4 CHARACTERISTICS OF ROAD SAFETY PROBLEMS IN ASIA-PACIFIC REGION

4.1 Introduction

The ESCAP questionnaire was returned by 25 countries and although not all tables were completed by all countries, it did provide sufficient information to gain an insight into the characteristics of road safety problems in the Asia-Pacific region and changes which appear to be underway in individual countries.

The following gives an overview of some of the more interesting characteristics emerging from preliminary analysis of the questionnaire data. Tables containing these aspects of the data are included as Annex A at the end of this report. This analysis is based on data returned by September 1996.

4.2 Night-time accidents

Taiwan Province of China, Azerbaijan and Australia have the highest proportions of night-time accidents, while four of the South-Asian countries - the Islamic Republic of Iran, Pakistan, Sri Lanka and Malaysia - have the lowest (see figure 4.1 below and table 4.1 in annex A). This perhaps could be related to less late night drink / driving in these Islamic countries.

The number of accidents in the Taiwan Province of China appears to be decreasing generally. However, the number of accidents at night is not decreasing at the same pace as the day-time ones, resulting in an upward trend in the proportion of night-time accidents. A similar case exists for Russian Federation. The high percentage of night-time accidents in Australia, however, reflects the 1993 data: there is also a general downward trend in both day and night-time accidents with the proportion at night decreasing, up to 1993. The high numbers of accidents at night in Australia in 1993 may be indicative of a new trend, but it is not possible to comment on this until later years of data are available.

In Pakistan, there has also been a downward trend in the number of day and night-time accidents. In this case, however, there has been a greater decrease in those occurring at night. This also appears to be the case for New Zealand and Turkmenistan (see figure 4.2).

In the Republic of Korea, Malaysia and the Islamic Republic of Iran, the number of accidents has been increasing, with the number occurring at night increasing slightly more than those occurring during the day. In Sri Lanka and Fiji there have also been upward trends in accidents during the day, but proportionately smaller increases in those at night.

Figure 4.1: Percentage of night time accidents, selected Asia-Pacific countries (1993)
Hong Kong has seen a decrease in daytime but an increase in night-time accidents. The figures for Bhutan and Western Samoa are too small to allow meaningful trends to be deduced.

4.3 Accidents occurring on wet roads

Figure 4.3 shows that the most striking data on this aspect are for Azerbaijan, which appear to show that 93 per cent of accidents in 1993 occurred on wet roads. The trend data show the proportion increasing from 85 per cent to 93 per cent from 1980 to 1993. This proportion of night-time accidents seems highly unlikely and needs to be checked with those with a better knowledge of that country, to ensure that the data sent back by Azerbaijan are correct. The project team have been unable as yet to verify this data, this is the only country which appears to have a particularly strong trend, and suggests there are almost certainly errors in the data submitted.

The total number of accidents in the Republic of Korea increased substantially between 1987 and 1989 - by 46 per cent - and have stayed around this higher level in recent years. However, inspection of the data relating to road surface shows that this increase is solely in accidents on dry road surfaces (+62 per cent from 1987 to 1989), while the numbers on wet surfaces decreased (-26 per cent from 1987 to 1989) (see figure 4.4).

Myanmar apparently has a large proportion of accidents occurring on wet roads, between 30 and 40 per cent, in comparison with other countries. Western Samoa and New Zealand have the next highest proportions.

The lowest proportions of wet road accidents occur in Sri Lanka, Russian Federation, Thailand, Malaysia, Turkmenistan and the most recent years in the Republic of Korea.

It may seem surprising that Australia appears to have a higher percentage of wet road accidents than many of the other Asia-Pacific countries. This may be related to the type of accident included. The Australia data only include accidents resulting in death or hospitalization of one or more victims, while other countries may include slight injuries or even property damage only accidents. Wet road accidents may tend to have more serious consequences than dry road ones because of loss of control at speed. This might explain why Australia shows up as having a higher percentage occurring on wet roads than other countries which would normally be expected to have greater incidences of heavy rainfall and hence wet roads. This needs to be explored further.
Figure 4.3: Percentage of wet road accidents, selected Asia-Pacific countries (1993)

Figure 4.4: Changes in wet road accidents, selected Asia-Pacific countries (1983-93)

4.4 Type of road surface

The proportion of accidents on paved roads (table 4.3 in annex A) need to be related to the relative proportion of paved roads in a country, in order to compare countries. Table 4.4 in annex A shows that, for the few countries with both accident by surface type and length of paved road information, all countries have proportionately higher accident rates on paved roads than on unpaved ones. India has not provided data on accidents on unpaved roads, despite having more than half of its recorded length of roads unpaved.

