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# Strategies to Tackle the Issue of Speed for Road Safety in the Asia-Pacific Region: Implementation Framework

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The shaded areas of the map indicate ESCAP members and associate members.

Cover photograph: photo of a motorist speeding in a residential school zone. Source: [jhorrocks] / [iStocks.com]

# Strategies to Tackle the Issue of Speed for Road Safety in the Asia-Pacific Region: Implementation Framework

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# Glossary

**Bus Rapid Transit (BRT)** – a high-quality bus-based transit system that delivers fast, comfortable, and cost-effective services in urban transit contexts. It does this through the provision of dedicated lanes, with busways and stops typically placed in the centre of the road, off-board fare collection, and fast and frequent operations. For further details, see www.itdp.org/library/standards-and-guides/the-bus-rapid-transit-standard/what-is-brt/

**Crash** – an event in which a moving vehicle collides with another vehicle, object or person on a road. The term "accident" implies that the event in question was neither predictable nor preventable or that it occurred with no known causes. Road crashes (and especially injuries and deaths) have known causes and are preventable. The term "crash" rather than "accident" has been deliberately used in this report to underscore that important distinction.

**Crash modification factors (CMFs)** – indicate the expected number of crashes in the after-installation period where CMF < 1 indicates the crash reduction effect of an engineering intervention.

**Enforcement tolerance** – the extent to which police officers will refrain from penalizing a driver who has exceeded the speed limit.

**General deterrence** –the extent to which people are deterred from certain behaviour, such as speeding, not because they have been caught, but because they believe that they may be caught and suffer undesirable consequences as a result.

**Intelligent Speed Adaptation (ISA)** –a vehicle technology designed to improve drivers' compliance with speed limits via varying degrees of speed control:

- Advisory – the driver is informed of the speed limit and alerted when he or she travels above the posted speed limit;
- Supportive/override – when a vehicle is travelling above the posted speed limit, the accelerator becomes harder to push down, but the driver can override the system;
- Limiting – the vehicle is limited to the posted speed limit.

**Power model –** an estimate of the effects of changes in average speeds on crash incidence and severity. This shows a direct relationship between increasing speeds and the likelihood of both injury and death – a 5 per cent decrease in average speeds leads to approximately a 10 per cent decrease in the number of crashes involving injuries, and a 20 per cent decrease in crashes involving fatalities.

**Safe System** – a road transport system that ensures that no one is killed or seriously injured in the event of a crash.

**Specific deterrence** – the extent to which a person is deterred from certain behaviour because they have previously been caught and penalized for that behaviour.

**Vulnerable road users (VRUs)** – pedestrians and riders of non-motorized and motorized two- and three-wheeled vehicles.

# Executive Summary

As has been underscored at a number of key global events and in numerous documents published over the last decade, improving road safety is now an urgent global priority. The unfortunate reality is that road safety programmes and policies have failed to address the increase in the number of vehicles on roads and the average speed at which vehicles are travelling. This has exacerbated an already grave global road safety crisis.

The laws of physics relating to speed mean that all countries and regions would benefit from reductions in average vehicular speeds. Indeed, there is a direct correlation between vehicular speeds and the likelihood of people suffering physical harm, with the probability of crashes, injury and death rising as the speed of vehicles increases. Furthermore, vulnerable road users, including pedestrians, cyclists and motorcyclists, are all at high risk of severe or fatal injury in crashes, even at low speeds, because they are poorly protected. The harmful effects of speed also increase on wet, snowy or icy roads. However, any action taken to reduce vehicular speeds helps to reduce the number of crashes, injuries and fatalities, regardless of weather conditions and among all categories of road user.

Ideal speeds are lower than most road users think. Lower vehicular speeds are more economical than high speeds, and can enhance people's environment, health and quality of life as a result of a reduction in costs associated with crashes, road maintenance, noise, fuel use, and emissions. There is also a turning point at which traffic flow improves with lower speeds.

A safe speed is one that is appropriate not only for the usage/type and quality of the road but also for a country's vehicular fleet and the type and mix of the road users. The management of vehicular speed therefore includes setting speed limits that reflect those considerations and reduce the likelihood of death or injury in the event of a crash (these are known as survivable speed limits) as well as preventing speed limit violations (speeding).

## Key observations

For this report, a study was conducted to examine speed management in ESCAP member States in order to identify ways in which they can improve speed management. The study revealed that travel speeds on roads in those States are not controlled effectively through survivable speed limits, speeding enforcement, engineering interventions or vehicle safety measures. Some key observations include:

- Casualties in many ESCAP member States include a high proportion of pedestrians and those travelling on two- and three-wheelers.
- The imposition of speed limits is the most common way to reduce speeds on urban arterial roads and rural routes in ESCAP member States. However, speed limits are generally set too high and too little thought is given to how fatalities rise as speeds increase, particularly among vulnerable road users. Inadequate road infrastructure safety standards and high numbers of unsafe vehicles on the roads also increase the number of injuries and fatalities.
- The undesirable consequences for travellers of lower speeds encourage drivers to ignore speed limits and few measures are taken to deter speeding.
- In both rural and urban areas in ESCAP member States, pedestrian walkways alongside roads remain rare, even in areas where pedestrian numbers are very high. As a result, pedestrians are often compelled to walk on roads that have been designed for motorized vehicles travelling at much higher speeds than individuals travelling on foot.
- Roads in ESCAP member States are often used simultaneously by vehicles that vary widely in terms of their size, mass and safety. Those vehicles, which include cars, motorcycles, trucks, and agricultural vehicles, travel at very different speeds and often share the road with cyclists and pedestrians, significantly increasing the risks of death and injury among all road users, including, in particular, vulnerable road users.
- In many ESCAP member States, the vehicles offered for sale do not always meet basic safety standards.

