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He stressed the need for cooperation between international agencies, as it provides an opportunity to pool resources and to associate complementary approaches to solve the safety problems in an intersectorial way.

A specific approach of WHO was described, aiming at integrating accident prevention at primary health care level, which is now being experimented in Thailand. A Seminar on Accident and Injury Prevention at the Primary Health Care Level had been held the preceeding week to formulate the protocol of this project. Community involvement in this field should be an important factor of success and deserves to be encouraged.

After these introductions, Dr Vichit Punyahotra, Professor of Surgery and Secretary General of the National Safety Council of Thailand, was elected Chairman. Nicole Muhlrud, Head of Project on Road Safety in Developing Countries at the French National Institute for Research on Transport and Safety (INRETS), was asked to be Rapporteur. A list of participants is given in Annex 1.

2. Road accident statistics in Asian countries

ESCAP introduced the discussion by presenting a comparative analysis of some accident data gathered in the countries of the Region (3). The main features can be summarized as follows.

2.1 Accident costs

Studies carried out in the Transport and Road Research Laboratory (TRRL) and in Japan on a sample of developed and developing countries have generally estimated accident costs at over 1% of the GNP; this is a high figure when compared to the average growth in the developing world. It also indicates the order of magnitude of the funds that would be justified for spending on traffic accident prevention, but have unfortunately been unavailable so far in most countries of the Region.

2.2 Accident records

Data on accidents for international comparisons are hard to find, as the main sources of statistics provide only fragmentary information. Data on motorization (numbers of vehicles on the road, kilometres driven) is even poorer. Available figures show, however, that:

- road fatalities are not decreasing in the Region in the same way as in developed countries over the recent years, and are sometimes even sharply increasing, as for instance in Nepal or Sri Lanka;
- trends in accident rates (accidents related to motorization) are very heterogeneous from one country to another;
- the severity index (fatalities per hundred casualties) is much nigner in the countries of the Region than in the developed world.

2.3 Main accident characteristics

In spite of the limitations of the accident data available, some high-risk groups can clearly be identified:

- pedestrians account for a high proportion of road fatalities nearly everywhere in the Region (60% of fatal accidents in the Republic of Korea, 42% in Pakistan, 40% in Sri Lanka; 57% of the victims in urban areas and 37% on rural roads in Thailand, etc.);
- two-wheelers, mostly motorcycles, are also heavily involved in accidents in several countries, in particular in Malaysia and Nepal (nearly 60% of fatal accidents in both countries), in Thailand (36% of victims), in Indonesia, and in Singapore;
- professional drivers are themselves a high-risk group; serious safety problems are related to goods transport, for instance in Indonesia and in Singapore, while public transport vehicles are heavily involved in accidents, for example in India or in Afghanistan.

Accident factors cannot be determined with any precision from the data available; however, the general opinion is that unsafe behaviour plays a major part in accident causation, and that driver training, education, and enforcement of traffic regulations are strongly needed to increase safety in the Region. Improvement of faulty roads should also carry a high potential of accident reduction.

2.4 Discussion

Obtaining exhaustive and reliable accident data is a problem experienced by all the countries in the Region. Accidents are generally severely underreported, and the figures available can only be considered as indicating a minimum. The reasons behind this are manifold: accident registration is a heavy burden for an overworked police force - parties involved in accidents often settle the case between themselves without calling in the authorities - the communication network is poor and accidents are reported too late - information transfer to a central statistical unit is only partly effective - accident data forms are too difficult to fill in - etc.

Whatever the problems in each country, they should be analysed and gradually overcome, as there is a definite need for good accident data, in order to draw comparisons at the international level and plan efficient cooperation, identify targets at the national level and design and evaluate safety programmes, finally work out sound safety diagnoses and apply the right countermeasures.

The way to gather and store the data at national level may vary from country to country, but some homogeneity is needed for the content and definitions of the data to collect; in particular:

- a common definition for fatalities and injuries should be agreed upon;

- the minimum significant data required should be standardized; in the present situation, this would be best defined at an intermediate level between rough statistics (as used to identify policy targets) and detailed descriptions of individual accidents, so as to be of help for simple safety diagnoses;
- one important feature of a basic data collection is the precise location of accidents, a requirement for blackspot identification and local safety programmes.

It is to be noted that fatalities alone are not sufficient to measure the overall importance of the safety problem: disabilities resulting from accidents are also a heavy medical, economical and social burden. Data is therefore needed as much on morbidity as on mortality. In addition to the statistical accident data usually recorded "on-the-spot" by police forces or similar bodies, hospital data should also be collected, if not at the national level, at least in some test regions or districts in each country, and a linkage between the two data-files should be established. Comparing police and health data should also provide an estimate of the level of underreporting and pinpoint some of the reasons for it, thus allowing for gradual upgrading of the data collection system. Again, a standard form for injury registration by medical staff needs to be designed.

When organizing an accident data collection, a balance has to be struck between what should be useful for the various purposes of accident analysis and what is possible in the field: standard registration forms should contain only information clearly defined and easy to understand, and should not take more fill-in time than available for the policeman, doctor or nurse in charge. It is far preferable to work out a limited but exhaustive and reliable accident file than an ambitious but incomplete one.

To define target groups and priorities for safety action, some exposure data are needed in addition to good accident statistics. The most widely used indicators for exposure are numbers of vehicles on the roads or, better, numbers of kilometres driven by categories of vehicles. While the adequacy of such indicators is still being debated, the corresponding data are clearly poorly defined, difficult to compare from country to country, and in many cases incomplete or unreliable (even in the more developed nations). Good exposure data require sophisticated and expensive surveys, and are still the object of many research studies. In the meantime, accident rates should only be used with extreme caution and considered as very rough indicators.

Although a lot of work has already been in progress to improve accident statistics in the countries of the Region since the 1985 ESCAP seminar, it is clear that continuing efforts are still needed to reach a sufficient level of quality in the description of the national accident situations and trends.

3. Accident trends and status of national traffic safety programmes in Asian countries

3.1 Thailand

The topic was introduced with a presentation of the situation in Thailand, and a comparison with other developing countries (4).

Infectious and parasitic diseases, which used to be the major cause of death in developing countries, have been steadily declining as a result of the improvement of health services and of economic development; meanwhile, the increase of road accidents has altered the order of priorities, and traffic unsafety has now become a primary cause of death and a difficult socioeconomic problem in the developing world. Accident severity, in terms of fatalities per hundred casualties, is also much higher in developing countries than in Europe. Thailand is a good illustration of these trends.

Hospital data show that injuries from accidents in Thailand have been sharply increasing since 1981, to reach 2 million in 1983, of which about a third result from traffic accidents. The number of fatalities may be on a slightly downward slope, but was still of 38 000 in 1983 (with again a third of this for traffic fatalities).