In Malaysia the upward trend in accident numbers in the two most recent years has been solely in accidents on paved roads. Figures on the length of paved and unpaved roads show that in Malaysia there has been an increasing proportion of paved roads in recent years, so it is to be expected that a higher proportion of accidents will occur on paved roads - which also tend to be those with more
traffic. This is to be expected in all countries, if they gradually replace unpaved with paved roads.

Similarly, upward trends in accident numbers in Fiji and Myanmar in recent years have solely been on paved roads, although there is no available data to check growth in the length of paved roads.

On the other hand, there has been a 24 per cent decrease in accidents on paved roads in Australia between 1989 and 1993, while the equivalent reduction on unpaved roads was only 15 per cent, despite the available road length data suggesting that the proportion of paved roads is increasing in Australia.

4.5 Accidents in urban areas

Comparison of the percentage of accidents occurring in urban areas (see table 4.5 in annex A), between countries, is not meaningful without some comparison of their relative levels of urbanization. Table 4.6 in annex A, for those countries for which both urban accident and urban population data were available, shows the proportion: per cent accidents in urban areas divided by per cent population in urban areas. Countries with values less than one have a disproportionately high rural accident problem. Australia, for instance (1993 value = 0.83), only counts fatal or serious accidents - these will be more prevalent in rural than urban areas. The Bhutan data is dubious (due to the unexpectedly low number of accidents) and may have been collected from a sample of cities rather than for the country as a whole, which may explain its apparent high value in 1993.

In Sri Lanka around 90 per cent of the reported accidents appear to occur in urban areas, although only 22 per cent of the population live in urban areas (see figure 4.5). There could be a number of explanations for this. Firstly, under reporting of accidents is likely to be higher in rural areas. Secondly, there may be a more marked difference in vehicle ownership and/or availability between urban and rural populations in this country.

In terms of trends in urban accidents the increase in the number of accidents in the Republic of Korea since 1989 has been solely in rural accidents - urban accident frequency appears to have been decreasing. The proportion of urban accidents in Sri Lanka, while dominating the statistics, have not altered substantially from 1980 to 1993.

![Figure 4.5: Urban accidents and population, selected Asia-Pacific countries (1993)](image-url)
In Malaysia, Russian Federation and Turkmenistan the proportion of urban accidents have been increasing. In the Republic of Korea, Taiwan Province of China, Azerbaijan, Australia and New Zealand the proportion has been decreasing. In the Taiwan Province of China, Australia and New Zealand the number of accidents has been decreasing overall - but the urban ones have been decreasing more rapidly.

It is expected that, for various reasons, accidents occurring in rural areas result in more severe injuries. This can be seen to be the case for all countries with available data, (figure 4.6). The graph shows that for urban areas the percentage of injuries is in each case higher than the percentage of fatalities. This may be because of higher vehicle speeds, or because of lack of or delay to emergency services.

Figure 4.6: Accidents in urban areas, selected Asia-Pacific countries (1993)

Little provision for pedestrians in India
4.6 Deaths and injuries by type of road user

4.6.1 Pedestrians

Accidents involving vulnerable road users such as pedestrians can usually be expected to result in more severe injuries. Figure 4.7 shows the difference between the involvement rates of pedestrians in fatal and injury accidents. In all countries apart from Sri Lanka, Turkmenistan and India, pedestrians are involved in a greater percentage of fatal accidents than they are in injury accidents (see also table 4.8 in annex A). It should be noted that another possible explanation for this lower apparent involvement in injury accidents is under reporting, which may be more common for pedestrian and cyclist accidents.

The highest proportion of pedestrian involvement in fatal accidents is in Hong Kong, where two thirds of fatal accidents involve a pedestrian (see figure 4.7 below and table 4.7 in annex A). Western Samoa, Sri Lanka and Fiji have pedestrians involved in over 40 per cent of fatal accidents. The Republic of Korea, on the other hand, appears to have a very low proportion of less than 1 per cent. The urban/rural accident trends showed that the increases in accident numbers in the Republic of Korea in recent years were solely in rural accidents. Since pedestrian accidents in Asia unlike Africa seem to be predominantly an urban problem, it is not surprising to see that the number of pedestrian accidents both fatal and injury has decreased in the Republic of Korea in recent years (however the very low percentage in Figure 4.7 almost certainly suggests significant under reporting of such accidents in Republic of Korea). It is also interesting to note that the increases in recent years have been in injury, not fatal accidents.

There has been a downward trend in the proportion of fatalities involving pedestrians in the Taiwan Province of China, Malaysia, Singapore, India, Sri Lanka and New Zealand. There is no obvious trend in Hong Kong, Azerbaijan, Western Samoa or Australia. Countries experiencing an upward trend include Thailand, Turkmenistan and Fiji.

