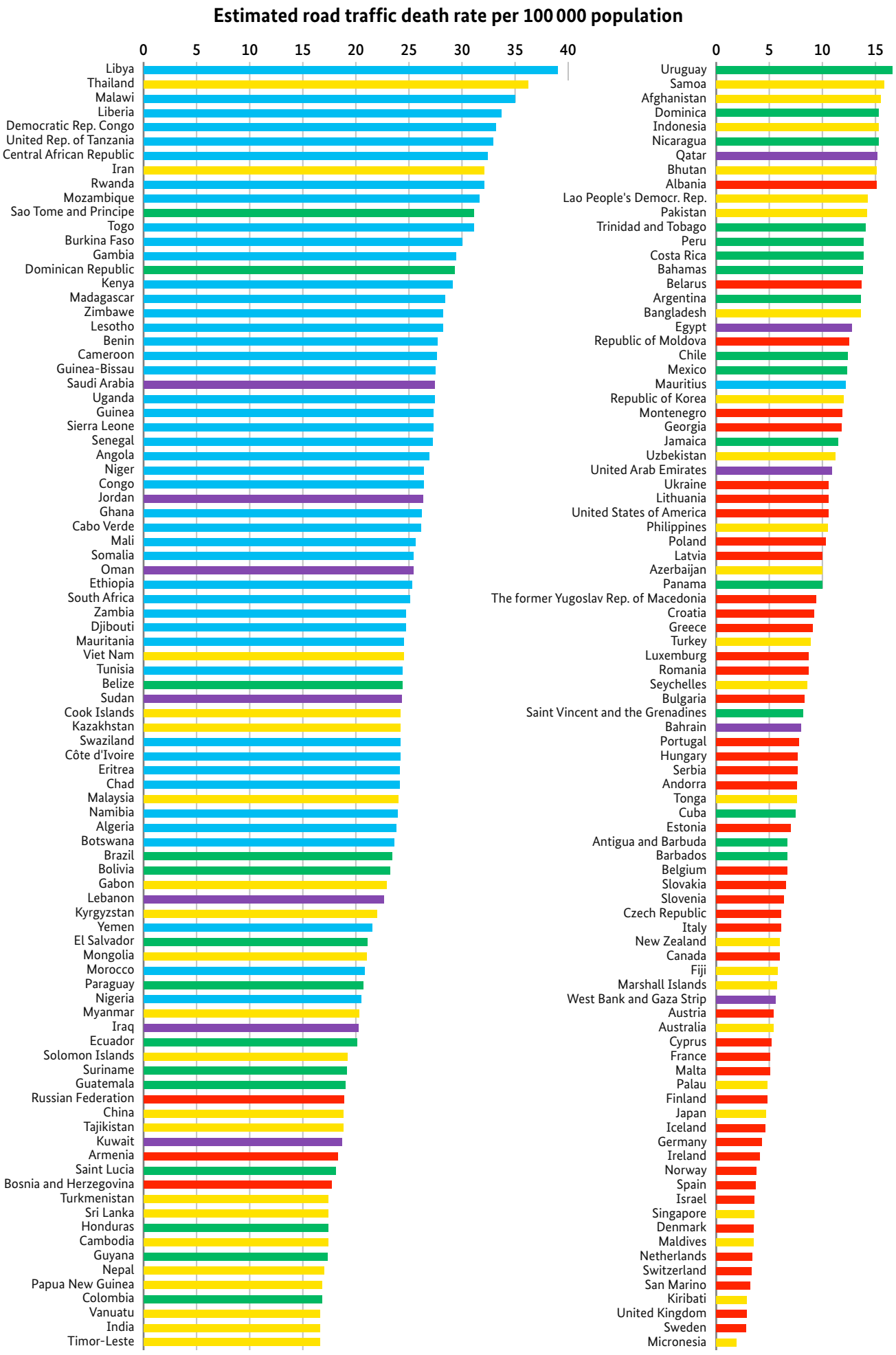
Comparing risk internationally

A number of different fatality rates can be used as indicators to compare risk of death in different countries. The most common rates and their characteristics are given below.

→ *Deaths per billion vehicle–kilometre*
This indicator describes the safety quality of road traffic and theoretically is the best indicator to assess the level of risk of the road network. This indicator does not take into account non-motorised vehicles (such as bicycles), which can in some countries, represent a large part of the vehicle fleet and of the fatality figures. Only a limited number of LMIC countries collect data nationwide on distance travelled and so it can rarely be used in LMIC countries.

→ *Deaths per 10 000 vehicles*
This rate can be seen as an alternative to the previous indicator, where the annual distance travelled is unknown. This indicator can therefore only be used to compare the safety performance between countries with similar traffic and car-use characteristics. It requires reliable statistics on the number of vehicles. In some countries, scrapped vehicles are not systematically removed from the registration database, thereby undermining accuracy. This indicator also does not take into account non-motorised vehicles (such as bicycles), which can in some countries represent a large part of the vehicle fleet and of the fatality figures. In addition, in countries where large parts of the population live in remote areas away from roads or where the vehicle fleet is not accurately known, this indicator can give misleading assessment of risk.

→ *Deaths per 100 000 population*
Since the population is readily available, this is most convenient to be used in most countries. This rate expresses the mortality rate, or an overall risk of being killed in traffic, for the average citizen. It can


Estimated road traffic death rate per 100 000 population
0
5
10
15
20
25
30
35
40
Libya
Thailand
Malawi
Liberia
Democratic Rep. Congo
United Rep. of Tanzania
Central African Republic
Iran
Rwanda
Mozambique
Sao Tome and Principe
Togo
Burkina Faso
Gambia
Dominican Republic
Kenya
Madagascar
Zimbawe
Lesotho
Benin
Cameroon
Guinea-Bissau
Saudi Arabia
Uganda
Guinea
Sierra Leone
Senegal
Angola
Niger
Congo
Jordan
Ghana
Cabo Verde
Mali
Somalia
Oman
Ethiopia
South Africa
Zambia
Djibouti
Mauritania
Viet Nam
Tunisia
Belize
Sudan
Cook Islands
Kazakhstan
Swaziland
Côte d'Ivoire
Eritrea
Chad
Malaysia
Namibia
Algeria
Botswana
Brazil
Bolivia
Gabon
Lebanon
Kyrgyzstan
Yemen
El Salvador
Mongolia
Morocco
Paraguay
Nigeria
Myanmar
Iraq
Ecuador
Solomon Islands
Suriname
Guatemala
Russian Federation
China
Tajikistan
Kuwait
Armenia
Saint Lucia
Bosnia and Herzegovina
Turkmenistan
Sri Lanka
Honduras
Cambodia
Guyana
Nepal
Papua New Guinea
Colombia
Vanuatu
India
Timor-Leste
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Samoa
Afghanistan
Dominica
Indonesia
Nicaragua
Qatar
Bhutan
Albania
Lao People's Democr. Rep.
Pakistan
Trinidad and Tobago
Peru
Costa Rica
Bahamas
Belarus
Argentina
Bangladesh
Egypt
Republic of Moldova
Chile
Mexico
Mauritius
Republic of Korea
Montenegro
Georgia
Jamaica
Uzbekistan
United Arab Emirates
Ukraine
Lithuania
United States of America
Philippines
Poland
Latvia
Azerbaijan
Panama
The former Yugoslav Rep. of Macedonia
Croatia
Greece
Turkey
Luxemburg
Romania
Seychelles
Bulgaria
Saint Vincent and the Grenadines
Bahrain
Portugal
Hungary
Serbia
Andorra
Tonga
Cuba
Estonia
Antigua and Barbuda
Barbados
Belgium
Slovakia
Slovenia
Czech Republic
Italy
New Zealand
Canada
Fiji
Marshall Islands
West Bank and Gaza Strip
Austria
Australia
Cyprus
France
Malta
Palau
Finland
Japan
Iceland
Germany
Ireland
Norway
Spain
Israel
Singapore
Denmark
Maldives
Netherlands
Switzerland
San Marino
Kiribati
United Kingdom
Sweden
Micronesia

be compared with other causes of death, like heart disease, HIV/Aids, etc. It is useful to compare risk in countries and is the rate used by WHO and the UN in tracking changes in countries during the UN Decade of Action on road safety. Fatalities per 100 000 inhabitants is the indicator used most often.

Who is killed and what are the impacts?

The majority of road crash victims in developing countries are not motor vehicle occupants, but pedestrians, motorcyclists, bicyclists and non-motorised vehicle occupants. Poor driving, poor vehicle standards and overloading of unrestrained passengers also make buses and taxis very dangerous in LMICs, frequently resulting in multiple fatalities or injuries in a single crash. As the poor are most likely to use the roads as pedestrians, bicyclists, motorcyclists, or as users of public transport, they are greatly over represented in, and affected by, road crashes.

Road deaths were ranked 9th in 2004 as a cause of lost years of life and are expected to be ranked fifth by the year 2020. Increasingly road crashes reduce social welfare (see Box 1). The economic cost of road traffic crashes globally has been estimated at USD 518 billion. Road traffic crashes cost most high income countries between 1–2 % of their gross national product, GDP although this can reach 5 % (in low and middle income countries).

Road injury is now the leading cause of death for 15 to 29 years old and also the second major cause for 5 to 14 years old (WHO 2015).

"In developing countries the situation (road safety) is made worse by rapid and unplanned urbanisation. The absence of adequate infrastructure in our cities, together with the lack of a legal regulatory framework, makes the exponential rise in the number of road accidents all the more worrying. The statistics show that in Brazil, 30 000 people die every year in road accidents. Of these, 44 % are between 20 and 39 years of age, and 82 % are men."

Luis Inácio Lula da Silva, Former President, Federative Republic of Brazil (cited in WHO 2004)

This quote really emphasizes the involvement of breadwinners in road traffic crashes and as Box 1 shows the impact on families can be devastating. The effect of young, productive people being killed or injured in road crashes has not only a huge impact on the economy, but also on the dependent families that they leave behind or burden once seriously injured.

The cost of crashes in urban areas has also been calculated to be very significantly higher than those occurring in rural areas due primarily to the much higher costs of congestion and hence loss of "time" to other road users when this is included. A recent national road crash and injury costing study for Thailand estimated that for this reason the costs associated with road casualties in Bangkok were

Figure 2: *Average rates of deaths/100 000 population (in 2013) in WHO regions.*

- UN Economic and Social Commission for Asia-Pacific (UNESCAP)
- UN Economic Commission for Europe (UNECE/and Mediterranean countries)
- UN Economic Commission for Africa (UNECA)
- UN Economic Commission for Latin America and the Caribbean (UNECLAC)
- UN Economic and Social Commission for Western Asia (UNESCWA)

Note: Libya Actual rate is 73.4

Source: Based on WHO global status report, 2015 and chart produced by Alan Ross

Africa	26.6
Eastern Mediterranean	19.9
Western Pacific Region	17.3
Southeast Asia Region	17.0
Region of the Americas	15.9
European Region	9.3
Worldwide	17.4
Average EU countries	6.0
Best countries:	
Sweden	2.8
UK	2.9
Netherlands	3.4

over ten times greater than those occurring in much more rural areas (Prince of Songkla University 2007).

The role of local authorities in reducing road casualties is crucial. However, despite the need to improve the situation, a comprehensive road safety strategy is seldom top of the local political agenda. Inefficient political decision-making processes, other issues such as the management of traffic flows, spatial and urban planning, economic and financial problems often hinder local authorities in taking steps to improve road safety. Nevertheless, all local authorities, whether or not they have a statutory responsibility for road safety, must recognise that they play a key role in reducing road casualties through their road management functions and their local influence. An urban safety management strategy should be developed which focuses on reducing the number and severity of road crashes within the context of the development and transport goals of the

Figure 3: *A Matatu after a crash, Nairobi.*
© Manfred Breithaupt, Nairobi, Kenia, 2016

Box 1: The role of road injuries in increasing poverty

TRL, together with local partners conducted large-scale house-hold surveys to assess both the scale and longer-term consequences of involvement in road crashes in two locations in North Asia. Stratified cluster sampling of 83 199 households in Bangladesh and 19 797 Bangalore (India) in pre-selected rural, urban and slum areas was carried out. The interviews were supplemented by contacting 156 bereaved households (from police records) and 367 seriously-injured victim households (from hospital records) in Bangalore (see full report for details). The main results were as follows:

Impacts on households

While only one household member may be involved in a crash, the impacts will be felt by the whole household, which includes, on average, another four people.