The highest intake from road accidents is from young road users, and hospital figures indicate that over 40% of accident victims are under 20 years of age, and a further 29% between 20 years and 30 years. Victims are mostly pedestrians (57% in urban areas, 37% in rural ones) and motorcyclists (36%). Pedestrian accidents account for 36% of the total number of collisions in the country.

The distribution of traffic injuries according to the part of the body damaged appears very similar to what can be observed in the United States, as shown by a comparative study carried out in university hospitals in Bangkok and Chicago.

The direct cost of accidents in Thailand has been estimated to be US \$ 1.5 million a year, but the real economic cost of unsafety can be considered as 16 times higher, which represents a substantial part of the GNP.

Immediate safety action is obviously needed, but raises problems, either technical (not enough accident data available for planning purposes, no information as to the real causes of accidents, too little research) or institutional (too many agencies involved in fields related to traffic safety measures). To overcome the second type of problems, a National Safety Council of Thailand has been established under the direct authority of the Prime Minister, in order to set up national policies and strategies for accident prevention, establish effective intersectoral coordination, and follow up and evaluate the safety programmes implemented. A National Accident Research Centre has also been created; its first task has been to gather accident data from the various existing sources (mostly police departments and hospitals),

and to try and homogenize definitions and procedures for data collection; some research into the causes of traffic accidents has also been undertaken, starting with motorcyclists and bus drivers, and associating ad hoc surveys, interviews, and behavioural observations.

At the local level, Thailand is experimenting with the integration of accident prevention (including road accidents) within primary health care strategies, in cooperation with WHO. The demonstration project was presented at the Seminar on Accident and Injury Prevention at the Primary Health Care Level, held in Pattaya, 3-5 March 1987 (5).

3.2 India

India, like most of the developing world, experiences a problem of lack of statistical accident data and, as a direct consequence, of lack of a real traffic safety policy. The problem is aggravated by the large size of the country and its federal organization, in which data gathering and decision-making are both decentralized. Even laws and regulations may be enacted at state level, and there is no uniform system for accident data collection.

Motorization has been sharply increasing in India over the past few years: the number of vehicles on the roads has gone up from 1.5 million in 1970 to 4.4 million in 1980, and 8.6 million in 1985; the situation has reached a critical point. About half the registered vehicles are two-wheelers, and 80% of the new registrations in the larger cities are motorcycles. Exposure data in terms of kilometres driven are, however, still unavailable.

As there is no computer-based vehicle file, it is impossible to keep track of the age or roadworthiness of the vehicles in traffic and take the ancient ones off the road, so some of them are now well past retirement age.

All this creates a major safety problem. The estimated accident rates are quite alarming. Over a third of the traffic accidents concentrate in the metropolitan areas (Bombay, Calcutta, Delhi, etc.). Accident characteristics are not stable in the present complex situation, and vary from state to state and region to region: countermeasures which are applicable in some parts of the country may be irrelevant in others. Safety action is obviously a difficult task.

The Government was already aware of the problem in 1979, and appointed a study group to analyse the main characteristics of unsafety and propose countermeasures. The study group produced an extensive list of recommendations, with particular emphasis on human factors (related to drivers), vehicle maintenance, and the inadequacy of the existing road network to modern traffic (lorries and cars).

The conclusions of the study group are still the only available basis for planning and policy-making. However, the traffic situation has grown so much more complex over the past few years that real priorities have probably changed. Pedestrians may be increasingly involved in accidents, and the mixture of traffic (including two-wheelers) is probably a major source of problems.

Decisions are, however, now being taken for accident prevention; they focus primarily on:

- driver training: the basic principle is to train instructors, so that they can better train drivers; a special institute is being created to this effect, as well as a pilot driving school.
- traffic regulations: the existing traffic law dates back to 1939 and is ill-adapted to the present situation; the Parliament is to review it in the near future, in order to update it in view of the new traffic conditions.
- highway patrol activities, especially those concerning help on accident scenes.

Factors related to human behaviour and vehicles are seen as the key issues for national safety policies. However, working out a more up-to-date description of the accident situation and its main causes would be greatly needed at this stage.

3.3 Indonesia

Over the past 10 years, Indonesia has been registering rapid growth; corresponding development has solved many of the nation's problems, especially in the field of public health, but has also created some new ones, in particular road accidents.

Motorization and movements of people and goods have sharply increased, with a number of registered vehicles going up from 5.3 million in 1982 to 7.3 million in 1986; 70% of these are motorcycles. Although large investments have been allocated to road construction and improvement, the length of the road network has not increased in proportion with the amount of traffic using it, especially as the characteristics of soil and climate make road works difficult and expensive. The lack of quality and quantity of public transportation systems is also a factor encouraging the use of private cars and adding to the imbalance between traffic and road length.

As a consequence, the average yearly number of road accidents went up to 46 000 in 1982-84, with 10 800 fatalities and over 52 000 injuries. The number of fatalities has decreased over the last two years as an effect of a law on mandatory helmet wearing for motorcyclists (9700 fatalities in 1986).

Although accidents now seem to be on a downward slope, traffic violations are seen to increase; this may, however, also be an effect of the extension of control and enforcement activities.

The main factors that combine to cause accidents and traffic problems in Indonesia include the following:

- human factors (involved in 70-80% of all collisions): physical fatigue of professional drivers, emotional instability, lack of discipline or insufficient adjustment to the modern way of life (especially in urban areas), economic stress for professional drivers (fierce competitive conditions);
- environmental factors: urban growth, mixed traffic (cohabitation of motorized and non-motorized vehicles), difficult climatic conditions (fog or heavy rains), difficult terrain (mountainous and swampy areas);

- road factors: too few safety devices;
- vehicle factors: overloading of motorcycles considered as a family vehicle, "home-made" vehicles which do not meet safety standards, etc.

Traffic problems may also be enhanced by the fact that the 1965 traffic law is now obsolete, and there is still too little enforcement of the main safety regulations (lack of personnel, insufficient training); while the helmet law has already demonstrated visible effects on accident reduction, seat belt wearing is still unpopular and would require enforcement.

Another point deserving attention is the improvement of motorcycle design, aimed at making this type of vehicle fitter for passenger transport (up to 4-5 persons).

Even though preventive action should result in a serious reduction of road accidents, the strengthening of emergency medical care is essential to save more human lives and prevent disabilities. Improvements are particularly necessary in the pre-hospital phase, which requires the development of a communication system, and first-aid training for the personnel likely to arrive shortly on accident scenes (police for instance).