![Figure 4.7: Pedestrian involvement in accidents, selected Asia-Pacific countries (1993)](image-url)
4.6.2 Cyclists (including bicycles and tricycles)

Figure 4.8 shows that cyclists have a proportionately higher involvement in fatal accidents for the majority of countries. The exceptions are Sri Lanka, New Zealand and Australia.

The involvement of cyclists in fatal and injury accidents, according to data collected to date is surprisingly low. It is highest in China. The available data (obtained from the official China Road Accident Statistics annual report, not from the questionnaire) show their involvement in fatalities and injuries to be much higher than in other countries - almost a quarter of all fatalities are cyclists (see figure 4.8).

There are very small numbers of cyclists involved in accidents in some of these countries, notably the Republic of Korea, Singapore, Azerbaijan, Turkmenistan, Fiji, Western Samoa and New Zealand, which makes meaningful interpretations difficult.

Figure 4.8: Cyclists involvement in accidents, selected Asia-Pacific countries (1993)
4.6.3 Motorcyclists

Figure 4.9 shows that motorcycles are involved in a high proportion of fatal accidents in the Taiwan Province of China (54 per cent), Malaysia (52 per cent) and Singapore (51 per cent). In Taiwan Province of China this involvement is decreasing, but in the other two countries it is increasing. Sri Lanka also has seen a general upward trend in percentage of fatal accidents involving motor-cycles, having increased from 11 per cent in 1980 to 21 per cent by 1991 but this has dropped back to 15 per cent in recent years (see table 4.11 in annex A).

![Motorcyclists involvement in accidents, selected Asia-Pacific countries (1993)](image)

In the Republic of Korea, Azerbaijan, Turkmenistan, Australia and New Zealand, the proportion of fatal accidents involving motor-cycles have been steadily decreasing. Figure 4.9 shows that for all countries except New Zealand and the Republic of Korea, there is a greater involvement of motorcycles in injury accidents than in fatal accidents.
In Sri Lanka and Turkmenistan the number of motorcycles in the vehicle fleet has been increasing more rapidly than other types of motor vehicles. Motorcycle involvement in fatal accidents in Sri Lanka has increased, but in Turkmenistan it has decreased.

The number of registered motorcycles has been increasing in Hong Kong, Republic of Korea, Taiwan Province of China, Malaysia and Fiji, but not as rapidly as other types of motor vehicles - resulting in decreasing proportions of motorcycles in the vehicle fleet. Malaysia, however, has increasing proportions of motorcycle involvement in fatal accidents.

In Australia and New Zealand the number of registered motorcycles has decreased, while the total number of motor vehicles has increased. Involvement of motorcyclists in fatal accidents has also decreased.

When comparing motorcycle involvement in accidents with motorcycle ownership, it is noticeable that the more developed countries, Hong Kong, Singapore, Australia and New Zealand have the highest ratios. Using the indicator: per cent of fatal accidents involving motorcycles divided by per cent of the motor vehicle fleet that is motorcycles (see table 4.12 in annex A), these four countries have values higher than one, while Malaysia, Sri Lanka and Turkmenistan have values less than one, i.e. the involvement of motorcyclists in fatal accidents is less than would be expected given the level of motorcycle ownership.

For the ratio: per cent of injury accidents involving motorcycles divided by per cent of motor vehicle fleet that is motorcycles (table 4.13 in annex A) Hong Kong, Singapore, Australia and New Zealand also have values greater than one, as does Malaysia. Reduction in motorcycle related injury accidents in Taiwan Province of China means that the ratio has gone below one. Sri Lanka and Turkmenistan again have values that are below 1, indicating that the involvement of motorcycles in injury accidents is less than could be expected given the level of motorcycle ownership.

4.6.4 Motor car users

Motor cars are involved in over 50 per cent of fatal accidents in Taiwan Province of China and in over 70 per cent of fatal accidents in Australia, Azerbaijan and New Zealand. Motor cars are becoming more frequently involved in fatal accidents in the Republic of Korea, Taiwan Province of China, Singapore and Thailand. Their involvement rates are decreasing in Malaysia and Fiji, and are roughly constant in Hong Kong, India, Turkmenistan, Australia and New Zealand (see tables 4.14 and 4.15 in annex A).
Cars are becoming more dominant in the motor vehicle fleet in Hong Kong, the Republic of Korea, Taiwan Province of China, Malaysia, Singapore, Western Samoa and New Zealand. They have remained at a constant level in Australia, and have decreased their proportion in Thailand, Sri Lanka and Turkmenistan. The proportion of the motor vehicle fleet that is motor cars in these selected countries ranges from 75-80 per cent in Australia and New Zealand, down to around 21 per cent in Taiwan Province of China and Sri Lanka.