Direct and indirect costs

Road crashes impose a double financial burden on poor households. At the same time that they face unexpected medical, if not funeral, costs, they also lose the income of the victim and/or carer. Urban poor Bangladesh households paid the equivalent of almost three months household income on funerals, a significantly greater pro-portion of household income than the non-poor.

Consequences

Over seven out of ten poor families suffered a decrease in total household income after a member was killed or seriously injured in a road crash. Less income means less food to eat. Seven out of ten Bangladesh poor bereaved households reported food consumption decreased after a road death. While the impact was slightly less on the seriously injured households, the poor were significantly worse affected than the non-poor (59 % of urban poor vs 25 % non-poor). The burden from road crashes appears particularly high, tipping many households into poverty. In Bangalore 71 % (urban) and 53 % (rural) of poor households interviewed were not poor before the fatal crash.

Aeron-Thomas A, G Jacobs, B Sexton, G Gururaj and F Rahman (2004), *The involvement and impact of road crashes on the poor: Bangladesh and India case studies*, TRL, Crowthorne, UK.

http://www.grsproadsafety.org

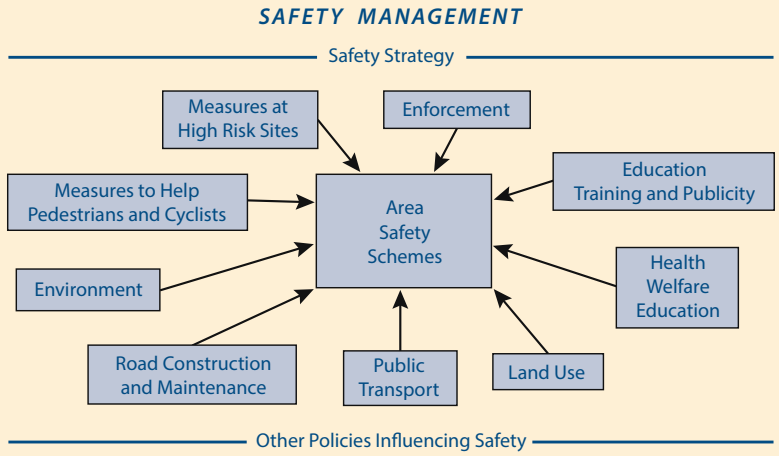
Box 2: Urban Safety Management

Urban Safety Management (USM) has been developed and effectively used to specifically improve road safety in built-up areas. The approach has been championed in the UK and the Netherlands, and TRL produced a manual specifically adapting the methodology for LMICs (TRL 2004).

The USM approach has been shown to reduce casualties in towns and cities by tackling accident problems on a broad front. The approach is relevant to all built-up areas in which drivers have substantial choice of route. For free-standing towns, the approach can be applied to the urban area as a whole. In larger cities, it will usually be more practical to divide the urban area into sub-areas each of which can be considered as a whole. The approach requires all interest groups to work closely together to raise the profile of traffic safety in town management and planning.

The USM approach should be used for the following reasons:

- In urban communities, multiple objectives are set concerning the promotion of local activities and the movement of traffic, often under competing interests. In this context, road safety problems cannot be treated separately.



- Accidents are usually dispersed across an urban area. However, this distribution is subject to fluctuation. Therefore, it would be inappropriate to design countermeasures for individual accident sites only.
- Safety measures are more effective if they form part of a comprehensive safety policy. To ensure maximum impact complementary measures of a policy should be identified and co-ordinated.
- Traffic safety may not be a leading priority issue for local policy-makers or citizens. Therefore, as well as direct safety initiatives, there is a need for embedding safety measures in other policies.
- Integrated safety programs help local authorities compile a complete picture of existing problems before defining priorities for action.

Elements of Urban Safety Management approach

USM defines the principles of a good safety management strategy as one which:

- Formulates a safety strategy for the urban area as a whole;
- Integrates safety with other urban strategies (*e.g.* transportation, land use planning, Safer Routes to Schools);
- Considers all kinds of road users, especially vulnerable road users;
- Considers the functions of different kinds of road;
- Integrates existing casualty reduction efforts into the strategy;
- Uses opportunities where other policies and strategies may help to enhance safety (*e.g.* improving safety within an urban regeneration project);
- Encourages all professional groups to help to achieve safety objectives;
- Guards against possible adverse safety effects of other policies;
- Encourage residents and all road users to become actively involved in the process and thereby take ownership of it;
- Translates the strategy and objectives into local area safety schemes;
- Monitors progress towards the safety objectives.

Adapted from:

http://www.transport-research.info/Upload/Documents/200310/dumas.pdf

local authority. The Urban Safety Management (USM) approach is outlined in Box 2.

Widely acknowledged strategies to improve urban road safety include:

- Coordinating road safety policies with other planning aims (Section 2 of this module);
- Assessing the problem and setting targets for casualty reductions in road safety Action Plans; (Section 3);
- Creating a safer road environment (Section 4);
- Raising public awareness and improving education (Section 5);
- Traffic law enforcement to encourage safe road user behaviour (Section 6);
- Promoting use of safer vehicles (Section 7);
- Providing assistance to road crash victims (Section 8);
- Sound financing of road safety policies (Section 9);
- Integrating all of these elements into a "comprehensive road safety policy" (Section 10).

All road safety activities should be monitored to ensure that the money is being spent effectively and lessons are learned about the most and least successful measures and schemes. Monitoring of an action plan must focus on whether the objectives are being achieved.

"Safe Systems" approach

Currently the recommended approach to improving road safety further amongst the best performing countries is the "Safe Systems" approach.

The main underlying principle is that human beings will always make errors and because of this, it is essential that when a crash does occur exposure to forces that could potentially kill or seriously injure must be minimised and design of the "system" should seek to ensure that happens.

Developed from successful approaches to safety employed in more predictable, closed situations such as rail or air travel, etc. the safe systems approach aims to manage crash forces in the case of a collision on the road. The Safe Systems approach is appropriate for all countries, not just the high achieving High Income Countries (OECD/ITF 2008).

Why do we need Safe System approach?

This is needed:

- To alter public and policy-maker perceptions of what is possible;
- To avoid the negative effects of policy fatigue and fragmentation with each stakeholder working in isolation ('silo syndrome');
- To advocate shared responsibility for holistic and multi-sectoral road injury prevention strategies.

The approach also emphasizes:

- Network infrastructure improvements with posted speeds appropriate for function of that road and the level of protection required to minimise injury;
- Economic approach to emphasize the scale of the issues and to target actions to gain maximum returns and impact;

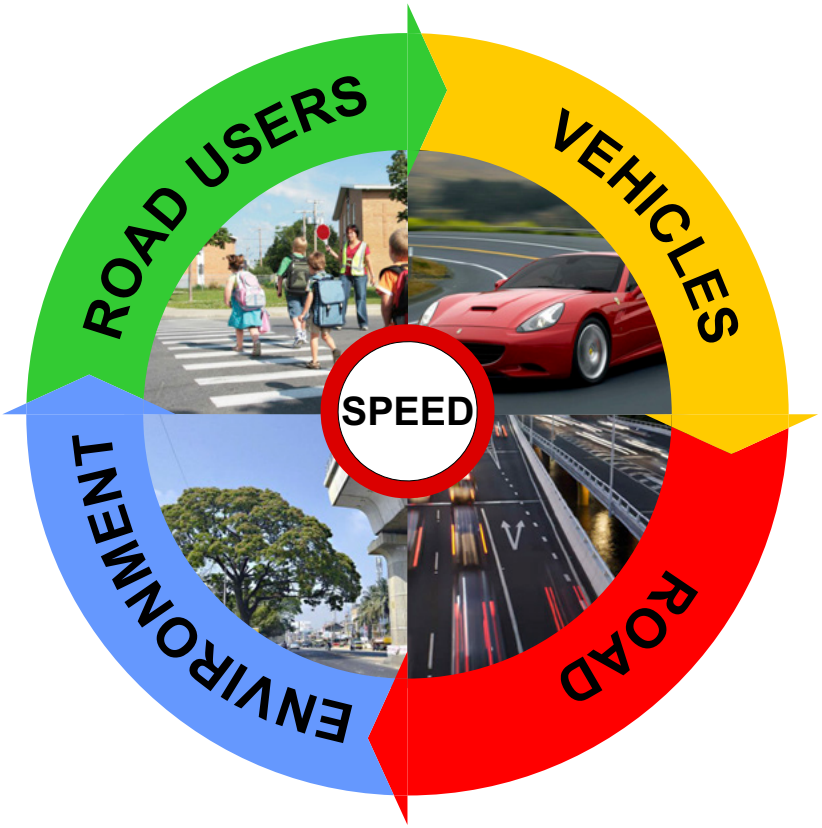


Figure 4: *Elements of a safe system approach.*
Source: K. Lipovac, International Road Safety Centre, Belgrade, Serbia

- Development of comprehensive and inclusive management structures for safe transport operation;
- Seeing safety in the wider context of broad economic development, environmental and health goals; and
- Shared responsibility for safety by all stakeholders.

With the global vision now in place through the UN Decade of Action on Road Safety countries and individual agencies must show leadership in setting ambitious goals and targets as part of the safe system approach. The goals and targets must be **SMART**:

- **S**pecific – target a specific area for improvement;
- **M**easurable – quantify or at least suggest an indicator of progress;
- **A**ssignable – specify who will do it;
- **R**ealistic – state what results can realistically be achieved, given available resources;
- **T**ime-related – specify when the result(s) can be achieved.

Vision zero

Vision zero is an initiative adopted by the Swedish Government. The basis of the philosophy is the idea that no fatal or serious injuries need occur on any roads providing that the vehicle, driver and infrastructure adhere to standards which are currently achievable.

Vision zero encompasses the "Safe Systems" approach to minimise chances of death or serious injury. Thus vehicle speeds on streets where pedestrians are present must be below those which will result in serious injury to those outside the vehicle in the event of a collision.

Similarly, high speed roads should be physically divided to ensure that opposing vehicles cannot meet in a head on collision.

Transport systems are traditionally designed for maximum capacity and mobility, not safety. This means road users have in the past been held responsible for their own safety. The Vision Zero Initiative takes the opposite approach. The main burden for safety is placed on system design. Ultimately, no one should die or suffer serious injury in traffic because the subsystems should be designed to prevent death or severe injuries. This can be done through safer designs. Box 3 shows how safe system concepts can be brought into design of intersections.

Box 3: Safe Intersection Design Principles (SIDPs)

Principle 1 – *key principle* – limit travel speeds through intersections to 50 km/h

Principle 2 – *important principle* – avoid 90-degree impact angles

Principle 3 – *important principle* – physically separate vulnerable road users or provide travel speeds < less than 30 km/h

Principle 4 – *supporting principle* – limit point of conflict

Principle 5 – *supporting principle* – promote active mutual responsibility at intersections

Source: Candappa et al., 2015

2. Organisation of Road Safety

International experience shows that two aspects of road safety make it difficult to manage effectively. First, road safety involves a great number and variety of stakeholder organisations to cover all aspects of the relevant safety issues at National and Local level.

At National level there needs to be clear delegation of responsibility to one single organisation to coordinate and manage road safety activities. Two alternative approaches have been developed to organise road safety at the National level. One approach favours the establishment of a "National Road Safety Council" (NRSC) or Commission with a Secretariat to carry out the work, the other promotes a Lead Agency from among the various existing institutions involved to manage and coordinate activities and to provide the secretariat function from within. Both approaches, however, aim at allocating responsibility at National level and developing effective coordination of stakeholder activities horizontally at National level and vertically with activities undertaken by local stakeholders at Municipal or local administration level.