The police has so far played the leading role in accident prevention in Indonesia, with duties ranging from law enforcement or public education (particularly for school children) to traffic management and driver licensing. Other ministries also play a part: transportation, industry, public works, interior, health. It is felt that efforts to improve safety should be strengthened, and new recommendations at the national level should soon promote the establishment of a national accident prevention committee for intersectoral coordination.

It is also felt that accident prevention is one aspect of improved community welfare, and that communities should accordingly get more involved in this field. Public motivation should be enhanced through education and media campaigns.

3.4 The Philippines

The Philippines is an archipelago of over 3000 islands, out of which 20 are of major importance for traffic. The road network is relatively dense (157 000 km including 25 000 km of national roads), but heterogeneous as 50% only of the national highways are paved and 30% of the provincial roads; the rest of the network is mainly surfaced in gravel.

The vehicle fleet, which included 1.2 million registered vehicles in 1984, is also heterogeneous, with 30% trucks and many other transport types; in particular, 100 000 jeepneys are used for local public transport, half of them in Metro Manila. The fleet is mostly old, and some of the jeepneys can be considered as vintage vehicles ...

Accident statistics are not comprehensive yet, but improvements in the data collection system are under way. As it is, the annual number of road fatalities is estimated to be over 4500, which is extremely severe by international standards, taking into account the size of the country and the present motorization level. Accident costs amount to over 1% of the GNP.

A major road safety study was carried out in the Philippines in 1986, in order to provide a general policy framework for accident prevention in the short and the medium terms. The safety diagnosis established on the basis of extensive surveys and behavioural observations demonstrated in particular:

- very high accident severity;
- high proportion of pedestrians in urban accident victims, and severity of accidents involving light vehicles (bicycles, tricycles or motorcycles);
- extreme severity of accidents resulting from a loss of control of a bus or a truck;
- high frequency of rear-end or head-on collisions related to overtaking manoeuvres;
- frequent involvement of vehicle-related factors such as overloading or poor maintenance.

The most probable factors contributing to accident causation were identified through in-depth accident analysis based on data collected from trial courts. Recommendations for a countermeasure programme and the corresponding institutional framework were drawn.

On the basis of these recommendations, a first short- and medium-term safety programme is now being actively planned, and an intersectoral coordinating body is soon to be established. The Philippines have now reached the initial stage of implementation of a national integrated safety policy; although application of safety measures will of necessity be gradual, a permanent reference to the overall framework is seen as essential in order to get maximum efficiency of complementary actions.

3.5 Sri Lanka

Traffic accidents have assumed epidemic proportions in Sri Lanka: they are a leading cause of mortality in the country. The problems started in 1977, when annual imports of vehicles started increasing dramatically and road accident figures grew accordingly; since 1980, the situation has stabilized at 24 000 accidents per year. About 8% of these are fatal, and the mortality trend is still on an upward slope. The cost of injuries and disabilities is also heavy on the health system.

In order to tackle the problem efficiently, an infrastructure for intersectoral management of traffic safety was needed: a National Committee on Prevention of Accidents was created at the beginning of 1985 under the Ministry of Health. Its main duties are to analyse the accident situation, to develop a national safety programme, and to implement, monitor and evaluate it. The Committee is supported by WHO.

Video films have already been produced for information campaigns on accident prevention, and recommendations have been issued concerning:

- driving hours of heavy vehicle drivers;
- determination of medical fitness of applicants for driving licences, particularly for heavy vehicle and public transport drivers;

- restrictions to the licensing system for heavy vehicles, and mandatory training of drivers by the Sri Lanka Transport Board;
- promotion of the training of private bus drivers by the Sri Lanka Transport Board;
- introduction of a law on mandatory seat belt wearing.

The recommendations relative to driver training have already been implemented. The seat belt law is under study (helmet wearing for motorcyclists is already mandatory). Another current project is the improvement and licensing of driving schools.

A National Council for Road Safety has also been created under the Ministry of Transport. Its activities for 1987 cover the fields of school education (organization of road safety seminars at the district level, establishment of road safety committees in all schools), driver training (organization of workshops for driving instructors), promotion of local safety action (establishment of road safety committees in towns and villages, local safety campaigns), public information (booklets, posters, media campaigns, organization of accident-free month, etc.), enforcement and research (organization of a national seminar on road safety).

Within intersectoral cooperation, the health sector should play a specific part in future safety activities, focusing on epidemiological studies of traffic injuries, the development of a national information system, promotion of seat belt and helmet wearing, the prevention of drinking and driving, and the protection of pedestrians.

Initiating safety programmes is obviously easier than sustaining them: the problem is to keep enthusiasm high, as well as to ensure long-term improvement of road-user behaviour. Continuing public information activities are therefore essential, and a coordinated programme including seminars, campaigns, contests, exhibitions, etc., should be planned and implemented every year, both at the central and local levels.

3.6 Discussion

South-east Asian countries have a lot in common in the field of road safety, the main point being that road accidents are now becoming a major national priority, due both to a sharp increase in motorization over the last few years (while driver training and road improvement did not follow at the same pace), and to the progress made in disease control.

Intersectoral coordination and overall planning of a safety programme are usually seen as major conditions for efficient accident prevention; coordination may also be necessary between the decentralized agencies or local governments in countries such as India where a large part of decision-making and procedures are in the hands of states or local authorities. The coordinating body may have different structures from country to country, and the leading role may be assumed by the Prime Minister, the Minister of Health, the Minister of Transport, the Head of the Police, etc., but it is always set at a high level of decision-making.

All countries are trying to get some accident prevention activities going at a decentralized level: in the communities, within primary health care programmes, but also at an intermediate, e.g. district, level. Intersectoral committees are also sometimes set locally. Active participation of the citizens in accident prevention is viewed as a logical step, but also as an indispensable feature of a national safety policy in countries where the communication network is not the best and resources need to be found at all levels.

It is generally recognized that a major condition for safety policies to get properly implemented is a strong motivation of decision-makers, as well as, at the other end of the scale, public awareness of the importance of the problem and its possible solutions. Motivation for road safety action is still not strong enough in many countries, but can be enhanced through a realistic description of the accident situation (based on reliable data) and information at all levels. The process should be "snowballing", the difficulty being to get it started ...

Monitoring and evaluating traffic safety programmes is considered in all countries as a priority task, but one that requires exhaustive and reliable data collection systems, and therefore raises difficulties. Evaluation is still an activity of the future, but it is essential to work on it without delay as safety action is now really taking a start.