Relating rates of motor car involvement in fatal and injury accidents with the relative proportion of motor cars in the vehicle fleet shows that Taiwan Province of China and Turkmenistan have a higher motor car involvement in accidents than would be expected. Australia and New Zealand have values around the expected level of one. Hong Kong, the Republic of Korea, Malaysia and Singapore have values below one indicating that motor cars are not involved in as many accidents as might be expected from their proportion in the vehicle fleets (see tables 4.16 and 4.17 in annex A).

4.6.5 Commercial vehicles

Fiji and Hong Kong have the highest involvement rates of commercial vehicles in fatal accidents (see figure 4.11 and table 4.18 in annex A). Malaysia, Sri Lanka and Singapore have low involvement rates.

The total number of fatal accidents has been increasing in Hong Kong and involvement of commercial vehicles has also increased. In the Taiwan Province of China there is an increased proportional involvement of commercial vehicles due to a slower decrease in their involvement in fatal accidents. In New Zealand, the increased involvement is due to an increase in commercial vehicle involvement in fatal accidents alongside a decrease in total fatal accidents.

Republic of Korea, Azerbaijan, Turkmenistan and Australia have all seen decreases in fatal accident numbers and larger decreases in commercial vehicle involvement.

Singapore and Sri Lanka have proportionately higher involvement rates in commercial vehicles in injury accidents than in fatal ones (see table 4.19 in annex A and figure 4.11). In the other countries there is greater involvement in fatal accidents. While occupants of larger commercial vehicles will probably be better protected, accident outcomes may be more severe due to more vulnerable road users being hit by such large vehicles.

Comparing involvement rates within the proportion of commercial vehicles in the vehicle fleet (see tables 4.20 - 4.21 in annex A), shows

Figure 4.11: Commercial vehicle involvement in accidents, selected Asia-Pacific countries (1993)
that Hong Kong, the Republic of Korea, Taiwan Province of China and India have higher involvement rates than the size of commercial vehicle fleet as a proportion of total vehicle fleet would suggest.

### 4.6.6 Buses

Bhutan and India have the highest involvement rate of buses in fatal accidents. Malaysia, Singapore, Australia and New Zealand have the lowest (see figure 4.12 below and table 4.23 in annex A).

In Azerbaijan and Australia, the total number of fatal accidents decreased, while the number involving buses increased, resulting in an increased rate of involvement.

In Malaysia and India, the number of fatal accidents has increased, while bus involvement has decreased. In the Republic of Korea and Taiwan Province of China, bus involvement has been decreasing more rapidly than the number of fatal accidents.

There is a noticeably higher injury accident involvement than fatal accident involvement in Singapore and India, whereas in Malaysia and Azerbaijan it is only marginally higher. There is a lower injury accident involvement in Hong Kong, Taiwan Province of China, Australia and New Zealand (see figure 4.12 below and table 4.24 in annex A).

China has the highest proportion of buses in the motor vehicle fleet (see table 4.25 in annex A). All other countries have much lower proportions. The proportions in Hong Kong, the Republic of Korea and India are decreasing because the number of other motor vehicles are increasing more rapidly then the number of buses. In Taiwan Province of China the proportions are decreasing because the number of registered buses has levelled off. Tables 4.26 and 4.27 in annex A show that Taiwan Province of China has a poor record of bus related accidents by having values of the ratio: per cent accident involving uses divided by per cent motor vehicles that are buses much greater than one. India is also doing poorly. Singapore is the only country which has a lower fatal accident involvement than expected.

Research by TRL (Downing, 1988) has shown that the knowledge and skill of bus drivers in many developing countries is often low. This coupled with inadequate regulations, the long distance driven without adequate rest stops and the unsafe conditions all contribute to the higher rate of bus involvement in accidents in most of Asia-Pacific region.

![Figure 4.12: Bus involvement in accidents, selected Asia-Pacific countries (1993)](image-url)
4.7 Scope for further analysis

It is clear from this chapter that a number of interesting characteristics and differences emerge from the preliminary analysis undertaken to date. A few of the more interesting aspects have been summarized in this chapter and further details can be found in annex A to this report.

Although the database is still incomplete in some areas, far more analyses and interpretation is possible on the data now available within the compiled database as part of this project. In this project it has only been possible to do a few indicative analyses and comparisons to illustrate how the data could be used to gain a better understanding of the nature and characteristics of the problem in individual countries, in sub-regions and in the region as a whole.

The basic road safety database is available at United Nations ESCAP.