Local administration level public bodies responsible for traffic management, maintenance and construction, the police, school administrations and civic and advocacy groups at the local level (such as health care/emergency medical services, the local private sector and, last but not least, concerned citizens) are the key players in improving safety on local road networks of municipalities and local administrations. At local level there is also a need to develop horizontal coordination (to cover all key stakeholders at local level) and vertical coordination (to integrate activities vertically for with national and provincial initiatives municipal and community levels).

Secondly, the various organisations do not usually have road safety as their primary objective. Hence, road safety activities often get neglected. In order to overcome these difficulties, local authorities should make maximum use of their influence in support of road safety promotion. Therefore, they should ensure coordination between the various disciplines, institutions and organisations involved. Only if a community takes ownership of the road safety issue, can real changes take place. So all and any road users, in any capacity, and by any mode are stakeholders for safety.

Given the multi-faceted and multi-level nature of road safety, co-ordination of road safety is essential (GRSP 2001, Road Safety Management, Information Note 1).

Box 4: Capacity reviews

The World Bank recommends that a road safety management capacity review is undertaken in any country to establish a clear list of actions and targets before any major investment program which aims to reduce the problem of road safety.

The recommendations of the World Report (2004) highlight safety management issues at the global, regional and country levels and emphasize the building of institutional capacity to manage for results. In particular, the recommendations emphasize the importance of implementing a systematic and sustained response to govern road safety outcomes at the country level and place prime importance on the vital role of the lead agency in this process.

These implementation guidelines focus on strengthening the road safety management system and place special emphasis on related lead agency responsibilities in ensuring institutional efficiency and effectiveness.

Box 4 shows the World Bank approach to capacity building and Box 5 gives guidance on establishing a road safety working group.

Environment and planning for safety

There is currently increasing concern over the environmental consequences of the use of fossil fuels for vehicular transportation. The problems are both immediate (such as the impact on health because of the pollution produced) and longer term and most significantly the contribution of greenhouse gases to climate change. Increased reliance on motorised transport will also have a significant impact on health since it will result in greater levels of obesity.

For these reasons it is becoming increasingly clear that future transport planning should try to minimise or control the option of "one person in one car". Thus measures are being promoted to encourage people to go on foot or bicycles for relatively short journeys, and ideally on public transport for longer journeys. There are clear

implications and potential concerns for road safety since these measures encourage vulnerable road user modes. It is therefore vital that these schemes plan adequately for the safety of these road users through appropriate provision of footpaths and crossings for pedestrians, and segregation of two wheelers and animal carts from other faster traffic.

Transport plans which aim to reduce reliance on the car by encouraging trips by public transport can potentially improve safety by reducing the populations' exposure to unsafe trips. This is conditional on their being higher safety levels of the alternative modes which are provided. It is therefore necessary to have road worthiness technical inspections of public transport vehicles at least twice a year to ensure they are safe.

Similarly, the better planning and location of amenities such as schools, offices and shopping facilities so they are located away from fast moving traffic routes can play an important part in creating safer road networks in communities.

Depending on the organisational structures in a country, working groups, road safety units or commissions can be established to provide consultation mechanisms, to exchange information, to design a strategic urban road safety plan or program, and to implement the measures and activities.

A strong link between the police authorities and the local agencies related to road traffic management and road building and maintenance should be established to exchange information about crash sites and characteristics. Road safety units have been established, for example, in Ghana, Serbia and Fiji where they work successfully in the identification of black spots and dangerous sections of the road network and in the development of site treatments, such as low cost engineering measures or targeted law enforcement.

Local politicians play an important role when decisions have to be taken related to road safety strategies and the implementation and financing of road safety measures. The local administration should therefore keep up a

Figure 5: *A busy street scene in Bhubaneswar, India, with a broad mix of types of road users.*

Box 5: Establishing a road safety working group or commission

- Designate or elect a chairperson and determine what other executive officers may be necessary;
- Decide how membership will be determined and how long members will remain involved;
- Specify the length and frequency of meetings;
- Determine the procedure for making decisions (consensus, majority vote, board decision);
- Workgroup (fund-raising committee, planning committee, public relation/communication), or by priority areas (safety belts, impaired driving).

Source: NHTSA-safe communities

continuous dialogue with these political representatives to raise their awareness of road safety issues.

Serbia is a particularly good example of a country where road safety has been stimulated at local authority level to such an extent that there are around 170 community road safety action plans being implemented now across the country which are consistent with and support the National Action Plan for Road Safety. These local Action Plans are funded from 30 % of the Traffic fines collected in that community.

Co-operation between the public authorities and the non-public sector has been successful in many countries especially in the field of information, education and awareness raising. Public-private pilot projects supported by the Global Road Safety Partnership (GRSP) related

Figure 6: *Elderly people belong to the most vulnerable groups of the society with regard to road traffic accident risk.*
© Claudio Varano, Lima, Peru, 2005

to children's safety in Warsaw and Bucharest are good examples of sharing road safety responsibilities.

Alongside government and businesses, representatives of civil society are increasingly being recognised as an important partner in the delivery of road safety. Representatives of civil society may include those representing or caring for those involved in road crashes or their families (*e.g.* red cross/crescent societies, bereavement organisations), or those that represent the road users (*e.g.* automobile clubs, motorcycling groups, pedestrian or cycling associations, groups representing the elderly or blind). These organisations often have an extremely wide reach through their membership, and can inform a large proportion of society about road safety through their communications activities. The Global alliance for Road Safety NGOs identifies road safety NGOs in each country and supports such activity (http://www.roadsafetngos.org).

The design of a road safety plan which allows the participation of all major stakeholders should be elaborated by identifying areas that need improvement (UNESCAP, 2001). Goals have to be set and partners need to agree to them. Too many and too ambitious, or even unrealistic, goals would undermine the motivation of all participants, but realistic targets can be a powerful motivation. A step by step approach is recommended. It is important to focus plans on the highest at risk groups (often most vulnerable groups, such as children, elderly, poor and non-motorised transport users) and the high at risk behaviours (*e.g.* excessive speed of driver, non-wearing of seatbelts). It is important to keep the plans simple.

Box 6: Global under-reporting

Global status report on road safety time for action, WHO 2015

The WHO conducts a major exercise periodically to gather statistics on road deaths and injuries in member states, as well as on the status of traffic laws and levels of enforcement. The results indicated that surveillance of road deaths globally is poor, especially, but not exclusively in LMICs.

The latest report in 2015 shows that huge gaps remain in the quality and coverage of the data that countries collect and report on road traffic injuries. Reliable data on fatalities and non-fatal injuries are needed by countries to assess the true scope of the road traffic injury problem, to target responses to it, and to monitor and evaluate the effectiveness of intervention measures. Underreporting of road traffic fatalities remains a big problem in many countries, and the situation is even worse with regard to non-fatal injuries.

The WHO process also undertakes a modelling exercise, which takes account of population, vehicle fleet, health services and other factors to estimate what the realistic numbers of road death numbers could be, with some startling differences identified between official numbers and the probable actual numbers.

The total number of deaths reported in this latest survey is approximately 660 000 (using a 30-day definition for fatalities), indicating vast underreporting. When these data are modelled and corrected the total 30-day number for the 180 countries included in the study is 1.25 million.
The report also provides an overview of common safety related legislation in the countries.

Source: http://www.who.int/violence_injury_prevention/road_safety_status/2015/en

3. Assessing the Problem

Assessing the road safety problem at the local level requires a clear understanding of the numbers, distribution and characteristics of crashes and casualties and of the physical and social environment within which the solutions must be developed. Crash and casualty data are commonly collected by the police but there is an acknowledged problem both of access to data being withheld and of under-reporting. The extent of underreporting is much greater in LMICs, so the scale of the problem is often very much larger than revealed by official police statistics (see Box 6) and in addition the problem is still growing in many LMICs (Box 7).

Given this, it is often found useful to collect road casualty data from several sources, particularly in the health sector, in order to supplement police data to get an overall picture of the problem. However, the data collected by the police is usually the only source from which detailed information about the nature of individual crashes can be obtained and these data are essential for detailed analysis of problems at specific locations in order to design remedial measures and for other stakeholders to be able to deliver interventions in their respective areas. Police report forms should permit the collection of data related to:

Box 7: Traffic fatalities increasing in poor countries

Traffic accidents are a major cause of death and injuries worldwide, but while generally declining in the developed world, fatalities are still on the rise in many Low and Medium Income countries (LMIC).

The close correlation between health and economic growth was unveiled in a report from the World Health Organization (WHO). A commission chaired by the US economist Jeffrey Sachs claims that each 10 % improvement in life expectancy spurs between 0.3 and 0.4 percentage point rise in economic growth rates.

Road accidents turn out to be a substantial cause of death in many areas of the world. Although still a problem in developed countries the deaths in High income countries are low when measured against traffic fatalities in developing countries where 90% of the road deaths now occur although they have only 54% of the Global vehicle fleet. Worldwide, road accidents are now primary cause of death in the 15- to 29-year-old age group and the second biggest killer of the children with over 500 children dying every single day in traffic accidents (WHO 2015).

Average road deaths per 100 000 population are 24.1 for low income, 18.4 for middle income and 9.2 for high income countries. The trends are also highly variable across the different regions of the world.

During the last decade. most industrialised countries have experienced substantial reductions in traffic fatalities (*e.g.* down 50 % in Western Europe). Safer vehicles and highway designs and better post-accident care are reducing deaths in 40 middle income and 35 high income countries but deaths have increased in 23 low income, 34 medium income and 11 high income countries (WHO 2015).

Whereas the situation is improving in most high income countries, words like “unacceptable” and “dangerous” are often used to describe the situation in the developing World – and the situation appears to be deteriorating. Low-income countries suffer some 80 times more traffic fatalities per vehicle than high-income countries (albeit the difference in fatalities-per-capita is less severe). Pedestrians, cyclists and motorcyclists are generally disproportionately represented (typically accounting for 50% of victims) among accident victims – and so are poor people. The absence of institutional, engineering and infrastructure interventions are more important explanations than merely the numbers of cars. Lack of adequate driver training, public education and insufficient law enforcement are other reasons behind the statistics.

Furthermore, as Global NCAP has shown unsafe cars continue to be sold in LMICs by major motor manufacturers because countries do not have adequate legislation to prevent import of such less safe vehicles (http://www.globalncap.org).