4. Policy issues related to traffic safety (9 and 10)

4.1 Transport planning and traffic management

- Transport planning, particularly in urban areas where it affects daily trips and modal split, has a distinct influence on safety, although it is still technically difficult to predict which effects on accidents changes in the transport system may have. Indeed, effects of the development of specific transport means, such as bus networks for instance, are still controversial and widely depend on the local traffic conditions and the procedure of implementation. There are indications that light-rail transit systems may have a more homogeneous and favourable safety record. It is in any case highly probable that finding a suitable alternative to private car and motorcycle traffic in urban areas should contribute to increase safety.
- Although traffic planning in urban areas, i.e. the allocation of road space and safety devices to the various types of road user for smooth traffic operations, may be used to back particular transport policies and give priority to a specific transport means, some particular precautions have to be taken to ensure a good level of safety: the first one is to take into account the needs for free movement and protection of the vulnerable road users (pedestrians, in some cases cyclists); the second is to consider the city as a whole and provide for safety both in the congested and the quiet areas, where accident problems may be different but nevertheless exist.

- Planning for transport and traffic should take into account all practical requirements for operations, including pedestrian access to bus-stops or stations, car parking, etc., in order to avoid the development of unforeseen unsafe situations. Speeds should also be kept under the maximum acceptable in view of the local conditions, and speed control devices may have to be included in the traffic plan.
- Public transport operations may be made safer through driver training and improved maintenance of vehicles.

Clearly, some research is needed, particularly in developing countries, into the safety record of the various transport means available in urban areas, taking into account conditions of operations, urban surroundings and the local traffic mix; some contradictory examples mentioned in the discussion indicate, for instance, that heavy vehicles such as buses have a high potential of serious accidents unless a lot of care is put into the organization and follow-up of operations; on the other hand, one example in the Region of a light-rail system, Manila's metro, shows a good safety record (no accident after one year of operation) and indicates that indirect safety gains may also be quite high as less daily trips are now based on jeepney operations.

The safest form of mass-transit may well be the metro type, but high capital and maintenance costs are involved; a reappraisal of the economics of such systems, taking into account the expected safety benefits, is now needed to improve transport planning in the growing metropolitan areas of Third World countries. Such a study is about to start at Transport and Road Research Laboratory.

Although specific training of professional drivers is seen as essential, both to teach them proper use of their vehicles and to enhance their sense of responsibility towards their passengers and the other road users, it has been stressed that a heavy vehicle driver is not always guilty of bad behaviour in the conflicts or accidents that may occur, as he is too often the victim of extremely difficult working conditions. Fatigue resulting from long working hours, the heat and the noise in the vehicle, the strength required to manoeuvre loaded buses or lorries without power-assisted steering can be identified as accident-prone factors. Both technical improvement of the heavy vehicles used in developing countries and a regulatory framework for professional driving are acutely needed.

Pedestrians are the most endangered road users in the Region, particularly in urban areas. In many cities, not enough space is left for pedestrian activities as motorized vehicles in growing numbers tend to gradually occupy all the street space. The need for a proper network of sidewalks for pedestrians in the cities has been stressed, and this issue should be considered in any traffic planning study. Pedestrians are not just obstacles for motorized vehicles when they cross a street; walking is also a means of travel that is of high economical interest.

Many types of crossing device, such as overhead bridges, have been experimented with for pedestrians on high-traffic urban arteries (Manila, Bangkok, etc.). Such measures are costly and meet seemingly with various

levels of success; evaluation should take into account the local traffic conditions and the operational characteristics of the device from the pedestrian viewpoint; follow-up studies are in progress in Bangkok, where some overhead bridges have been fitted with mechanical staircases.

It has been stressed that most crossing devices put heavy constraints on the pedestrians, while walking traffic may be much more important than car traffic; in India, for instance, experiments have been carried out to provide adequate protection for the pedestrians crossing large arteries while equitably sharing the constraints between them and motorized vehicles, the latter going up a light slope and the former going down only a few steps to an underground passage. It is still too early to assess the effects of the experiment.

There is no lack of specific transport means, transport organization or safety devices in developing countries: the problem is to follow up their implementation, analyse how they work (or why they do not work), and evaluate their safety effects with reference to the local operational conditions. Time and money spent on such monitoring should be rewarded by future improvements in transport and traffic management.

4.2 Road engineering

A few topics were proposed as a basis for discussion.

- Improving roads to keep up with growing traffic is, of course, a requirement to prevent accidents, but the question is: how far should we go? If better roads mean higher speeds, part of the safety gains expected may be cancelled.
- "Built-in" safety is a goal to achieve when constructing new roads or developing new urban neighbourhoods. Some safety criteria should be identified on the basis of the findings from existing infrastructure configurations, bearing in mind all the categories of road users expected in the traffic mix. Future maintenance problems must be taken into account.
- On existing roads, improving safety means analysing the accident situation in order to design the most appropriate countermeasures. Different approaches will be required in urban areas or on rural roads. The situations to be treated may range in growing order of complexity from blackspots to stretches of high traffic routes to area-wide accident locations.

Built-in safety, of course, appears as a necessary part of accident prevention policies, maybe the cheapest one in the long range. Better roads are usually more costly at the construction stage, but a three-way trade off between investments, safety and the economics of vehicle operation should be sought.

However, a better road from a safety viewpoint is not necessarily always the most expensive one to construct; there are indications that if the fundamentals of road design are indeed safety prone, further improvements (relative to the running surface, for instance) may lose more through increased speeds than can be gained.

Examples from developed countries show that motorways or toll highways, i.e. dual carriageways with grade-separated junctions, have a much better safety record than ordinary roads, at least in rural areas and provided adequate speed limits are enforced; it is not clear, however, whether this good record results from the design itself or from the fact that light traffic has been eliminated and such routes do not cut through any inhabited areas. Operations of toll roads in developing countries have sometimes raised problems (with pedestrians using them, for instance), and it may be possible to find a more economical design to reach similar safety results.

When designing new highways, the roadside should be considered as well as the carriageway: lateral obstacles, ditches and lack of shoulders may seriously aggravate accidents, in particular those involving a loss of control of one of the vehicles. Roadside treatment is particularly important on some potentially hazardous locations such as bends or steep gradients.

Altogether, data should be gathered on the safety records of different types of highway design (width, surroundings, traffic allowed, etc.) in operational conditions, as can be found in developing countries. Maintenance problems should be kept in mind, and accidents should be analysed both on the newly constructed roads and after some time of regular operation.

In developing countries, the basic approach to corrective safety is blackspot treatment, which offers opportunities for experimentation, low-cost countermeasures and evaluation. It also involves a method of analysis that can be subsequently applied to other safety problems, both in urban and in rural areas (heavy traffic routes, area-wide countermeasures, etc.). It is stressed that although most accidents result from causal processes, including behavioural factors, some physical measures such as blackspot treatment are likely to be cheaper and much more efficient in improving safety in the short term than measures aiming at influencing behaviour or road user attitudes.