- Vehicle fleets tend to be relatively old in countries in the ESCAP region, and the transition to vehicles equipped with modern technology, such as Intelligent Speed Adaptation, is proceeding very slowly in low and middle-income ESCACP States.
- Inherently dangerous vehicles such as motorcycles and tractors, including those used as informal means of transport, are commonly found on the road in ESCAP member States

ESCAP member States could implement numerous highly effective speed management interventions. Speed management measures should be consistent with the global "Safe System" approach to road safety: road designers, builders and managers must take into account the known limits of the human body and must strive to reduce speeds with a view to creating road transport systems in which humans, are never exposed to crash forces beyond those which they can survive. That is, human life must lie at the heart of all speed management initiatives.

## Recommendations, including the adoption of an implementation framework

On the basis of the study, 28 specific recommendations and an implementation framework are proposed. Those recommendations and the framework will facilitate efforts by States to formulate action plans appropriate to their particular circumstances that can help reduce the number of injuries and fatalities on their roads. All countries should, moreover, seek to identify and give priority attention to interventions will be most effective.

The first group of recommendations focuses on reviewing existing speed limits, considering how speed limits and road infrastructure standards affect injury and fatality rates, and the posting of clear and consistent speed limits. The second group focuses on strengthening measures to deter speeding, including publicity campaigns to raise awareness of relevant laws and law enforcement, as well as on enforcing speed limits in conjunction with publicity campaigns to promote road user compliance, establishing targeted enforcement zones and extended coverage zones, imposing effective penalties that discourage speeding, developing and implementing effective speed camera programmes and applying manual speed enforcement methods. The third group of recommendations focuses on reducing speeds by means of engineering interventions. This includes using interim measures during road safety infrastructure improvements, installing warning signs and devices, and banning through traffic in selected areas and neighbourhoods. The last group of recommendations also pertains to regulatory and other measures that can encourage the development of safe vehicular fleets.

States should also encourage road users to purchase vehicles based on their safety ratings and should adopt measures that incentivize the purchase and use of safer vehicles. The proposed implementation framework comprises five steps:

### Implementation Framework

The framework for the implementation of the recommendations provides for:

- Identifying problems;
- Assembling a leadership team;
- Developing a strategic plan;
- Implementing that plan;
- Evaluating the effectiveness of the measures set forth in the plan.

## Stepwise illustration of the implementation framework

### 1. PROBLEM ASSESMENT

- How significant is the speed problem?
    - (i) In what proportion of serious casualty crashes is speed a contributing factor?
    - (ii) Where do casualty crashes involving speed occur?
- What is the profile of speed-related crash victims?
- What is the profile of speeders?
- To what extent do drivers comply with speed limits in various locations?
- Why do people speed in those locations?
- What are the speed limits, particularly in high-risk locations such as where traffic flows include significant numbers of vulnerable road users? How are speed limits set, communicated and enforced?
- What is the operating speed of traffic (mean traffic speed)?
- What legislation and regulations have been adopted with respect to speed management?
- What are the attitudes of communities towards speed management?

### 2. ASSEMBLE A LEADERSHIP TEAM

- Identify the road safety stakeholders who are concerned with or responsible for speed management.
- Secure the support and engagement of political leaders.
- Identify a coordinating agency or group.
- Earmark and commit financial resources to speed management.
- Sustain the involvement of all road safety stakeholders.

### 3. DEVELOP A STRATEGIC PLAN OF ACTION TO ADDRESS KEY CHALLENGES

- Formulate a plan of action on the basis of 1 and 2 above.
- Set programme objectives, targets and performance indicators.
- Decide on activities:
    - (i) Carrying out a speed limit review;
    - (ii) Strengthening speeding deterrence;
    - (iii) Implementing road infrastructure modifications to reduce speeds;
    - (iv) Promoting the use of safer vehicles.
- Identify required resources, legislative requirements and other mechanisms of delivery, and establish a time frame for roll-out and full implementation.
- Conduct public awareness-raising activities to mobilize and sustain the support and engagement of communities.
- Establish effective data collection mechanisms with a view to monitoring and evaluating the plan of action.