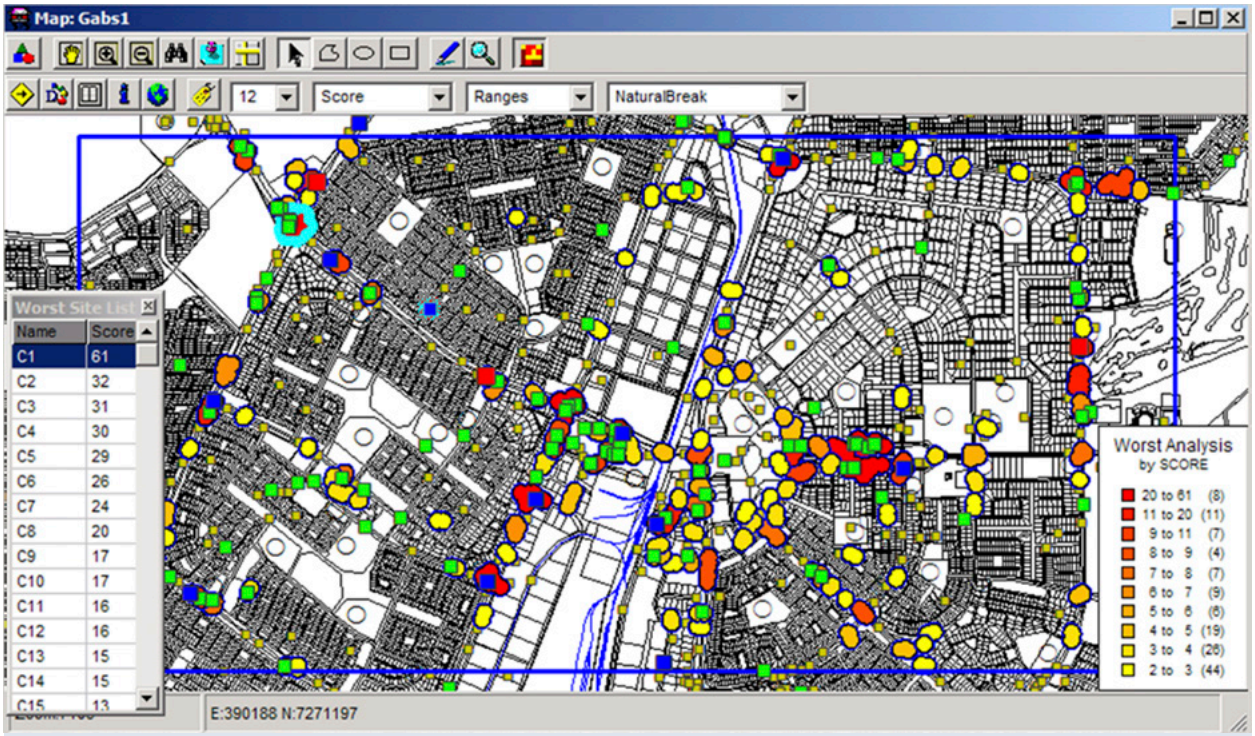


Figure 7: *Cluster analysis for Central Gaborone, Botswana.*

- The precise location of each crash (particularly by map coordinates or GPS, also by road name, road class);
- The time – by year, month, day of the week, time of the day;
- The participants', casualties and vehicle details including age, sex, vehicle types (including pedestrians and animals);
- The outcome of the collision such as the severity of injuries and material damage;
- Road conditions – such as junction type, signs, road markings, roadside obstacles;
- Environmental factors such as light conditions and weather;
- A written description including a collision diagram showing manoeuvres made before the crash; and
- Other contributing factors such as alcohol use, traffic law violations, use of seat belts or helmets.

The Common Accident Database Set (CADaS), initiated by the EU, identifies the key items needed for effective crash data analyses and many countries are now adopting this. Analyses systems should enable investigators to identify themes in the data, for example alcohol use or excessive speed, in order to direct appropriate treatments, enforcement strategies or educational needs. Crash location maps have also proven to be a useful tool. They can be produced by using computer-based software and mapping, which is now increasingly available even for LMICs through "off the shelf" PC based crash data systems that can be adapted to local needs and local language or even applications such as Google Maps. These maps allow identification of so called "black spots"; stretches or road sections of a road with a concentration of crashes which may be reduced through low cost road engineering treatments. With computerised records, modern software enables investigators to carry out in-depth analyses of the data (see Figure 7).

Another useful tool is a collision diagram (Figure 8), especially for dangerous locations where data from a number of crash records at a single location can be studied. They provide information about the manoeuvres undertaken when the crash occurred, *e.g.* turning to the left/right or pedestrian involvement. Common features in the diagrams for a specific site identify the particular problem which a remedial treatment should address.

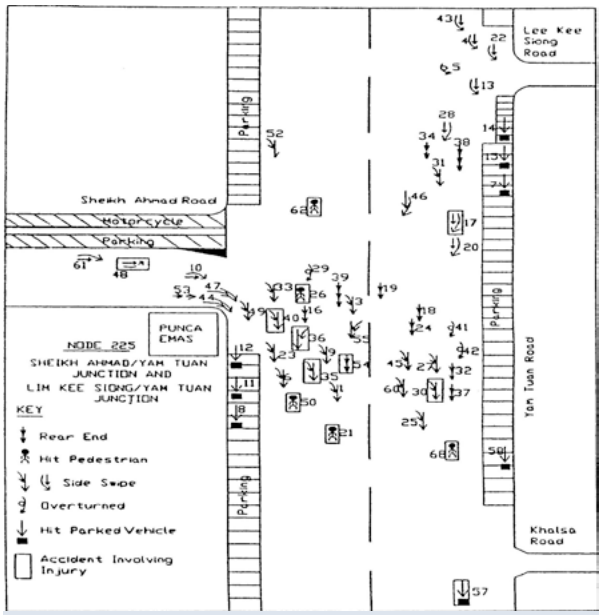


Figure 8: *A collision diagram from Malaysia.*
© TRL/JKR 1995

The data should be supplemented by traffic and appropriate demographic information to achieve a comprehensive analysis which identifies higher than expected crash rates, or unusually high proportions of a particular crash type. Site investigations are also crucial in addition to the desk studies for identifying road infrastructure problems and appropriate engineering solutions.

The inspections should also be carried out at the relevant locations and time periods, when crashes occur. For example, for those places where crashes are identified to occur more frequently at night, check whether visibility or light conditions may be contributing to the problem.

Also, comprehensive site investigations are important for the Court to determine responsibility for the accident. If an investigation is properly conducted, it will be easier to conduct court proceedings.

Box 8: Deaths per hour: 2.4

The severity of road safety problems in developing countries is illustrated by the following article. Many aspects mentioned in the article (*e.g.* cooperation between agencies) are discussed further in this module.

Death toll hits 59 in mass exodus ahead of Thai holiday

BANGKOK, April 12 (AFP) – The death toll from road accidents hit 59 on Friday and 3 000 others have been injured as Thais stage the annual mass exodus from Bangkok to celebrate the traditional new year, officials said.

"As of now there has been an average of 2.4 people dying and 155 injured every hour", Public Health Minister Sudarat Keyuraphan said in a statement after the first 24 hours of the toll count. In the hopes of curbing the fatalities that marr celebrations for the "Songkran" water festival every year, police have said that a drink-driving ban will be strictly enforced. National police and the public health and communications ministries have joined forces to set up 100 checkpoints across the country to test motorists for alcohol usage. If found to have imbibed, they face a jail.

During last year's six-day Songkran festival some 530 people died and 32 014 were injured in road accidents. This year, public health officials are braced for the toll to rise to 600 (AFP, 12 April 2002).

Figure 9: *A combination of low cost measures such as better channelisation, medians and traffic signs, for example – could have averted this accident in Bangkok, Thailand, which was caused by confusion surrounding a contra-flow bus lane.*
© Karl Fjellstrom, December 2001

4. Creating a Safer Road Environment

The process of adapting the layout and use of roads and footways in urban areas to manage the exposure of road users to risk will be in many cases a lengthy one. At every stage in this process, the responsible authorities should be taking all practicable and affordable steps to reduce casualties in the prevailing situations and to contribute to their further reduction in the longer term. Short term measures should address the existing transport system as a whole to reduce the number of collisions and injuries. Longer term measures must consider the planning and development issues surrounding the growth of the urban areas and focus on policies that prevent the creation of new situations in which life and limb are put at risk. This requires effective Access Control and Development Control procedures where the road safety unit of the roads authority have to be consulted to give approval for any scheme that allows a new road connection/access or increases significantly the traffic entering the road network of that road authority.

Figure 10: *Busy road without proper sidewalks.*
© Manfred Breithaupt, Downtown Nairobi, Kenya, 2016

All new road proposals should also be subject to a safety audit, by independent safety specialists (see Box 10).

The systematic identification and treatment of hazardous locations on the urban road network has great potential in reducing the number and severity of crashes. These short-term measures can be low cost, easy to implement and often do not need long bureaucratic procedures (see Towards Safer Roads TRRL/ODA, 1991 and the iRAP "Toolkit" http://toolkit.irap.org and http://safe-roads.net/en). Systematic analysis of collision diagrams and crash reports identify the low cost features which should be improved. They often include:

- Improvement of traffic signs;
- Improvement of road marking and delineation (for example bus, motorcycle or cycle lanes);
- Small construction measures which can be integrated in road maintenance activities such as improvement of the road surface or channelisation of junctions.

Box 9: Building and managing safer road networks

Roads authorities provide the road infrastructure where crashes and casualties occur but often, especially in LMICs, do not take adequate responsibility for safety of new or rehabilitated roads. It is therefore important to ensure that they have suitable structures and procedures in place to ensure safety on their road networks. This can be done in several ways:

1. ISO 39001 Assessments can be useful to check that the roads authority whether National, Provincial or Municipal has the correct organisation and procedures in place to manage and maintain road safety on their network.
2. Application of EU Directive 2008/96 is increasing being supported by Development Banks even outside Europe as it specifies the sorts of activities (Road Safety Audit, Black Spot Management, road safety Impact Assessment) that a good roads authority should be doing to ensure it is operating a safe road network.
3. The most effective way to ensure road authorities at each level take more responsibility for road safety on their networks (whether National, Provincial or Municipal) is to make road safety a statutory obligation and responsibility of the road authority at each level so that they have to report each year on the road safety situation on their network and what they have done to improve road safety and to reduce casualties.

Box 10: Road safety audit

Road safety audit has been mandatory on major road schemes in the UK for many years and is now also a legal requirement in Australia, New Zealand, Germany, Denmark and many other High Income countries around the world. Many countries have now developed good guidelines in this field, and the practice is spreading to low and middle income countries, particularly for schemes funded by international donors. The Public Works Department of the Government of Malaysia for example, has developed, and uses, a good set of road safety audit guidelines (JKR, Malaysia, 1997). These define road safety audit as: "*the formal examination of the planning, design and construction of a road project, and of the characteristics and operation of an existing road, by independent and qualified examiners, to identify any potentially unsafe feature or operational arrangement that may adversely affect the safety of any road user.*" It is important to recognise that this process:

- Is formal and independent of the design;
- Is done at various stages in the planning and design process;
- Is carried out by properly qualified staff; and
- Considers the safety of all types of road user.

Towards more liveable and safer cities: Examples for safe road infrastructure design

The GIZ publication "Towards more liveable and safer cities: Examples for save safe road infrastructure design" shows selected examples of low-cost and easy to implement solutions, including

- Pedestrian curb extensions
- Crosswalks (pedestrian crossings)
- On-street parking
- Pedestrian refugee islands
- Raised sidewalks at driveway intersections
- Road narrowing
- Small roundabouts
- Traffic diverter
- Traffic calming
- Plantation

Download: http://www.sutp.org/files/contents/documents/resources/J_Others/GIZ_SUTP_Towards-more-livable-and-safer-cities_Examples-for-save-road-infrastructure-design.pdf

Some countries report poor performance of road signs and markings, largely because of poor understanding and compliance by road users. Trials can help identify such potential difficulties, and integration with publicity and enforcement may help overcome poor compliance.

"Well-designed measures, based on analysis of crash records, have shown a great potential in reducing the number and severity of accidents, often at low cost."

It is important that road safety benefits are not arbitrarily ascribed to highway/road proposals or developments without a proper assessment of their casualty reduction potential. Therefore, all staff involved in the design and implementation of management schemes should have an understanding of crash prevention principles and easy access to relevant data for evaluation.

Pedestrians and cyclists are the most vulnerable road users and contribute 50% of the deaths in LMICs. They are often at risk due to the conflicting use of the same road space by different types of road users, for example pedestrians are often forced to use the roadway because of the absence of sidewalks or obstacles on a sidewalk

Figure 11: *Four Modes, four different lanes – Mode separation for light rail, motorised traffic, cyclists and pedestrians.*
© Andrea Broadous, Bilbao, Spain, 2008

(Figure 10). Measures to benefit non-motorised transport users and urban planning objectives must be developed (ETSC, 1999). In the UK, the Institution of Highways and Transportation suggest that the following hierarchy of measures should be considered before a design solution is chosen:

(1) traffic reduction,
(2) speed reduction,
(3) junction treatment,
(4) redistribution of road space, and
(5) provision of special facilities such as pedestrian crossing islands or cycle paths (for further information, see http://www.ciht.org.uk).