Blackspot treatment usually requires reliable accident data; accident location should be sufficiently precise to detect the build-up of accidents; the description of accidents, especially the pre-collision phase, should provide enough information to make at least a rough safety diagnosis possible. Blackspot treatment also requires some direct observations performed on site. Apart from this accident-based approach, road inspections can also be systematically carried out to identify locations where features of the carriageway or the roadside create "pitfalls" for the drivers, inducing behaviour unsafe in the circumstances (unannounced hazards, steep hills, sharp bends with brutal changes in the radius, etc.).

4.3 Vehicle safety

A few relevant points for discussion on vehicle safety were stated:

- although the part played by vehicle defects in accidents is difficult to assess with any precision, it is widely accepted that "safer" vehicles can be made; for developing countries, this raises the question of the definition of the relevant safety standards (vehicle characteristics and occupant protection devices) to apply to vehicles either imported or constructed in the country;
- minimum maintenance requirements may also be identified, addressing this time the individual road users or vehicle owners;

- technical control of vehicles may also be considered, although the necessary infrastructure may be costly and difficult to organize.

Requirements for vehicle safety, both in terms of standards and maintenance, should be specifically defined, drawing from past experience but also bearing in mind the geographical, economical and travel conditions in the countries of the Region.

Vehicle standards in developing countries should ensure "built-in" safety with the least possible maintenance. Given this compromise, some advanced features and electronic gadgets may have to be left aside for a while as inappropriate, and attention should concentrate on the basic infrastructural aspects and protective devices. Motorcycle standards are an important issue for the countries of the Region.

Standards should apply to vehicles made in the country as well as to imported ones, even if there are some economical problems to be solved. Home industries should be encouraged to produce spare parts which, when imported, are expensive and sometimes difficult to obtain, thus making maintenance all the more difficult.

Maintenance requirements are meant for the general public: they can be met only if they are kept to a realistic minimum, and the road users are aware of their safety implications as well as of the economical benefits they can bring in lengthening vehicle life. It is obvious that adequate information of the road users and educational measures are as important as proper definition of standards to obtain a safer vehicle fleet. Road users' attitudes towards cars should become more safety oriented.

A periodic technical check of vehicles is now mandatory for private cars in most developed countries and in some developing ones; existing examples show that, while cost-efficiency of the whole operation is difficult to predict, the organization of the corresponding infrastructure (network of checkpoints under the supervision of national or local administrations, enforcement) is difficult; even more difficult is to keep the infrastructure working over a long period of time.

Vehicle standards and state of repair are not the only factors that may affect safety: whether vehicles are used according to their designers intentions is just as important. Transporting passengers in pick-ups or lorries unfit for this type of application and overloading public transport or goods vehicles are two common examples in this respect. Again, such safety problems may be insoluble through purely regulatory measures, and some enforcement may be needed.

Finally, attention has been called to the safety problems raised by "home-made" vehicles, which are a current feature of traffic in several countries of the Region: they are usually built from very old spare parts which are sometimes mismatched and may be fitted with engines far too powerful for such a structure. Often, as they are not recognized as road-worthy, no license is required to drive them ... The traffic and accident problems created by such vehicles of high socioeconomic interest should be further investigated.

4.4 Education, information and driver training

Although behaviour can be influenced locally and rapidly through measures aimed at improving the road or its environment, the discussion concentrated on the means to obtain longer-term changes, such as driver training, information campaigns and school safety education.

Improvement of driver training is widely acknowledged as a major feature of traffic safety policies in the countries of the Region. Training by specialized instructors should be made mandatory prior to the driving test, and the test itself should be designed and applied in an efficient way to check incorrect driving procedures.

Additional training sessions may also be designed for drivers already licensed but having to adapt to a new kind of vehicle or displaying insufficient knowledge of the driving rules. An obvious target group is the population of professional drivers. However, past experiments in this field tend to show that individual behaviour is influenced by the social environment (or "collective" behaviour); this means that education or training measures are likely to be effective only if they address a substantial proportion of the reference population. This should be kept in mind when calibrating an experimental training scheme.

As pointed out earlier, unsafe behaviour is often a result of difficult driving conditions. It will be useless to try to improve behaviour, particularly as far as professional drivers are concerned, so long as the characteristics of the roads or the vehicles remain in contradiction with the use that has to be made of them. Comfort of the driving task should be studied and improved.

In general, more needs to be known about the traffic behaviour of different categories of road users in the countries of the Region before adequate education measures and information campaigns can be designed. Behaviour as well as individual reactions to countermeasures are not independent of the economical and psychosociological context, and some research on these issues should be carried out inside each country. The behavioural studies carried out in the developed countries may, in addition, provide some fundamentals common to most of the human species ... In the field of accident prevention, the importance of involving psychologists and psychosociologists should not be underestimated.

Education and information programmes should be defined with reference to actual local traffic conditions, and based on some minimum knowledge of the accident situation. While there is still no evidence as to the efficiency of such measures, it is felt that safety awareness of the road users should be raised and that a better balance should be struck between safety and performance. However, information campaigns should be used primarily as a support for other types of countermeasure (in particular, regulations, new environmental features such as contraflow lanes, etc., or car use and maintenance). Campaigns should then be timed in accordance with the schedule set for the implementation of the other countermeasures.

Children's education may be the most appropriate course of action to obtain long-term changes in behaviour and attitudes. Education programmes and pedagogy should be suited to each country's conditions, but should also take into account child development and the basics of child psychology. Provisions

should be made for the future development of areas where traffic accidents may not yet be a major problem.

Both education and information measures should be coordinated and planned as a comprehensive and rational policy, at the national and the local levels. In any case, changing behaviour, motivations and attitudes is a long and difficult task and should be considered as complementary to more technical measures, which may be less spectacular but more immediately effective.

4.5 Law, regulations and enforcement

The following points were proposed for discussion:

- new traffic laws introduced in a country should fit into the national legal system, and should also be acceptable to a majority of road users; before a new law can be applied, there may be a need to change public attitudes towards the particular traffic problems concerned, for instance through information campaigns.
- traffic laws should be enforceable: incorrect behaviour should be precisely defined, on the basis of measurable or observable criteria.
- even though they should be based on a broad consensus, traffic laws cannot be expected to work efficiently without a system of fines and enforcement strategies, specifically designed to suit the local legal, psychological and social conditions.

The discussion showed that many countries still have an old-fashioned legal system, often too complicated and, as far as traffic laws are concerned, ill-suited to the present levels of motorization and patterns of travel. A review and assessment of national legal systems seems a worthy activity in the short term, bearing in mind that the package should reflect scientific evidence and should not be overburdened by regulations difficult to enforce or with unknown effects on actual behaviour.