## 4. IMPLEMENT THE STRATEGIC PLAN OF ACTION

- Implement actions as per the aforementioned plan of action.
- Monitor progress against the plan and against performance indicators
- If target speed is achieved (as measured by speed measurement loops installed on roads), complete implementation and evaluate (go to 5)
- If target speed is not achieved (as measured by speed measurement loops installed on roads), review leadership and plan of action plan (go back to 2 and 3)

## 5. EVALUATION OF COUNTERMEASURES IMPLEMENTED

- Assess changes in baseline measurements collected during problem assessment:
  (i) Has there been a reduction in speed-related casualties?
  (ii) Has there been progress with regard to other aspects, such as the attitudes of communities?
- Identify lessons learned.
- Improve current and future programmes on the basis of evaluation results.
- Disseminate evaluation results to sustain political and community support.

# 1. Introduction

## 1.1 Background

Improving road safety is now an urgent global priority. In 2011, the Global Plan for the Decade of Action for Road Safety 2011-2020[1] was adopted with a view to stabilizing and then reducing the number of global road traffic deaths. Moreover, in accordance with target 3.6 of the Sustainable Development Goals, member States have made a commitment to halve the number of global deaths and injuries from road traffic accidents by 2020,[2] while, in accordance with target 11.2, member States are committed to providing access to safe, affordable, accessible and sustainable transport systems for all and improving road safety by 2030.[3]Furthermore, at the Second Global High-Level Conference on Road Safety, which was hosted by the Government of Brazil and co-sponsored by World Health Organization (WHO), 52 ministers and vice ministers adopted the Brasilia Declaration on Road Safety with a view to accelerating the pace of road safety initiatives and facilitating the achievement of the Sustainable Development Goals. The establishment of the United Nations Road Safety Trust Fund in April 2018[4], the release of the fourth Global status report on road safety in December 2018[5] and the upcoming Third Global Ministerial Conference on Road Safety, to be held in Sweden in February 2020, continue to sustain momentum with a view to improving road safety at the global level.

In that context, governments are increasingly being urged to implement interventions that can significantly reduce the number of road deaths and injuries. Since the Fourth UN Global Road Safety Week 2017 8-14 May 2017,[6] held in May 2017, speed management has emerged as a key intervention, particularly in the light of the publication by WHO of the document entitled "Save LIVES: a road safety technical package",[7] and the adoption of the 12 global road safety performance targets, target 6 of which provides: "By 2030, halve the proportion of vehicles travelling over the posted speed limit and achieve a reduction in speed related injuries and fatalities".[8] A set of indicators covering the implementation and outcomes for each of the 12 global targets is being developed by United Nations member States and relevant United Nations agencies, including the Economic Commission for Europe (UNECE) and the United Nations Children's Fund (UNICEF), to help guide action and facilitate efforts to measure progress at national and global levels.

The unfortunate reality is that, rather than decreasing, the number of road deaths has increased over the last decade. According to the most recent global status report on road safety, no low-income country was able to reduce the number of road traffic deaths between 2013 and 2016. Instead the number of deaths remained stable or increased over that period in 127 of the 175 countries surveyed for the report[9]. Furthermore, there has been no increase in the number of countries that have adopted laws in line with

[1] United Nations Road Safety Collaboration and World Health Organization, *Global Plan for the Decade of Action for Road Safety 2011-2020*. Available at: www.who.int/roadsafety/decade_of_action/plan/en/ (accessed on 16 November 2019).
[2] United Nations, *Sustainable Development Goal 3*. See sustainabledevelopment.un.org/sdg3 (accessed on 16 November 2019).
[3] United Nations, *Sustainable Development Goal 11*. See sustainabledevelopment.un.org/sdg11 (accessed on 16 November 2019).
[4] United Nations Road Safety Trust Fund, *Global Framework Plan of Action for Road Safety* (2018). Available at: www.unece.org/fileadmin/DAM/Road_Safety_Trust_Fund/Documents/UNRSTF_Global_Framework_Plan_of_Action_21_Nov_2018.pdf (accessed 16 November 2019)
[5] WHO, *Global status report on road safety 2018* (Geneva, 2018). Available at: www.who.int/violence_injury_prevention/road_safety_status/2018/en/ (accessed on 16 November 2019).
[6] For further information, see www.who.int/roadsafety/week/2017/en/ (accessed on 16 November 2019).
[7] WHO, *Save LIVES: a road safety technical package* (2017). Available at: www.who.int/violence_injury_prevention/publications/road_traffic/save-lives-package/en/ (accessed on 16 November 2019).
[8] WHO, *Global Road Safety Performance Targets*. Available at: www.who.int/violence_injury_prevention/road_traffic/12GlobalRoadSafetyTargets.pdf?ua=1 (accessed on 16 November 2019).
[9] WHO, *Global status report on road safety 2018*

best practices in the area of speed management since 2014. Road safety programmes and policies have proven far from adequate as vehicle numbers have risen and road speeds have increased in low- and middle-income countries. It should, moreover, be underscored that the South-East Asia subregion has the second highest road fatality rate globally[10].