Speed

Speed reduction is an especially important tool for improving safety on roads. At lower speeds crashes are less likely to occur since the driver has more time to react and resulting injuries will be less severe. Controlling vehicle speeds is one of the main mechanisms to moderating the potential for energy transfer between parties in a crash and thus a key element of the Safe Systems approach. ***Reducing the average speed by only 5 km/h — reduces the number of injury crashes by 10–14 % and fatal crashes by 15–22 %.***

In urban areas of some European cities permitted speeds have been lowered to 30 or even 20 km/h on streets in residential areas or near schools. This can improve safety significantly for cyclists/pedestrians, but also has the aim of improving the liveability of these areas, reducing the prominence and domination of motorised modes. The process of setting speeds needs to take into account the hierarchy of the road in addition to the "design speed" which may over time become inconsistent with the function of the road and the actual way the road is used in practice.

In many LMICs, speed limits are not set in a manner that is appropriate for the road environment. Often the lowest speed limit in a country is 60 km/h (and in some cases even higher), which is far too high for urban areas. This speed limit is often applied in a blanket manner across all urban areas. Moreover, transitions into urban areas are often unclear, and linear developments along major roads pose particular problems unless special efforts are made to give clear guidance to drivers. This can be particularly difficult to adhere to for the motorist and for the police to enforce. Conversely unrealistically low speed limits of 50 km/h or 60 km/h can also sometimes

Figure 12: *Separate cycle paths increase safety and comfort for cyclists.*
© Carlosfelipe, Pardo, Beijing, China, 2007

be applied in LMICs on major divided highways. Again such speed limits are often unenforceable because in this case the road design often lends itself to and encourages much higher speeds (which may be safe on such a road where there are no pedestrians or conflicts).

In linear settlements (small urban areas along major roads) it is often necessary to use engineering measures to show a clear distinction between the "urban" area they are entering and the rural road to each side of the settlement. This can be done by placing speed reduction measures such as a roundabout at entry/exit of the settlement to act as a "threshold" to indicate a different function of the road and speed reduction road humps or chicanes, raised pedestrian crossings, etc. to keep speed low as the vehicle passes through the settlement.

Inappropriately set speed limits can further jeopardise the safety of pedestrians since lower (but inappropriate) speed limits can tempt planners to install zebra crossings across even excessively wide roads. If the design or "character" of the road permits high speed, setting a speed limit alone will not ensure that drivers drive more slowly. Pedestrians must then try and cross in amongst very fast moving traffic. It is therefore important to have speed limits that are appropriate to the function that road is required to serve and the sorts of road users who are expected to use that road should reflect the proposed function.

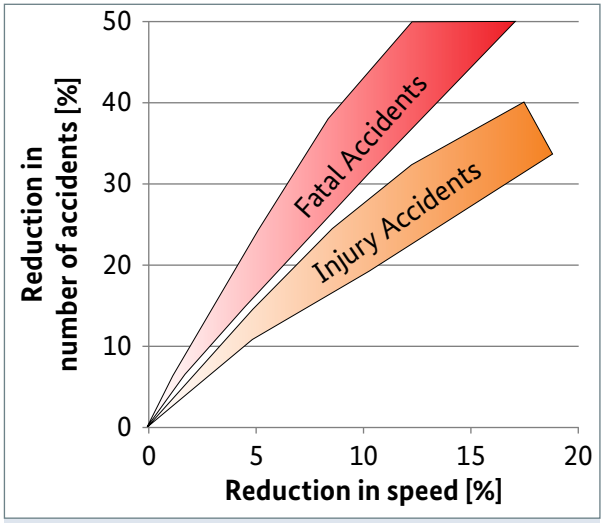


Figure 13: *Speed is a critical factor. Small reductions in speed can give huge reductions in accidents and severity.*

Home zones/mixed use

Generally, the road safety of vulnerable road users has tended to be promoted mainly by segregating them from motorised traffic and carefully controlling the different traffic modes.

However, this can lead to an inappropriate hierarchy of power on the road way which favours the motorised vehicles, with them monopolising road space. In order to provide greater equity for slower and more vulnerable road users, the notion of 'shared space' has been introduced initially in Holland by Woonerf system but which has since spread around the world. In shared spaces, clutter, controls and designated spaces for different types of road user are removed. In some cases, all such measures are removed.

The idea is that the vehicle driver will exercise more caution due to the uncertainty of driving where there are no signs or markings and where a vulnerable road user is sharing the same road space.

Some evaluations in High Income Countries (HICs) report a significant safety benefit with these residential schemes. What is unclear is the long term effect of such schemes once the initial novelty has worn off, and also whether this would be appropriate in LMICs. It could be argued that most LMICs already have similarly 'low control' environments similar to those advocated by 'shared space' enthusiasts. However, it is unclear to what extent such schemes could be beneficial where road safety culture is significantly less developed. In such locations there may be need for more use of physical impediments, *e.g.* speed chicanes, road humps, etc. to force drivers to stay at lower speed while in such areas Experience in some LMICs suggest that these physical measures can be successful (Figure 15).

Table 1 and Box 11 illustrate the economic returns from low cost engineering schemes, from analyses in the

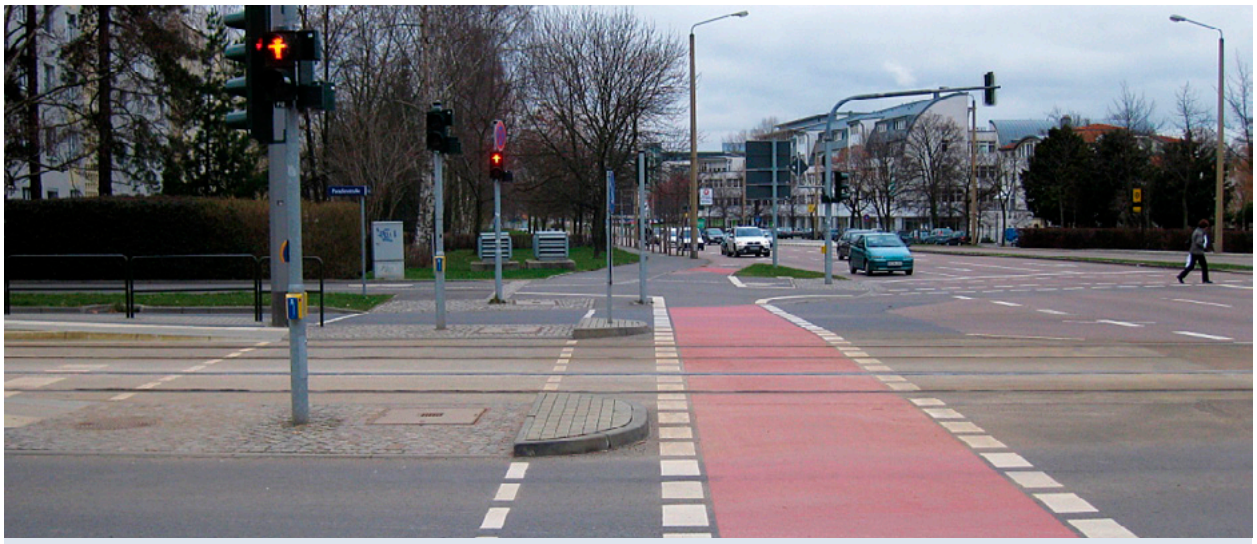


Figure 14: *Cycle paths marked red on intersections raise driver's attention for non-motorised traffic.*

Figure 15: *Residential areas (zona with traffic calming) in Belgrade, Serbia, where speed limit is 10 km/h.*
© Krsto Lipovic, Belgrade, Serbia

USA and the UK. Whilst the results are not necessarily directly transferable to LMIC cities, they illustrate the potential benefits which can be achieved by carefully designed schemes which target specific problems, as revealed by analysis of crash records.

Although statistical analyses and research are missing from LMIC cities, practical experience shows that significant reductions can also be achieved by application of such measures in LMICs.

Special attention should be given to road construction areas, where the risk of a crash is high. An appropriate arrangement of traffic signs and safety devices, as well as public information, specific traffic circumstances is important to enhance awareness about the specific traffic circumstances. Safety at road works is also an important issue in many countries and various guidelines are available on the Internet.

The need for more such facilities has increased with the adoption of Sustainable Development Goals (SDGs) to replace the Millennium Development Goals (MDGs) for the next 15 years. This will stimulate more efforts to promote sustainable modes such as working/cycling, etc. Since the SDGs also have targets related to road safety under ensuring healthy lives (target 3.6 in Goal 3) and safe transport in cities and human settlements (target 11.2 in Goal 11) (see http://www.globalgoals.org) there will be significantly increased focus on road safety in urban areas. Development Banks and bilateral Aid Agencies will be more willing to provide support for safety facilities to be provided for such more sustainable modes.

Box 11: First year rates of return for local authority road safety schemes in the UK

On behalf of the UK Department for Transport, the Transport Research Laboratory (TRL) maintains a database of local authority road safety schemes (the MOLASSES database). These are generally low cost schemes which address known problem locations.

Table 1 presents the average first year rates of return by type of scheme. A total of almost 2 000 schemes are included in this analysis. The average cost across all schemes was GBP 23 400, with an overall average first year rate of return of 372 %.

Table 1: Local authority road safety schemes in the UK – first year rates of return by type of scheme

Rank	Measure	First year rate of return %
1	Bend treatment (revised signs and marking)	722
2	Priority junction	523
3	Route treatments	520
4	Cycle schemes	444
5	Overall link improvements	276
6=	Signalised junction	266
6=	General link treatments	266
8	Link traffic calming	260
9	Pedestrian facilities	246
10	Area-wide schemes	225
11	Roundabouts	176

Gorell and Tootill (2001) "Monitoring Local Authority road safety schemes using MOLASSES" TRL report TRL512, Crowthome, UK

This emphasizes that expenditure on road safety is an "investment", not a "cost" and that the "return" in savings is many times the expenditure made.

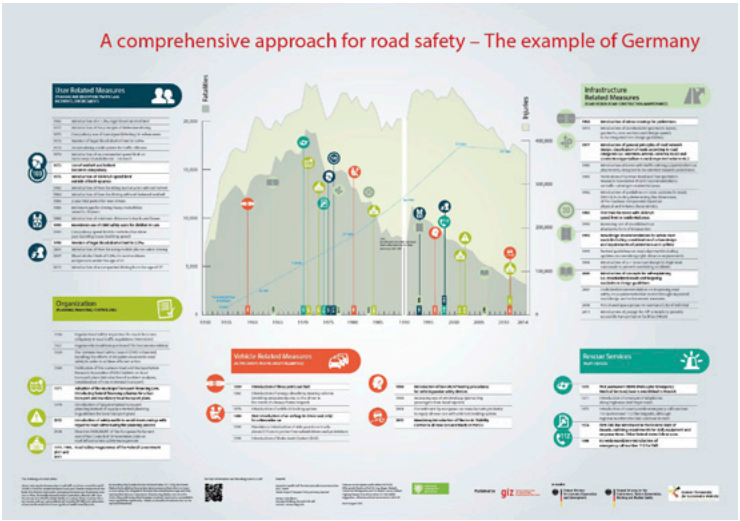
Unfortunately, many countries have not calculated the costs of road accidents so are unable to apply cost benefit analysis to justify expenditure. Cost estimates have been done for 10 LMICs in ASEAN region.

Figure 16: *Zebra crossings are a useful tool, but only if adequate speed restrictions are enforced and crossings are respected by motorists. (This example of a zebra crossing in Peru is not good practice. Where more than two lanes are to be crossed there should be a central refuge for pedestrians to stop in safety while waiting for a gap in traffic.)*

The challenge of road safety

About 1.4 million people die every year in road traffic accidents around the world. A further 50 million people are injured every year. Despite comparatively low levels of individual motorisation, emerging economies and developing countries in Africa, the Middle East and Asia are particularly affected, with more than 90% of traffic-related deaths occurring in these countries. If current trends continue, road accidents will overtake HIV/AIDS and tuberculosis to become the world's third most significant health hazard by 2030.