It was stressed that regulations and enforcement are always penalty oriented, which gives to this kind of safety measure a negative image: constraints and punishment. Incentives for good drivers should be part of the overall system. In countries where insurance is mandatory, incentives may come from there, but experiments should be made with other solutions (contests, rewards, etc).

Enforcement strategies should be designed so as to be applied with equity: there should be a consistency in the detection of incorrect behaviour, as well as in the way fines and penalties are actually attributed. All road users should stand an equal chance of being caught when they break the law. This tends to preclude strategies such as the "point system" (the driving license is taken away after a number of bad points have been attributed for traffic offences detected by the police) at least in countries where the means of enforcement are too restricted to ensure proper coverage of the entire population of drivers.

For good enforcement to be possible, the need for a specialized traffic police has been identified. Policemen should receive special training in order to gain some knowledge of traffic and safety problems and get acquainted with the techniques necessary in their job (for accident data collection as well as for enforcement). Traffic activities should also be promoted, and

shown as a valuable service deserving reward, both financially and in terms of career, just as any other police or civil service task. The fact that traffic police jobs have too often been undervalued in the past may explain some difficulties with enforcement, such as lack of motivation of policemen or bribery.

A complementary requirement is that law courts in charge of traffic or accident cases should work quickly and efficiently. Specific training in traffic matters may also be useful for magistrates and lawyers. Special courts dealing only with traffic offences may have to be created to ensure that months or years do not pass by before a traffic case comes to trial, the driver having by then forgotten all about the circumstances ... Also, how can the police keep motivated for the detection of incorrect behaviour if nothing comes out of it in the end?

In addition to dedicated policemen and magistrates, enforcement strategies require technical equipment (for instance, radars to measure speeds, breath analysers to measure alcohol rates, etc.). Without reliable measurement tools, policemen's decisions can always be disputed, and law courts will have a problem in backing them. Again, equity is at stake.

Enforcement thus appears as a difficult and costly activity, which points to the need for limited and well defined strategies, aimed at improving items of behaviour which are actually relevant for safety and which cannot be entirely improved through other methods (information to publicize new laws and to change attitudes, education to increase the necessary knowledge of road users).

It was also stressed in the discussion that traffic laws should not be considered as applying only to individual road users. There are cases, for instance, where an administration should be made liable for insufficient road maintenance. The problem of hospitals or health centres refusing to admit casualties from traffic accidents (because the patients are not medically insured, because the medical staff do not want to get involved with legal reports, etc.) should also be met with adequate legislation.

4.6 Emergency rescue systems

Part of injury prevention is to reduce accident severity and the resulting disabilities. Improvement of emergency rescue systems, and particularly of the pre-hospital phase (alert, transfer of casualties, dispatching centre), is thus a part of safety activities that should not be neglected in national programmes, even though accident prevention remains the first priority.

Emergency rescue systems should be treated as an integral part of overall health planning and should be organized to cope with all relevant injuries, not just those resulting from traffic accidents.

The organization of the pre-hospital phase of an emergency system should rely as much as possible on the structures existing in the country, particularly in terms of communication networks. New systems should preferably be set on a small scale, then progressively extended. For future developments, some research into modern communication systems may be fruitful.

There may be a case in developing countries for educating the public in general, and the people who are the most likely to arrive within a short time at the accident scene in particular (the police, for instance) to perform first-aid treatment. If most of the road casualties are transferred to hospital by private drivers, these should also be informed as to the precautions to take before moving an injured person.

The discussion finally stressed again that although emergency rescue is indeed an essential factor for injury control, most efforts towards better traffic safety should concentrate on avoiding accidents. Preventing the disease is obviously more satisfying than trying (imperfectly) to cure it.

4.7 Integration and evaluation of safety measures

In order to facilitate discussions in the Seminar, policy issues had to be detailed according to the main elements of the traffic or the social system to which they applied. However, it is clearly when they are combined and coordinated that safety measures are likely to produce the best results: accidents are generated by multifactorial processes, so that any safety target identified may react to a variety of actions which, if implemented together, will enhance each other.

Integrated safety programmes designed and implemented at the national or the local level are thus likely to prove more cost-effective than any series of uncoordinated measures. Although such programmes are only now being started even in the more developed countries, and proper monitoring has yet to be organized, this new approach to accident prevention appears by far the most promising one (11) (and is promoted for instance by National Institute for Transport and Boat Safety Research (12)).

Integrating safety action belonging to fields as different as law and road building is not an easy task. It requires, first of all, a strong coordinating body whose authority on the relevant decision-makers is established and effective at all stages of the procedure (design of the programme, planning of operations, implementation, monitoring and evaluation, feed-back). It also implies that there is strong motivation of decision-makers for accident prevention.

For an integrated safety programme to be operational, a pragmatic approach should be adopted when designing it: identification of the key people for decision-making or the promotion of safety, identification of the most likely sources of funds, determination of the most appropriate levels of implementation between central governments and communities. All these factors will differ from country to country according to the institutional and socioeconomic conditions, but two points should be stressed:

- even safety programmes planned at the national level may include groups of measures appropriate for implementation at a decentralized level, where the decision-makers and the professionals can be in closer contact with the public, and make a better job of getting the road users aware of current safety problems and conscious of the need for accident prevention, and also where additional funds may perhaps be found; coordination is then necessary between national and local administrations or governments, as well as between the various fields of action;

- in developing countries where resources for safety work are usually scarce, the role of nongovernmental organizations may be essential to ensure that an integrated safety programme can actually be implemented; the part taken by these organizations in the institutional framework (access to coordinating body? decision-making? implementation? financing?) is to be examined in relation to the national context, but it is clear that authority on the actions taken should remain with the coordinating body, and useful nongovernmental organizations should not be left to work outside the system.

Even if only a few countermeasures can be applied in the short term due to limited resources in manpower or financing, they should still be designed within the framework of a more extensive integrated programme, in order to ensure optimal compatibility between immediate and longer-term actions. Safety measures designed to complement or support each other should, however, always be implemented in a coordinated way, as intended in the programme.

Monitoring and evaluation of safety programmes are essential, both at the international level to get better knowledge of how countermeasures work in developing countries, and at national or local levels to assess any change in the accident pattern that may lead to a reorientation of safety policies.

Evaluation is a two-level procedure, applying both to overall safety programmes or to groups of associated countermeasures implemented simultaneously, and to individual countermeasures that can be considered, with regard to the way they work, as standing on their own. Evaluating blackspot treatment is a typical example of the second level.