## 1.2 Speed management: reducing travel speeds and speeding

Speed management is more than just the management of "speeding", which refers only to interventions targeting drivers travelling above the legal speed limit (or in certain jurisdictions targeting drivers travelling at an inappropriate speed for prevailing conditions). Fatalities can still occur even if drivers are travelling under the legal speed limit, particularly if the posted speed limit is too high for human bodies to survive in the event of a crash. A safe speed is one that is appropriate not only for the usage/type and quality of the road but also for a country's vehicular fleet and the type and mix of the road users. [11] It is important to note that usage can change over time and that this must be considered in speed limit setting. Many "highways" in ESCAP member States may be so in name only, while, in reality, roadside development and usage has turned parts of those roads into local shopping areas, necessitating appropriate speed limits for roads on which many pedestrians may be present. To prevent fatalities and injuries in the event of a crash, lower vehicular speed limits must be imposed on unsafe roads, when many vehicles on those roads are unsafe or when roads are used by a mix of road users travelling at different speeds, including users who are poorly protected. It is critical that speed management takes into account all those factors.[12]

The globally adopted "Safe System" [13] approach to road safety ensures that road designers, builders and managers base their work on the known limits of the human body and create road transport systems that ensure that no one is killed or seriously injured in the event of a crash. The management of speed is thereby consistent with the Safe System approach in that crash forces are reduced to survivable levels by reducing vehicular speeds.

## 1.3 Benefits of effective speed management

The laws of physics relating to speed mean that all countries and regions would benefit from reductions in average vehicular speeds. The Power Model, which can be used to predict the effects of changes in average speeds on crash incidence and severity, shows a direct relationship between increasing speeds and the likelihood of both injury and death, with a 5 per cent decrease in average speeds leading to approximately 10 per cent fewer crashes involving injuries, and 20 per cent fewer crashes involving fatalities (see figure 1).[14] Therefore, all actions that help to reduce speeds help to reduce crashes, injuries and fatalities.

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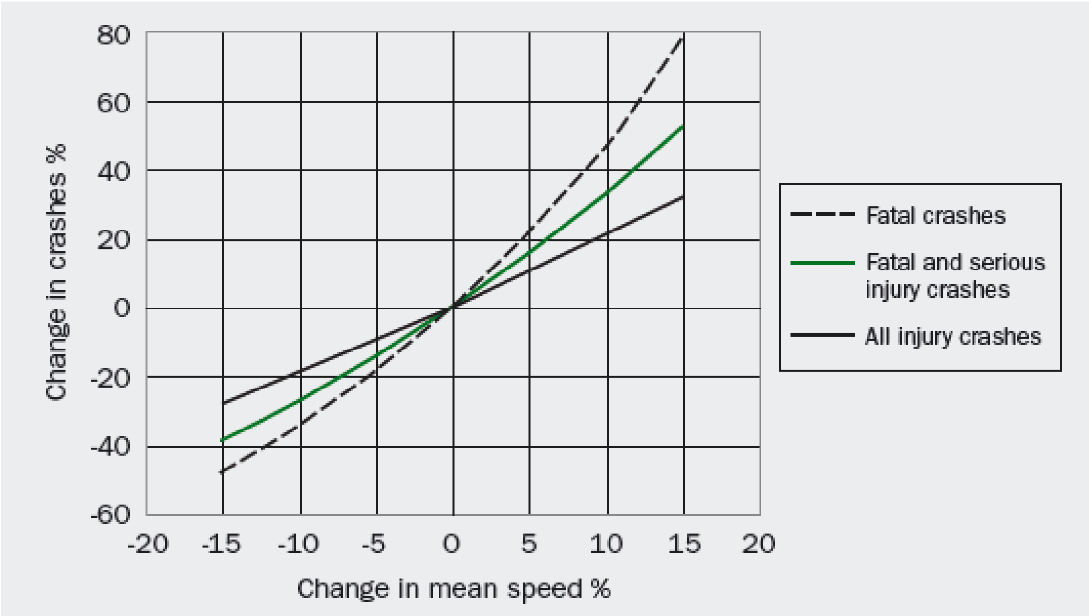
[10] WHO, *Global status report on road safety 2018*.
[11] Road types vary from motorways for long distance inter-urban travel, to arterial roads in urban areas to small local roads in residential areas and city centres.
[12] International Transport Forum, *Zero Road Deaths and Serious Injuries: Leading a Paradigm Shift to a Safe System* (Paris, Organization for Economic Cooperation and Development (OECD), 2016).
[13] International Transport Forum (2016); United Nations Road Safety Trust Fund (2018).
[14] Göran Nilsson, "Traffic safety dimensions and the Power Model to describe the effect of speed on safety". *Lund Bulletin* No. 221, (Lund Institute of Technology, Lund, Sweden, 2004); Rune Elvik, Peter Christensen and Astrid Amundsen, "Speed and road accidents: an evaluation of the Power Model", *Nordic Road and Transport Research*, vol. 1 (Oslo, 2005).