By launching the Decade of Action for Road Safety 2011–2020, the United Nations have called on the member states to step up their efforts to improve road safety. This info-graphic illustrates the comprehensive approach that Germany has taken as a response to sharply rising fatality rates since the 1950s. Along with many other European countries, Germany has succeeded in reducing fatalities significantly — thanks to a bundle of measures that can be replicated elsewhere.
Source: http://www.sutp.org/en/resources/publications-by-topic/others.html



5. Road Safety Education and Raising Public Awareness

If you want to change something, you have to do something. If you want to change someone's behaviour you must influence people's awareness and attitudes. One of the ways to do this is public awareness campaigns which have one or more of three important goals:

- To inform the public of the nature of problems and to prepare for change (*e.g.* in the law);
- To change attitudes; and/or
- To change behaviour.

If the general level of knowledge about road safety issues is low, then it is important to provide information which both raises awareness of the issues and provides a background against which more specific changes – for example in legislation and/or enforcement – are more likely to be accepted by the general public. Research in highly motorised, high income countries shows that road safety publicity campaigns, by themselves, have only limited impact on attitudes and behaviour. However, when combined with other activities, especially law enforcement, the combined approach can reduce the number and severity of injuries.

"Combined with enforcement, road safety publicity campaigns improve road user behaviour and reduce road crashes."

There is little direct research evidence about the impact of publicity campaigns in low and middle income countries, but it seems reasonable that the lower the level of knowledge, the more likely it is that campaigns or education will be of benefit, especially if combined with legislation and enforcement. However, to raise public awareness regarding safer traffic behaviour takes time and can only be successful if the messages are repeated often. Therefore, it is crucial to link awareness raising measures to specific problems, and to a target group. It is also important to have a clear objective and to evaluate the impact of the measure. GRSP has published excellent guidance on road safety publicity campaigns which stresses the linkage between campaigns and enforcement. The guidance stresses the importance of clearly defining the problem, setting out the objectives of the campaign and evaluating its impact (http://www.grsproadsafety.org).

Means of raising awareness include various public communication tools such as public information in the media, road side information, road safety events, educational measures (driver education, traffic schools for children), "Walk-To-School" events (see Figure 20), and so on. Such events often involve a large number of related governmental and civil society organisations.

Although these activities are widespread, there is some debate about their effectiveness. They are rarely subject to evaluation, in part because they usually are part of a package of road safety measures and it is impossible to attribute any changes in crash or casualty numbers to such activities in isolation.

Traffic parks (Figure 21) are used in a number of countries to raise public awareness about road safety through

Figure 17: *Road safety campaigns often aim to influence driver's behaviour, as illustrated by this sticker at a Thai Traffic Police station.*
© Dominik Schmid, Buriram Province, Thailand, 2010

educating children. They aim to teach school children better traffic behaviour, although there is also some debate about their effectiveness in LMICs. In Singapore, children are brought to the traffic park and taught safety by trained police personnel. In Germany, they have been used since 1949 in cooperation with the German Shell company, school authorities and the police. This type of model has been transferred to LMICs, for example, to the city of Montevideo, where a children road safety school provides theoretical and practical education.

Theoretical education on traffic rules and behaviour is complemented by practical exercises in a learning area that is especially prepared for this purpose, usually within the school ground or a nearby property. The main emphasis, however, is normally placed on the training and testing of the children as cyclists. The system of road traffic schools in Germany is part of the official school traffic education and is included in the curricula of the third and fourth school year. Shell provides the children's traffic schools with bicycles, helmets, traffic signs and, together with the police and the school authorities, is involved in the improvement of the educational program.

Figure 18: *Many developing cities have a diverse mix of motorised and non-motorised transport modes, moving at various speeds, often at high volumes within a shared, narrow right-of-way, as this photo from Suzhou, China shows. This poses particular road safety challenges, but police and transport agencies in developing cities instead tend to focus on how to assist motor vehicle traffic – often resulting in greater hazards for slower moving, non-motorised traffic.*

While these sorts of Traffic Parks work effectively when adequate resources are applied to cover not only initial costs but also running and maintenance costs and also to employ full time, properly qualified staff, they are often a total failure when installed in LMICs where resources are limited. In many cases, despite being opened with fanfares by Presidents and dignitaries and lots of PR activities they, after within months, become inoperable due to inconsistent/disrupted funding. In one case within 6 months the park could not be used for its original purpose because there was no money to pay for buses to bring children to the parks, no money for staff at the Park or to maintain it so it was made into a children's play area where parents could bring their children to play on the "roads" of the traffic park.

Facilities inside such parks (*e.g.* nice new road signs, well-marked pedestrian crossing, kerbs at the road side where children can stop before entering the "road" area, etc. are often absent outside such locations and may make the teaching in such traffic parks not relevant to the day to day reality of the road networks outside such "artificial" locations in LMICs.

They work in Singapore, Germany and the Nordic countries because the conditions inside the traffic park are the same as outside and adequate resources are made available. In LMICs this is not the case so teaching children in such artificial settings does not prepare them to deal with the real situation they face on normal roads.

It is extremely important to create safe routes to school projects to save the 500 children who die and the thousands more who are injured or crippled every single day in road accidents around the world.

The involvement of children in crashes, particularly while travelling to and from school and in the vicinity of their homes, is consequently often the subject of considerable local concern. The development of "safe routes to school" can be effective in improving both children's and parents' awareness and understanding of road safety problems, and by making journeys to school safer. These kinds of projects are undertaken in cooperation between parents, school staff and local traffic authorities and have been implemented successfully in many countries and cities around the world.

Figure 19: *The government in Bogotá, Colombia has supported many creative initiatives to promote road safety, including this 'road safety game' during a Car Free Day.*
© Karl Fjellstrom, Bogotá, 2007

Safe routes to school plans are developed to find the roads or pedestrian roadsides which are the safest for children, to provide a context for local improvements to the road and footway network, to provide pedestrian crossings at appropriate safe locations to improve safety and also to identify those parts of the road network which should be avoided. Information concerning the traffic flow, junctions and pedestrian crossings are gathered as well as the location of bus stops and public transport services.

Road safety training can also be beneficial for adult road users. Employers have found that there is both a business and a social benefit in providing such training to their employees, particularly those responsible for valuable vehicles carrying valuable cargoes (*e.g.* oil tankers). Major international organisations such as oil companies Shell and BP, have led the way in this respect in LMICs where more employee lives are often lost in road traffic crashes than from any other types of industrial accident. Training courses have been developed for car, bus and truck drivers as well as for motorcyclists.

In Argentina, a safety course for truck drivers developed by the German Road Safety Council within a German Government funded road safety project, included theoretical and practical modules which were translated and adapted to the local needs. Local authorities provided an unused airport for the training sessions and Mercedes Benz Argentina (Daimler AG) supported the course by lending two trucks. This kind of course can also be a first step towards the creation of an institutionalised licensing system (*e.g.* Certificate of Competence) for truck drivers, which often is lacking in developing countries.

In Serbia there is no specific subject in schools where children can learn about road safety and children do not have an opportunity to practice and listen about safe ways from home to school. Local authorities are therefore investing in road safety education and with help of road safety experts have developed training for school children. This training is theoretical and practical and based on the concept "10 lessons for life". Also, in Serbia peer to peer education is used to teach road safety for young people in high schools. It is one of the very popular ways to deliver safety education to young people.

Increasing the use of seat belts by car (front and rear), bus and truck occupants has a great impact on the reduction of the severity of the injuries due to crashes. In many developing; countries, particularly in Asia and Latin America, and in many African cities where motorcycle use is both widespread and growing (often as taxis), the use of helmets offers substantial road safety benefits.

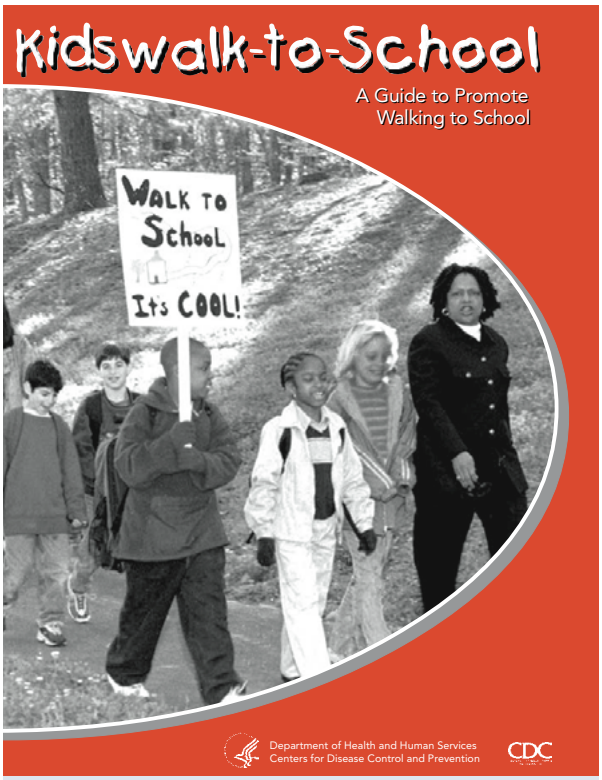


Figure 20: *Events like the US 'Kids walk to school Day' are supported by a wide range of government agencies, research institutions and NGOs.*

Use of occupant and rider protection (seat belts, helmets) is an area where the importance of linking publicity, legislation and enforcement is vital to achieve the maximum safety benefit. Unfortunately, experience to date shows that decision-makers in many developing cities tend to give insufficient attention to these aspects of road safety, and in particular to protection of more vulnerable road users. As a consequence, this group continues to dominate those killed or injured. Governments could require motorcycle manufacturers/distributors to give 2 free helmets with every motorcycle sold plus a voucher for 4 hours of instruction at any driving school where motorcyclists can be shown films for 1–2 hours about motorcycle crashes, conspicuity and safety issues and consequences of not wearing helmets or being visible. In addition, they can be given training for 2 hours on importance of conspicuity, protective clothing, riding on wet roads or in darkness, etc.

Figure 21: *Children's traffic school in Lima, Peru.*
© Jeroen Buis, 2007

Figures 22a, b: *Part of "10 lessons for life": "Survival skills". Ideally teachers should be doing the teaching of "survival" skills relevant for each age group (rather than police teaching meanings of road signs which often happens in LMICs). Learning materials should be age related and focused on their needs.*
Source: Krsto Lipovac (2014), 10 lessens for life (booklets), Model 5, Belgrade.

6. Enforcing Safer Road User Behaviour

Strong but fair, and targeted enforcement is critical to the safe and efficient use of urban road systems. Substantial safety benefits can be achieved if road users are deterred from committing traffic offences. The presence of an effective traffic police force which is seen to enforce the law if it is broken, is a primary means of ensuring safe road user behaviour. The examples of seat belt and helmet wearing cited in the previous section are good examples of this. Other critical aspects of behaviour where substantial road safety benefits can be achieved if they are properly controlled are vehicle speeds and drunk driving.

"Traffic law enforcement requires professional skills that are different from other types of police work."

The main objective of enforcing traffic regulations is to deter violations related to dangerous behaviours to ensure road safety, not to maximise the number of infringement notices issued. Police activities should primarily increase road users' perception of the likelihood of illegal behaviour being detected, and of being penalised if they are caught.

Detection and deterrence can only be achieved if the law is specific about its sanctions. As urban road legislation varies from country to country, the main strategy should consist of combining enforcement activities (mainly speed and alcohol controls, helmet and seat belt wearing) with information and awareness raising measures on the consequences of excessive speeds or drink-driving or not wearing a helmet or seat belt.