Global evaluation of programmes and long-term evaluation of simple countermeasures may rely on accident data, providing the data collection system is working efficiently and reliably by the time implementation starts. General monitoring of an integrated programme (checking that the institutional organization works, that measures are applied following schedule and produce effects according to expectations, etc.), as well as short-term evaluation of simple countermeasures, will be based on behavioural changes, with an observation procedure designed in view of the goals stated for the integrated programme and each of its components. Special planning for monitoring and evaluation is thus necessary for each new safety programme, taking into account its characteristics and the time-scale involved.

It has been stressed that such follow-up activities are essential to any progress in accident prevention, especially in developing countries where so little is known of the opportunities and the problems.

5. Research and technology transfer

An overview of past activities and present needs in road safety research in Asian countries was first made. Past efforts in the field focused essentially on accident recording, a preliminary requirement for both research and practice. Seminars and study tours were organized for information transfer. Such a feedback between researchers and practitioners is bound to be beneficial in the long term and should be further encouraged.

From the ESCAP point of view, future research should be oriented in relation to the main safety problems already identified; these include in particular data treatment (computerized files, statistical issues, etc.), standards for vehicle design and maintenance, and quality and homogeneity of road hardware (marking, signing, safety devices). Follow-up and evaluation of countermeasures adapted to the local context are also primary requirements for a research policy in the Region, with emphasis on experimental measures aimed at improving pedestrian and two-wheeler safety. Driver training is, finally, a field where research should also prove useful.

Following this, some of the research already carried out at TRRL in developing countries was briefly described, on the basic principles of close cooperation with research institutes and administrations concerned with safety (a TRRL team working for a minimum of two years in a developing country), and of noncommercial technology transfer. Over the last few years, TRRL research has focused on accident data bases and low-cost countermeasures. Mr Yerrell stressed that knowledge is slow to build, and that each country should not have to cover all research fields relevant to safety: there is a need to identify the areas which can be generalized and the transferable research results, so that developing countries can concentrate resources on the study of actual specific problems. This approach is the most rational in the short term, and relies on the free dissemination of research findings.

Drawing from past experience of INRETS in developing countries, the need for multidisciplinary research was underlined, associating accident analysis and the study of road-users' behaviour and attitudes, and for long-term research planning, a sustained effort being necessary to monitor and evaluate integrated safety programmes and learn from them to improve future accident prevention strategies. Closer links between research and practice should also be the rule, as most measures designed in developing countries will have significant new features; the coordinating structures set at national level for the implementation of integrated programmes should thus also be of use to promote research and identify skills and resources.

WHO focused on international cooperation, and showed that research on accident prevention has been given too little priority in the past: most of the medical resources have been allocated to fields such as cancer research for instance, in spite of the prevailing effect of injuries on public health, and even safety-oriented research has from the start emphasized clinical rather than epidemiological aspects. WHO is now trying to shift the emphasis to more operational research, essentially community-oriented and relying on improved medical/engineering cooperation.

For countries to be able to pool knowledge and research efforts, some specific activities should be initiated in each of them. But the emergence of a multiplicity of research studies without proper channels to gather and compare results and prevent unnecessary duplication of effort is to be avoided at all costs. A platform or consensus for cooperation at the international level is essential, in order for each country to be aware of new research activities carried out elsewhere and to have access to the available corpus of knowledge. Research institutes in all nations have a part to play in the establishment of such a research cooperation network, and WHO is prepared to promote it.

The discussion that followed demonstrated a wide agreement on the points developed above.

- Identification of relevant transferable research results, evaluation of low-cost countermeasures and integrated safety programmes, development of evaluation methods, and behavioural and psychological studies within the national context of each country were viewed as the main research priorities.
- Suggestions were made to start a cooperation network, which could be based, with WHO assistance, on the national safety councils or similar coordinating bodies created in Asian countries, as well as on some European research institutes taking part on a noncommercial basis. Thailand offered to act as a focal point for south-east Asia if required.
- The problem of the scarcity of resources available for research was also discussed: funds are needed for information transfer as well as for research studies themselves. Aid agencies should be made aware of the close relationship between research and operations, and evaluation-oriented activities should be an integral part of any action plan financed. Requirements for a multidisciplinary approach to safety analysis, requiring the intervention of specialists in human sciences, should also be stressed. In other words, new funding policies for safety research in developing countries are called for. The World Bank representative agreed that research should be better supported in the future.

6. The role of health professionals in the intersectoral management of traffic safety

It was noted that, although almost any sector of governmental action, from housing to vehicle standards, had definite public health implications, health as an explicit objective always seemed to get a low priority rating in national policies. A wider cooperation between health specialists and other professionals was pleaded for, in order to evaluate the health consequences of any new sectoral programme, including possible effects on accidents, but it was stressed that government departments usually did not like to have their decisions questioned and that some diplomacy was therefore needed, taking care to avoid confrontations. In the particular field of traffic accident prevention, for instance, health services should get more involved, but leadership should remain with the Transport Department (or its equivalent).

It was also suggested that a specific role of the health sector at the international level should be to inform and sensitize politicians and decision-makers to the safety issues. Motivation inside a country may often develop through international channels.

It was underlined that for developing countries to be able to reduce their accident rates at least to those observed in developed countries, the ministries of health had to consider accident prevention on a level with action against communicable diseases and allocate corresponding resources. A strong point of the health sector for accident prevention is that there is usually a widely decentralized health network while transport or communication departments rarely get in contact with communities.

The health profession should also be viewed as a possible pressure group for the promotion of specific safety measures: there are examples of countries where, for instance, the seat belt law was advocated and adopted as the result of pressure from the medical doctors. At the international level, he stressed that sensitizing the decision-makers to safety issues, as WHO has largely done in the past, was essential but not sufficient to get action going: there was also a need for the health sector to generate cooperation with other agencies representing different professional activities, both for operational and research purposes.

The final consensus reached in the Seminar on this point is that public health services should get progressively more active in accident prevention, and should be an integral part of the coordination established at both the national and international levels for the promotion of integrated safety programmes: technical cooperation should make the best use of all the means available, and the health sector's special strengths (interactions of health problems and other fields of decision-making, decentralized action) should be important factors for future progress in accident prevention.

7. Recommendations

- (1) More efforts should be made in all countries towards a comprehensive and reliable accident data collection. The level of collection most appropriate to the present situation is intermediate between simple statistics and a detailed description of individual accidents, and should allow economic evaluation of unsafety and identification of priorities for action, as well as blackspot location and simple safety diagnosis.

To build up reliable data bases, technical cooperation between developed and developing countries will be helpful. A measure of standardization of the data collected (definitions, classification) is needed for international comparisons.