**Figure 1. Relationship between percentage change in speed and the percentage change in crashes involving injuries and fatalities.**

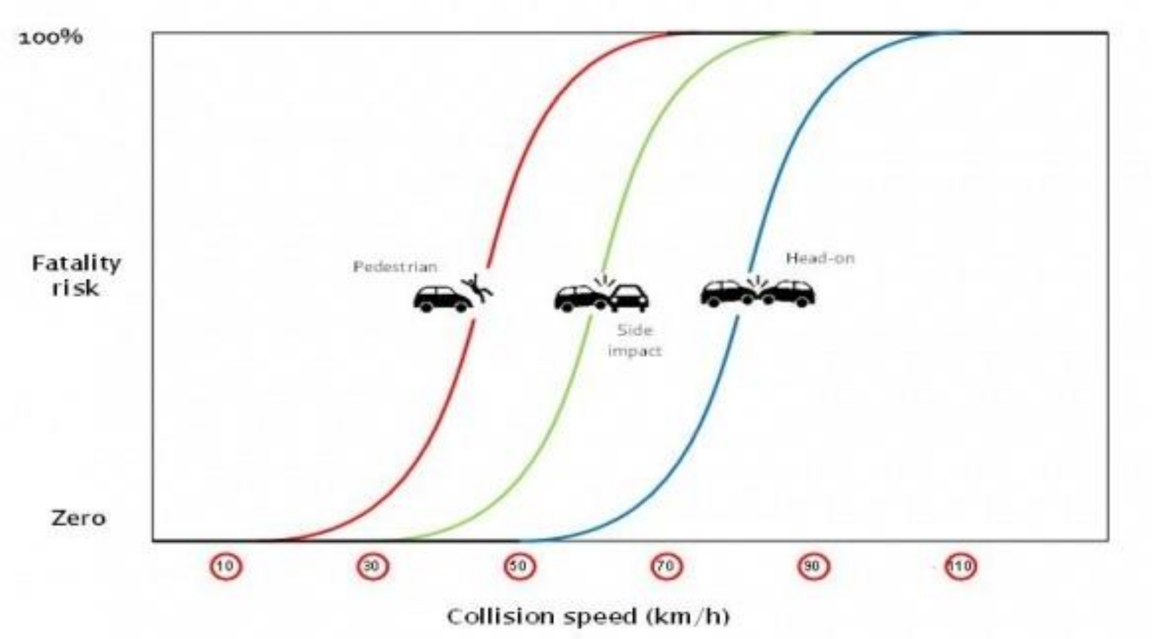



Source: Global Road Safety Partnership (2008)[15] and Nilsson (2004)[16]

Because they are poorly protected, vulnerable road users, including pedestrians, cyclists, moped riders and motorcyclists, are particularly at risk of severe or fatal injury when motor vehicles collide with them. Most vulnerable road users have an 80 per cent likelihood of being killed at an impact speed of 50 km/h, but this risk is reduced to 10 per cent at a 30 km/h impact speed. In a modern car, a car occupant wearing a seat belt has an 80 per cent likelihood of being killed at an impact speed of 70 km/h in a side impact crash, but this risk is reduced to 10 per cent at a 50 km/h impact speed. In addition, in a modern car, a car occupant wearing a seat belt has an 80 per cent likelihood of being killed at an impact speed of 90 km/h in a frontal impact crash, but this risk is reduced to 10 per cent at a 70 km/h impact speed. That is, even small reductions in speed result in substantial safety benefits to all road users with the greatest gains made for vulnerable road users (see Figure 2)[17].

[15] Eric Howard and others, Speed management: a road safety manual for decision-makers and practitioners (Geneva, Global Road Safety Partnership, 2008).
[16] Nilsson, "Traffic safety dimensions and the Power Model to describe the effect of speed on safety".
[17] WHO, World report on Road Traffic Injury Prevention (Geneva, 2004).

**Figure 2. The relationship between impact speed and survivability for different crash scenarios.**




Source: Greater Wellington Regional Council, New Zealand[18]

Lower speeds result in improved outcomes because the distance covered during the time it takes the driver to react and apply the brakes to bring the vehicle to a halt (the stopping distance) is reduced at lower speeds (see figure 3). However, a vehicle's stopping distance tends to increase on wet, snowy and icy roads[19]. This is because the vehicle's tyres no longer grip the road when water, snow or ice builds up on the road surface. As a result, the driver may lose control of the vehicle. It is therefore particularly important to reduce travel speeds in adverse weather conditions. At normal speed (and depending on other features such as tyre tread), a vehicle may also "aquaplane" on water on the road surface. That is to say, the tyres may become supported by the water, which disrupts their contact with the road.[20] This is a particularly dangerous outcome that can sharply reduce braking efficacy and result in loss of directional control of the vehicle. The benefits of reduced speed are particularly relevant in ESCAP member States, many of which experience heavy monsoonal rains. Figure 3 shows the stopping distances of modern cars at different speeds.