Excessive and inappropriate speed is a very common traffic offence. There is strong evidence that the risk of a crash, and the severity of its consequences, increase dramatically with vehicle speed (Figure 23). The development of a speed management strategy is a common strand of road safety policy in cities of high income countries, and law enforcement is a critical element of such a strategy. Two approaches of enforcement have been traditionally used: ***the stationary enforcement*** method generally involves an observation unit more or less hidden at the roadside and an apprehension unit, downstream clearly visible, at which point speeding drivers are stopped and charged.

The mobile method is enforcement from a moving unmarked or marked police car and is better since it can focus on all moving offences and not just on speeds.

In recent years, the introduction of red light and speed camera technology has been highly cost-effective in developed countries but only if they are used in the right way, which means putting the cameras at high risk locations (ETSC 1999). Radar detection may be more appropriate in low and middle income countries if they do not have the capacity (*e.g.* because of poor addressing systems) to make use of the evidence provided by cameras to bring offenders to court. However, some cities in LMICs (*e.g.* Chisinau in Moldova) have achieved a 30% reduction in road deaths in one year through installation of red light cameras at all key intersections. Such schemes can be funded by equipment suppliers who can provide, install and maintain the equipment in return for a proportion of fines collected.

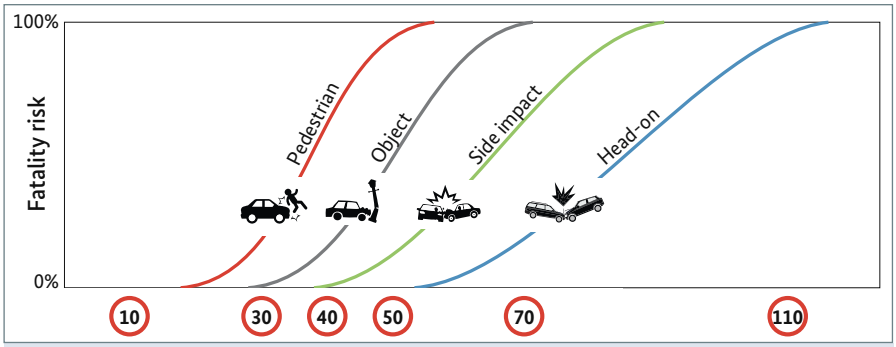


Figure 23: *The impact of the collision speed on mortality rate for different types of road accidents. Risk of death increases with speed for each crash type.* Source: SWOV, Leidchendam, The Netherlands

Local police authorities should adopt a road safety policy and the operational objectives should be coordinated with local/urban road safety plans. Urban Traffic and Transport Authorities should support the police in the introduction of technological aids for traffic law enforcement. As with many aspects of road safety, the coordination of activities by the various actors is essential for maximum benefits.

7. Promoting the Use of Safer Vehicles

As vehicle safety standards are generally set at governmental level, or imposed de facto by the standards of imported vehicles, local authorities should ensure that all vehicles owned or operated by the local authority itself or by companies under contract to it are maintained to good standards of safety,. This is especially so for safety-critical parts such as braking systems, steering system, lamps and tyres. Increasingly, developing countries are adopting relevant UN Conventions (see Module 4c: *Inspection & Maintenance and Roadworthiness*).

A comprehensive inspection, maintenance and roadworthiness system requires close co-operation between vehicle roadworthiness inspection teams, trained vehicle mechanics and workshops (to guarantee vehicle repair according to safety standards) and traffic police (to enforce vehicle inspection via roadside checks).

Good databases and certification can also help ensure better standards by making it easier for the police to check that vehicles have been inspected as required by law. In most cases, technical vehicle inspection is complemented by vehicle emission testing, in order to meet the rising need for air quality measures to reduce pollution from transport related sources. A comprehensive inspection, maintenance and roadworthiness system distinguishes between private cars, heavy goods vehicles and public service vehicles. Heavy goods and public service vehicles, due to their more frequent use, should be inspected more frequently (usually twice a year) than private cars which are typically inspected once a year.

A major problem in LMICs is the import of 2nd hand cars (or even crash damaged cars) from the High Income countries (HICs). These are repaired locally and brought onto the road and can often be dangerous. The only way to ensure they are safe to use public roads is to insist that ***all such imported vehicles are required to pass a road worthiness technical inspection before*** being allowed to use public roads. Permanent import of vehicles with steering wheel on the wrong side should be also banned. Vehicles transiting through the country or imported for less than 1 month can be permitted to have steering on the wrong side.

A second problem occurs with the import of new cars in countries where there are inadequate import controls in place. Manufacturers have been shown to sell less safe vehicles in LMICs (by removing safety features) than they sell in EU and USA because EU and USA have stronger controls. The simplest solution is for LMICs to insist that any new imported vehicle must meet EURO NCAP standards.

Overloading (Figures 24 and 25) is a serious problem in many LMICs, and relates to the technical specifications

Figures 24 and 25: *Overloading is a major cause of crashes. The front wheels of a truck loaded with bamboo trunks in Bangladesh (top) barely touch the ground, while a grossly overloaded truck in Amritsar, Punjab, India is a serious hazard.*

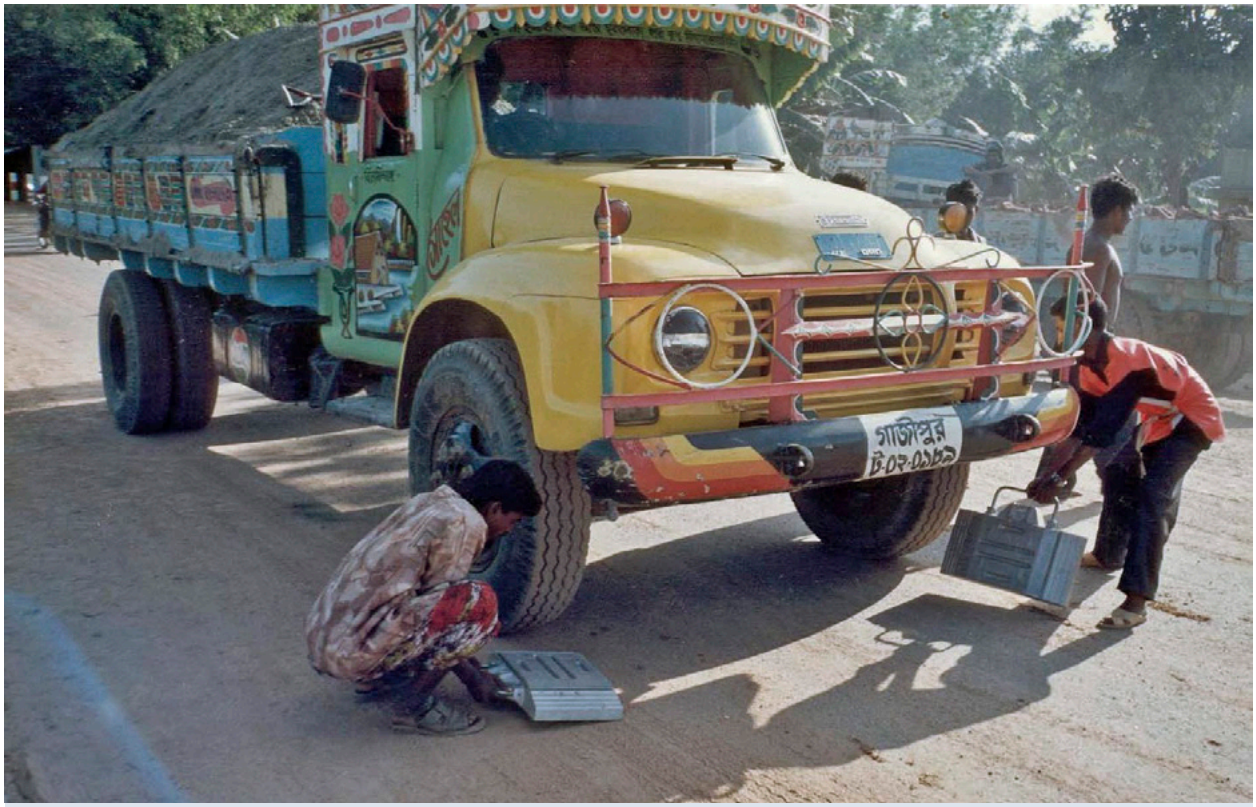


Figure 26: *In order to control overloading, traffic police in Tangail district, Bangladesh use mobile measuring units ('mobile courts').*
© Rainer Kuhnle

of vehicles. Vehicle types have a specific maximum carrying capacity, which depends on the structural strength of the chassis and is usually linked to the design standards of roads and bridges in a country. If this local capacity is exceeded, vehicles may not react correctly in critical situations. The problem of overloading should be kept under special surveillance by the traffic police or vehicle inspectors.

This is not only a safety issue, as overloaded vehicles cause disproportionate damage to roads and impose substantial economic burdens on the authorities responsible for maintenance.

Thus limiting overloading is important both from a road safety perspective and to protect a city's investment in its road infrastructure. But there can be problems of corruption which can occur when police interact directly with public. Appropriate controls need to be placed to minimise such problems.

Overloading of vehicles with passengers, or carrying passengers in an inappropriate, unrestrained manner, is a clear and common safety hazard in low and middle income countries. In some countries it is common to observe a family of five using a single low-powered motor cycle, workers being carried on the open backs of Lorries, and people packed tightly into and on top of buses. Such practices can lead to significant and unnecessary loss of life and where possible should be discouraged.

8. Providing Assistance to Road Crash Victims

The health consequences of road crashes can be influenced by preventive actions before the crash (active safety), during the crash (passive safety) and after the crash (rescue, EMS treatment and rehabilitation): The health services are usually only involved after the crash, but appropriate management of road casualties following the impact is a crucial determinant of the chances and quality of survival. Improvements in the immediate treatment of victims and emergency rescue systems have a great effect on road safety, so much so that health professionals talk about the "Golden Hour" and "Platinum Ten Minutes" since getting appropriate care immediately to the injured is so vital to find health outcomes.

When formal ambulance systems are absent, as is generally the case in LMICs, effective first aid at the crash site and appropriate handling of injured people, become even important (Figure 27).

Efforts should be made to educate the public and those most commonly on the road, *e.g.* commercial drivers (trucks, taxis, buses) and those involved in the transport of casualties (such as taxi drivers) in the basic 5 or 6 actions that can be taken to preserve life and to avoid further injury to victims by inappropriate handling of spinally injured victims.

Local authorities and employers can support first aid training both for staff and the general public. The widespread use of mobile telephones, especially in countries without historic investment in cable-based telephone systems, offers an opportunity to develop a system of fast access to the emergency services through a single "999" or "911" style emergency telephone number which ideally operates throughout the country.

In addition, a simple app on smartphones could give guidance on the basic 5 or 6 actions to maintain life until medical help arrives. Provision of first aid stations close to locations on major rural highways is also a way of improving access to medical assistance for crash victims and has been implemented in Vietnam and is being trialled in Kenya. By providing basic first aid training to police, fire services and other rescue personnel who are likely to attend road crashes, victims will have a greater chance of survival.

There is also evidence that joint training to rescue/ambulance/police personnel who attend road crashes can lead to better outcomes and reduced death and injuries. This for example allows medical persons to start treating the injured trapped inside a vehicle while he is being released instead of having to wait until fully released. This saving of 10 minutes in commencing of treatment may be the difference between life and death.

Figure 27: *First aid at a crash site in Côte d'Ivoire.*
© IFRC

9. Sound Financing of Road Safety Policies

Without sound financing mechanisms, no serious road safety measures can be implemented or sustainably maintained. At a national level, the major funding sources are:

- Budgets ring-fenced for road safety in the relevant Ministries, drawn from general tax revenues;
- Levies added to 3rd party insurance premiums or fuel;
- Traffic fines dedicated to road safety activities;
- Agreed small (5 %) percentage of road user charges; and
- Private sponsorship.

At the local or municipal level, traffic fines, private sponsorship, and local public budget lines complemented by national public funding, are particularly important for financing road safety activities, (see also GRSP, 2001).