Experimental data collection systems implemented in different countries should be followed up with respect to the existence and content of a standard accident form, the actual on-the-spot registration of accidents, and the channels used to gather data at the central level.

To describe the importance of the safety problem, morbidity is as essential as mortality. Morbidity indicators need to be defined, and collected through standard procedures in health services. A linkage of on-the-spot accident data and morbidity data should be organized, if not at the national level and for all accidents, at least at the local level in pilot regions or districts. Common procedures for several countries will allow international comparisons.

- (2) Integrated safety programmes should be promoted, as they are likely to prove more cost-effective than a multiplicity of uncoordinated sectoral activities.

Integrated safety programmes may be designed at the central level for a country as a whole or at the local level with authorities in charge of accident prevention (state, region, district, community). Increased

community involvement in accident prevention should open new opportunities for action and enhance the effects of national safety policies.

Integrated safety programmes can be designed and implemented only if two conditions are met:

- the government and local authorities are well aware of the growing social and economic cost of traffic accidents, and are strongly motivated for safety action: a good data base and a strong diagnosis should help in reaching this point.
- a coordinating body is created, with some authority over the departments or services responsible for the relevant sectoral activities (roads, traffic, education, planning, etc.). The leading authority in the coordinating body should be strategically placed with regards to decision-making.

International cooperation and coordination of the integrated safety programmes initiated in each country should help avoid duplication of effort in areas of common interest, and should allow the pooling of skills and technical tools.

Integrated safety programmes are a new feature in accident prevention policies, and should draw from safety research carried out both in developing and developed countries.

- (3) The accident situation and trends in developing countries justifies the strengthening of emergency health care and the provision of emergency rescue systems, in order to reduce both the fatalities and the disabilities resulting from accidents. Emergency rescue and care should be planned as an integral part of health services.

Although quick and proper treatment of accident victims is essential, the emphasis in national integrated safety programmes should, however, remain on all accident prevention aspects.

- (4) More efforts should be devoted, once adequate accident data collection systems have been set to work, to safety diagnosis in the countries of the Region. This includes better identification of priority areas and of the main factors, related to road infrastructure and the environment, vehicles, and road-user behaviour, that combine to generate accidents.

Similarly, follow-up studies of the safety measures or programmes implemented should be undertaken, in order to gain knowledge from past actions and gradually improve accident prevention strategies.

For diagnosis and evaluation, some technical help from research institutes in developed countries would be helpful, which involves setting permanent communications at the international level for information exchange and the development of new methodologies. Training of the various professionals responsible for accident analysis and countermeasure evaluation will be necessary.

- (5) Even at the present stage when only fragmentary accident data are available, the safety problems of pedestrians and motorcyclists emerge as an obvious priority in most countries of the Region, as in many other developing countries. Other priority areas may be goods transport (truck traffic on rural roads), and public transport (mainly in urban areas), all involving professional drivers. Short-term research and programmes should logically focus primarily on these problems, keeping to the intersectoral and integrated approach.
- (6) A meeting similar to the present Seminar should be planned in two years' time, to evaluate the new developments in traffic accident prevention in the countries of the Region, and exchange experience with respect to integrated safety programmes, national or decentralized.

The Seminar demonstrated a need for establishing a permanent international forum to facilitate information exchange and further technical cooperation. As an initial step, the national focal points (i.e. research institutes) should be nominated, enabling a permanent flow of information and experience within the Region.

The Seminar recommended that activities be developed within the South Asian Regional Cooperation (SARC), and WHO and ESCAP expressed their willingness to support subregional expert group meetings.

- (7) The Seminar recognized that all the actions it was advocating implied the allocation of greater resources to road safety activities and programmes. The countries in the Region are urged to examine all possible sources of funding and support, both governmental and nongovernmental; the latter, for example, could include insurance companies and private commercial firms. Similarly, the various aid and lending agencies should be urged to include resources for safety programmes within their forward planning and budgeting.

It was noted that all the above recommendations agree with existing informal World Bank guidelines for road safety lending.

8. Some needs for future research

The gathering of information and critical assessment of the effects of countermeasures applied in developed countries may be of use for the developing world, provided details of process evaluation (observation of the way safety measures work) are available in relation to the local conditions of application. In addition, studies of the road safety context (socioeconomic conditions, opinions and attitudes of the road users towards mobility and safety, etc.) should be carried out in developing countries in order to identify the relevant criteria for the transfer of technology and research results.

Similarly, a need has been expressed in the Seminar for a review of the most fundamental research results in the traffic safety field and associated disciplines (engineering, psychology, medicine, etc.), in order to identify the basic knowledge that may be generalized to any situation involving human beings, and make it widely available.

Both of these tasks are difficult as they require extensive information gathering and critical research reviews, and rely on close international cooperation, involving both researchers and practitioners in traffic safety. Results from such approaches are likely to be helpful for all safety professionals in both developed and developing countries, who still have to rely on fragmentary knowledge available from uncoordinated and often incomplete studies; however, even if such a research is initiated immediately, results will take a long time to obtain.

Some short-term research is also needed in the meantime; specific areas which should be relevant to the problems of south-east Asian countries have been identified during the discussions of the Seminar, such as:

- definition and test of standard accident data procedures;
- identification of the main accident problems in the countries of the Region, and in-depth analysis of their causes; in particular, the processes generating pedestrian and motorcycle accidents should be a priority for investigation in most countries;
- comparison of the safety records of different means of transport in urban areas, and of different types of road design in rural areas;
- experimentation and evaluation of low-cost safety measures on blackspots;
- identification of construction standards and maintenance criteria for vehicle safety, relevant to the conditions existing in the countries of the Region;
- safety record and improvement of home-made vehicles with high socioeconomic importance;
- the driving conditions of professional drivers and their influence on accidents;
- comparative analysis of the legal framework for traffic in different countries, and of strategies for law application and enforcement, with respect to the local cultural and economic context;
- content and delivery of public information campaigns for traffic safety and related subjects; and guidelines for public information strategies; this area of research involves both accident analysis and studies of behaviour and attitudes of road users;
- training and testing procedures for drivers, in particular professional drivers;
- training programmes for safety professionals in the relevant sectors of activity, including traffic police and specialized court magistrates;
- evaluation methodologies based on accident analysis and on behavioural observation, for integrated safety programmes and for specific low-cost countermeasures.

Part of the extensive research involved should be carried out inside each country of the Region, but most research areas also imply that comparisons can be made at the international level, either between countries experimenting with the same problems or in some instances between developing and developed countries. Strong and sustained international cooperation and coordination are obviously fundamental requirements. Differences between the national traffic and socioeconomic conditions should be identified and borne in mind for any comparison studies.

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Annex 1

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