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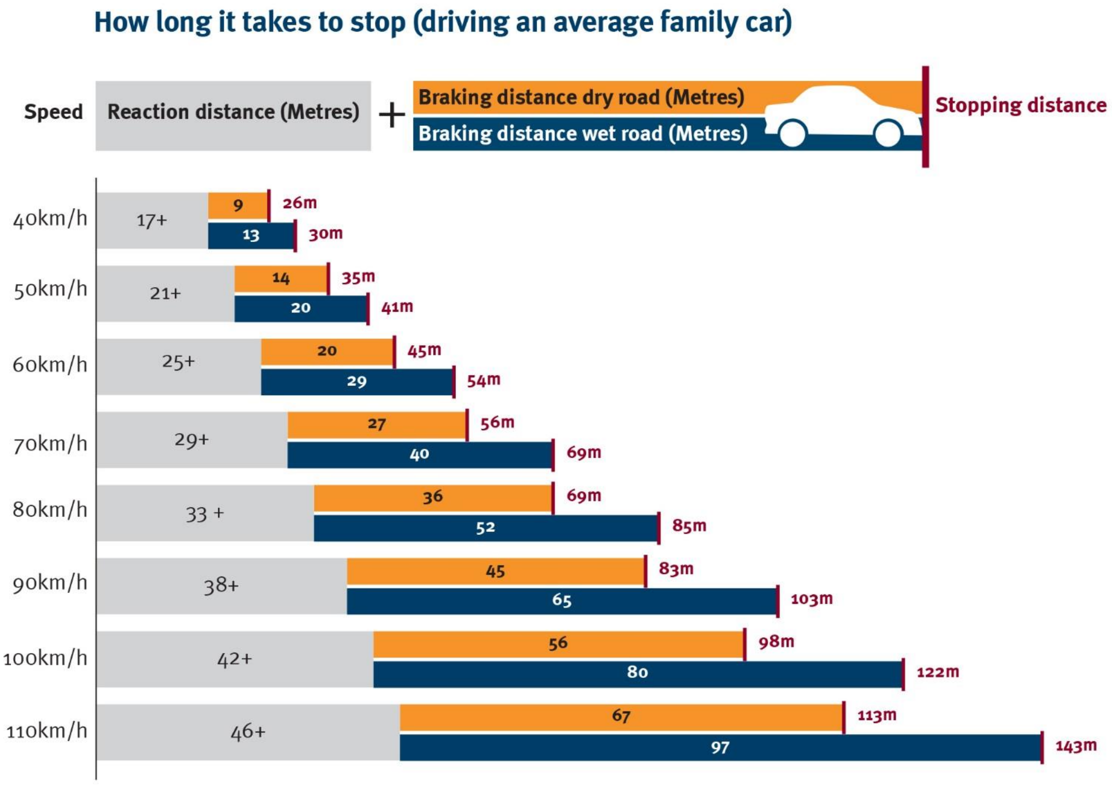
[18] Greater Wellington Regional Council, *Survivable Speeds* (Wellington, New Zealand, 2015). For additional information, see: www.gw.govt.nz/survivable-speeds/ (accessed on 18 November 2019)

[19] Canada, British Columbia Ministry of Transportation and Infrastructure, *Why stopping distances matter more during the* winter, (Victoria, Canada, 2016). Available at: https://www.tranbc.ca/2016/12/16/why-stopping-distances-matter-more-during-the-winter/ (accessed on 18 November 2019)

[20] Alina Burlacu, Carmen Racanel and Adrian Burlacu, "Preventing aquaplaning phenomenon through technical solutions" *Građevinar*, vol. 70 (12) (Zagreb, 2018), pp. 1057-1062.

**Figure 3. Stopping distances at different travelling speeds in a modern car on sealed roads with good friction in dry and wet conditions.**

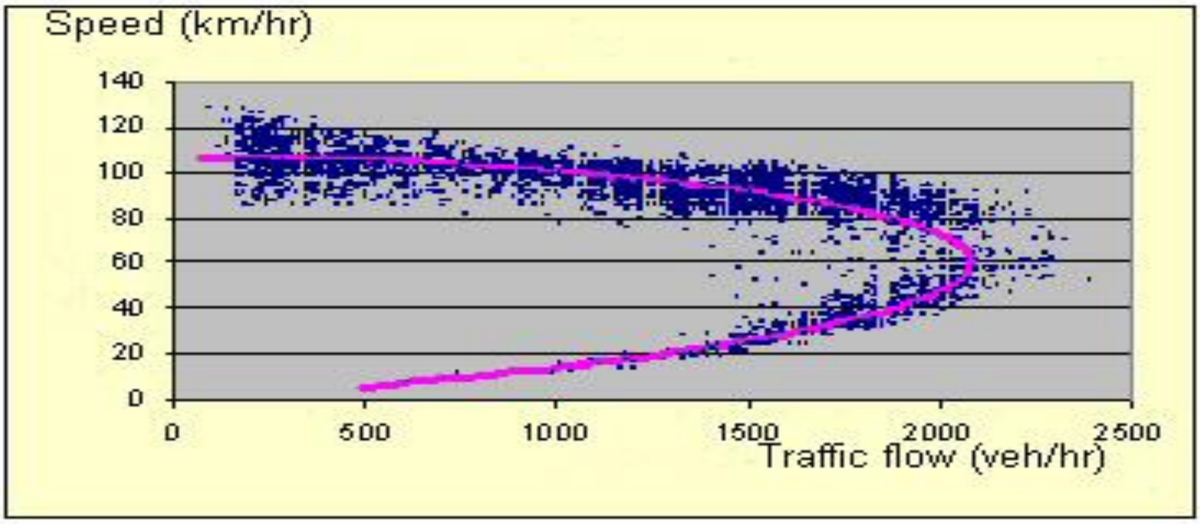



Source: Australia, government of Queensland.[21]

Speed reductions not only lead to fewer crashes and injuries, but also have environmental and economic benefits[22]. Furthermore, there is no direct correlation between increasing speeds and the ease of traffic flow as is commonly believed. Instead there is a turning point at which traffic flow improves with lower speeds. Analysis of hundreds of real-world locations shows that the number of vehicles passing through a given point (i.e. traffic flow) decreases for speeds of 70km/h and above compared with 50km/h[23] (see figure 4). A key reason for this is that drivers accept increased headways at higher speeds.