In most high income countries, road safety is regarded as a public sector responsibility, and hence relies and gets significant state funding. In such cases a financial provision specifically allocated to road safety is integrated into the urban transport or roads budgets.

This is dedicated not only to road infrastructure measures, but also considers traffic law enforcement linked to financial support for publicity campaigns and public relations. Depending on the local government responsibilities it may also include elements for emergency services and education. The amount of the budget will depend on the local authority's objectives, as specified in the local road safety plan, as well as the distribution of total resources earmarked for road safety (for example: how much money is for education, for child restraint systems, for retro reflective waistcoats). Unfortunately, in LMICs, often road safety is still not given sustainable earmarked funding as the resulting losses are often not known (even though such losses can be as high as 4 to 5 % of GDP in LMICs).

In funding and implementing an urban/local road safety plan, the local authorities should seek to maximise funding contributions from those parties who benefit most from the measures within the plan – primarily road users. This is why levies on motor insurance or local sales tax on fuel have an obvious appeal as they link directly to use of the road system, and provide a potential source of revenues which will grow in proportion to traffic.

Private sector companies also will benefit from safer roads on which to operate and from an improved corporate image by investing in local road safety activities. Large commercial organisations such as banks, trading and oil companies are often willing to support local road safety activities as part of their social and corporate responsibility obligations. For community-based road safety awareness activities, the sponsorship of local vehicle traders, insurance companies (vehicle insurance and medical care), and transport operators can support the work of local non-governmental organisations by providing support for education and information materials such as flyers, posters, and so on but these will provide only limited funding.

The best and quickest source (where it exists) is the 3rd party compulsory motor insurance policies. With the help of the Insurance Regulator, companies underwriting 3rd party motor insurance can be persuaded to allocate 5–10 % of the premiums collected into a special Road Safety Fund earmarked for road safety. If as expected, casualties reduce there are less payouts so insurance companies make more profit.

Whilst sponsorship has been used in some countries for many years to support road safety activities, it is generally ad hoc and not very large-scale. The development of a partnership approach, led by the Global Road Safety Partnership, has brought together government, business and civil society to address road safety issues. Such tri-sector partnerships add value in a number of ways. They raise the political profile of road safety. They bring the skills and resources of the private sector to bear and they engage the community through NGO organisations such as the local Red Cross or Red Crescent society. The experience of GRSP is that more can be achieved by working together in this way (see Box 12 and Figures 28 and 29).

In Serbia there is also good experience in mobilising local communities, *e.g.* Mladenovac municipality had a high death/100 000 population rate. The most at risk group was young people. Recognising the problem Commission for Traffic Safety, Chancellery for youth and NGO organisations jointly made a campaign to improve road safety for this target group.

Furthermore, Serbia has legislation that all traffic fines go into a special road safety fund from where 70 % of the money collected goes to pay for a National Road Safety Agency, police enforcement and various initiatives at National level. In addition, 30 % funds go back to the municipality where fines were incurred to finance a local Road Safety Action Plan and local safety interventions. This has resulted in all 170 municipalities having local Road Safety Action Plans.

Box 12: Partnership working in road safety

A high profile road safety program in Bangalore

In the Indian city of Bangalore, GRSP is working with a local partnership organisation – the Bangalore Agenda Task Force (BATF) – created by the Chief Minister to make Bangalore the 'best' city in India.

Engagement of police in the program

In road safety, BATF brings together the city authorities, local businesses and the public to deliver effective road safety projects such as a publicity and enforcement campaign against drinking and driving. Engaging the police in the program was a vital step, as campaigns are known to be much more effective when linked with appropriate enforcement. The legal limit for blood alcohol whilst driving in India is particularly low by international standards (0.3), although the law is widely abused, as revealed by surveys in Bangalore before this program was initiated.

"Partnership approach"

The partnership approach which has been adopted has enabled a high profile campaign with widespread support from the police, local government and the business community to be undertaken. A systematic evaluation of its impact was undertaken.

Figure 28: *Launch of Bangalore drink driving campaign.*
© BATF

Figure 29: *Road safety education in Italy, 2006.*
© Gianni Franco, Wikimedia Commons

10. Towards a Comprehensive Road Safety Policy

The preceding elements of a sound road safety policy must not be seen as isolated or arbitrary items. Rather, they form the building blocks of a coordinated/interrelated policy.

Integrating these elements is a pre-condition for successful road safety activities in this way and both national and international experience can play a significant role when local authorities set their goals and plan the steps to be taken.

Many countries seek the advice of international initiatives, such as the Global Road Safety Partnership (GRSP), the European Traffic Safety Council (ETSC), the European Road Safety Observatory (ERSO) or national agencies such as the German Road Safety Council (DVR). The latter, for instance, is established and financed by the state (45 % by Ministry of Transport), and by the private sector (55 % by insurances, transport companies, etc.).

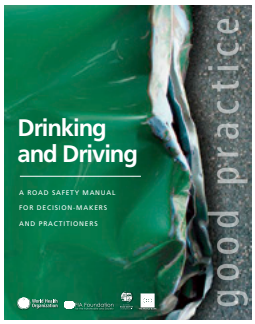
In addition, The United Nations Road Safety Collaboration (UNRSC) coordinates road safety efforts at a Global level. WHO also compiles data on the numbers of road deaths and injuries globally. Much useful information is also available from the Global Road Safety Partnership (GRSP) website http://www.grsproadsafety.org.

These institutions provide forums for discussion, the dissemination of information, best practices and lessons learned. Some like the newly established "not for profit" International Road Safety Centre (IRSC), http://www.irscroadsafety.org, provide training, text books and training materials to encourage development of local road safety specialists in LMICs and institutionalising of road safety for sustainability.

In addition, a number of "How To" road safety manuals (available online at http://www.who.int/roadsafety/projects/manuals/en) exist for the key areas of seat belt use, drinking and driving, helmet wearing, speed management and crash data systems, etc. These have been produced in recent years by UNRSC and a few of the most important ones are shown in Figure 30. These comprehensive manuals summarise best international practices and give step by step guidance on implementing a range of the most effective measures to improve road safety and are aimed at a broad range of practitioners and decision-makers.

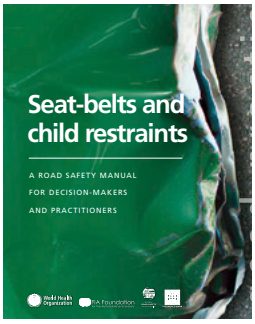
Finally, a Comprehensive Road Safety Policy begins with a good example being set by those who wish to improve the road safety situation. Therefore, all those engaged in developing the road safety policy or implementing it are expected to respect traffic rules and otherwise exhibit good conduct in traffic, both during and outside their working hours. A "safety culture" has to become a part of everyday life. As long as this is neglected by authorities and their staff, there will be no real change. How many more lives have to be lost on the world's roads before we are able to dramatically reduce the 1.3 million deaths and 50 million injuries that occur each year around the world?

Drinking & Driving



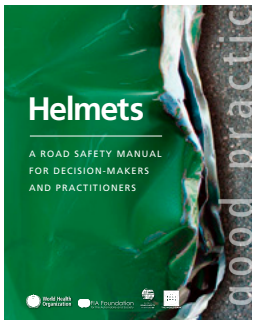
Drinking and Driving is one of the main causes of road crashes worldwide. Effective drinking and driving programmes have the potential to save thousands of lives.

Seat-belts & child restraints



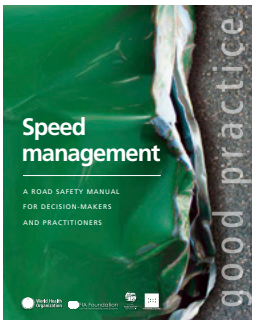
'Seat-belts & child restraints' is a practical guide to implementing, enforcing and evaluating seat belt programmes.

Helmets



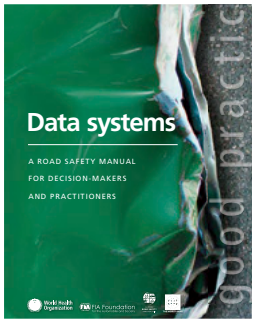
A large proportion of the deaths of people injured or killed while riding two-wheelers result from injuries to the head.

Speed management



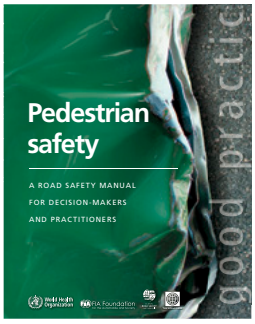
Speed has been identified as a key risk factor in road traffic injuries, influencing both the risk of crash as well as the severity of the injuries.

Data systems



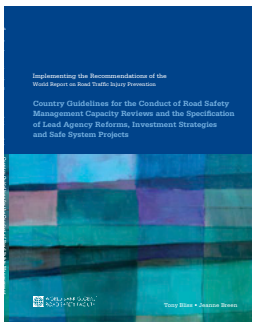
Focuses on the implementation of a crash database derived from police records

Pedestrian safety



Describes the magnitude of pedestrian deaths and injuries; key risk factors; ways of assessing the safety situation and prepare action plans; and how to design, implement and evaluate effective interventions

Road safety management manual *)



Country Guidelines for the Conduct of Road Safety Management Capacity Reviews and the Specification of Lead Agency Reforms, Investment Strategies and Safe System Projects

Figure 30: *A sample of the International best practice guidelines developed by UN road safety Collaboration (UNRSC) that are available for (free) downloading from the WHO website.* http://www.who.int/roadsafety/projects/manuals/en

*) http://siteresources.worldbank.org/EXTTOPGLOROASAF/Resources/traffic_injury_prevention.pdf

In addition, a few other important guidelines and manuals both new and those developed earlier and in use around the developing world are being systematically updated and these will be made available for free download from International Road Safety Centre (IRSC) website (http://www.irscroadsafety.org) as and when they become available.

SUTP.
Sustainable Urban Transport Project

SUTP – Sustainable Urban Transport Project. 2016: Celebrating 15 years of dedication to sustainable urban mobility — SUTP supports decision-makers worldwide to plan and to implement innovative and sustainable mobility solutions. SUTP offers a comprehensive knowledge platform, capacity development, hands-on advice and networking opportunities. Within the past 15 years, more than 5 000 decision-makers, planners and students have benefited from our training offers. We've produced a rich library of Sourcebook Modules, Technical Documents, Case Studies, Factsheets, Policy Briefs and Reading Lists. All documents are accessible through our webpage, along with a comprehensive photo collection and a video channel. Be invited to use and distribute them!
http://www.sutp.org
https://www.facebook.com/sustainableurbantransport-project
https://twitter.com/_SUTP

CAPSUT.
Capacity Building in Sustainable Urban Transport

CAPSUT – Capacity Building in Sustainable Urban Transport — CAPSUT is an international platform, dedicated to capacity building in sustainable urban transport. It offers information on upcoming training courses, academic offers as well as online lectures across institutions.
http://www.capsut.org

German Partnership for Sustainable Mobility
Sustainable Mobility – Made in Germany

GPSM – German Partnership for Sustainable Mobility — The GPSM is serving as a guide for sustainable mobility and green logistics solutions from Germany. As a platform for exchanging knowledge, expertise and experiences, GPSM supports the transformation towards sustainability in developing and emerging countries. More than 150 friends from academia, businesses, civil society and associations are participating in the network and are happy to share their knowledge. http://www.german-sustainable-mobility.de
https://www.facebook.com/germansustainablemobility
https://twitter.com/GermanMobility

GIZ INTERNATIONAL
FUEL PRICES

International Fuel Prices provide decision-makers with data on fuel prices on a global scale. GIZ, with its global network of projects in 135 countries, regional offices and representations in 64 developing countries, publishes a biennial study "International Fuel Prices" on the global fuel sector since 1999. On an annual basis, we are convening fuel regulators to discuss appropriate pricing and taxation schemes for fuel prices.
http://www.giz.de/fuelprices
https://energypedia.info/wiki/International_Fuel_Prices

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