[21] Australia, government of Queensland, *Stopping distances: speed and braking* (Brisbane, Australia, 2016). Available at: www.qld.gov.au/transport/safety/road-safety/driving-safely/stopping-distances (accessed on 17 November 2019).
[22] Chika Sakashita and Soames Job, "Addressing key global agendas of road safety and climate change: synergies and conflicts" *Journal of the Australasian College of Road Safety*, vol. 27(3) (2016), pp. 62-68. Available at: acrs.org.au/wp-content/uploads/Journal-of-ACRS-27-3-final-for-web.pdf (accessed on 17 November 2019).
[23] OECD and European Conference of Ministers of Transport, *Speed Management. Report of the Transport Research Centre*, (Paris, OECD, 2006). Available at: www.itf-oecd.org/sites/default/files/docs/06speed.pdf (accessed on 17 November 2019).

**Figure 4. The relationship between traffic flow and speed for an urban motorway.**

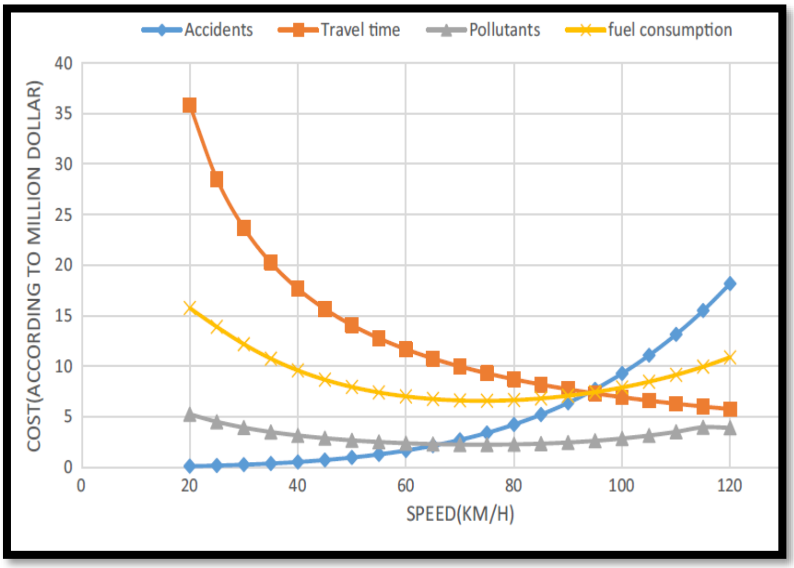



Source: OECD and European Conference of Ministers of Transport (2006)[24]

In addition, reduced open road speeds reduce noise, air pollution and emissions and thus the negative impact of transport on climate change, life quality and health[25]. Open road travel time increases are generally smaller than expected with speed limit reductions, and economic gains can result from reduced speeds due to the reduced costs of crashes, fuel use, and road maintenance[26] Figures 5 to 7 illustrate the relationship between costs and travel speed. Those graphs are based on data obtained on high quality rural roads and highways, rather than poor quality roads or roads in urban areas that are characterized by a high proportion of stop-start driving and large numbers of vulnerable road users. Economically ideal speeds will be dramatically lower on poor quality roads and on roads in urban areas.

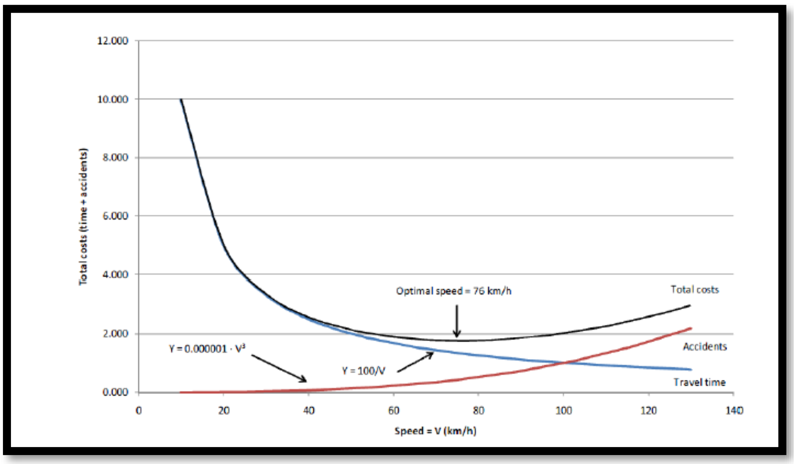
[24] OECD and European Conference of Ministers of Transport, *Speed Management. Report of the Transport Research Centre*.
[25] Soames Job, "The influence of subjective reactions to noise on health effects of the noise" *Environment International*, vol. 22 (1996), pp. 93-104; WHO Regional Office for Europe. *Environmental health inequalities in Europe: assessment report*. (Copenhagen, WHO, 2012).
[26] See for example: Max Cameron, "Potential benefits and costs of speed changes on rural roads", Report CR216. Monash University Accident Research Centre (Victoria, Australia, 2003); Max Cameron, "Optimum speeds on rural roads based on "willingness to pay" values of road trauma" *Journal of the Australasian College of Road Safety*, vol. 23(3) (2012), pp. 67-74; Rune Elvik, "The Power Model of the relationship between speed and road safety: update and new analyses", Institute of Transport Economics report No. 1034/2009 (Oslo, Norwegian Centre for Transport Research, 2009); Mansour Hosseinlou, Salman Kheyrabadi and Abbas Zolfaghari. "Determining optimal speed limits in traffic networks", *International Association of Traffic and Safety Sciences*, vol. 39(1) (2015), pp. 36-41.

**Figure 5. Relationship between speed and different components of travel cost in the Islamic Republic of Iran.**



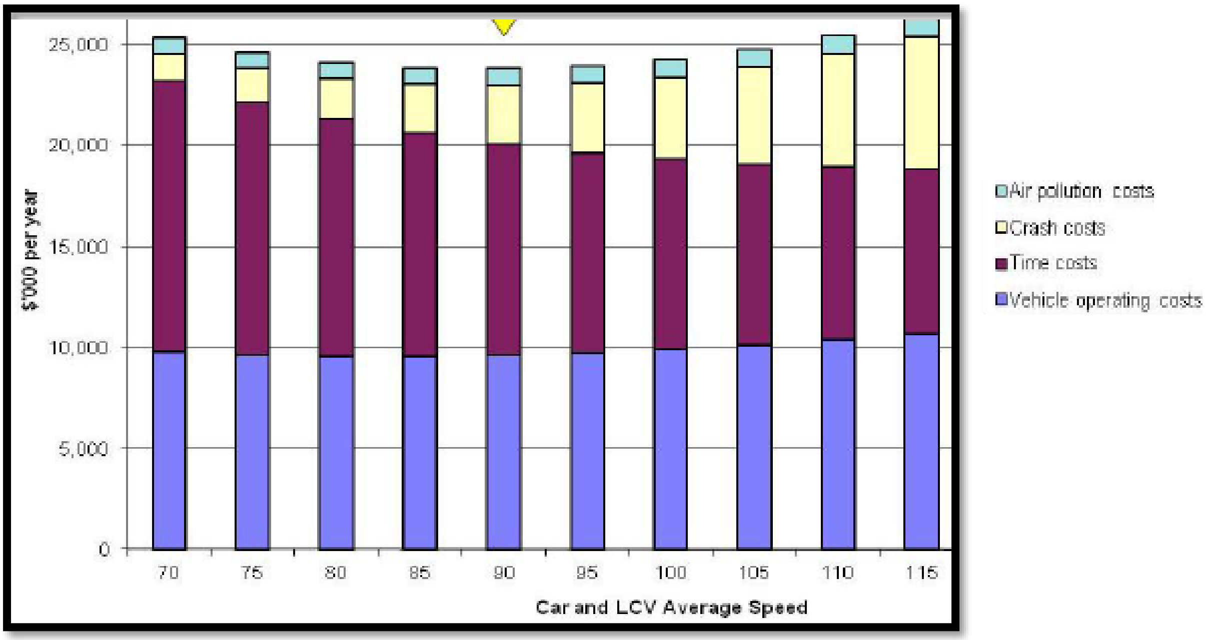

Source: Mansour Hosseinlou, Salman Kheyrabadi and Abbas Zolfaghari (2015)

**Figure 6. Relationship between speed and different components of travel cost in Europe.**




Source: Rune Elvik (2009)

**Figure 7. Relationship between speed and different components of travel cost in Australia.**




Source: Max Cameron (2012)

# 2. The relationship between road safety and speed in ESCAP member States

## 2.1 The type and number of road deaths in ESCAP member States

While the aim of road safety initiatives is to reduce the number of both deaths and injuries, death data alone are used in many countries to monitor road safety, partly because, globally, death data are the most commonly available data. While accurate data on road deaths are unavailable in many countries, fatal crashes tend to be reported more often than crashes that result in injury. Injury data capture is more challenging for a number of reasons, including inconsistencies among countries and jurisdictions regarding the definitions of serious and minor injuries. In addition, most countries rely on data from the police, who record deaths, whereas data from hospitals, which often record crash-related injuries, are much more challenging to obtain and collate at the national or state level. Moreover, those injured in a crash are not necessarily treated at hospitals and, if they are, their injuries may not be recorded as resulting from road crashes. However, in Australia, where accurate data on both deaths and serious injuries are available, that data shows that there are approximately 30 serious injuries for every road crash death[27]. Serious injuries clearly have significant economic and human costs, including the costs of medical treatment, the costs of temporary or permanent disability resulting from crash-related injuries and a reduced quality of life. While there is limited accurate data on serious injuries in ESCAP member States, it is critical to acknowledge the significant costs of serious injuries and fatalities resulting from road crashes.

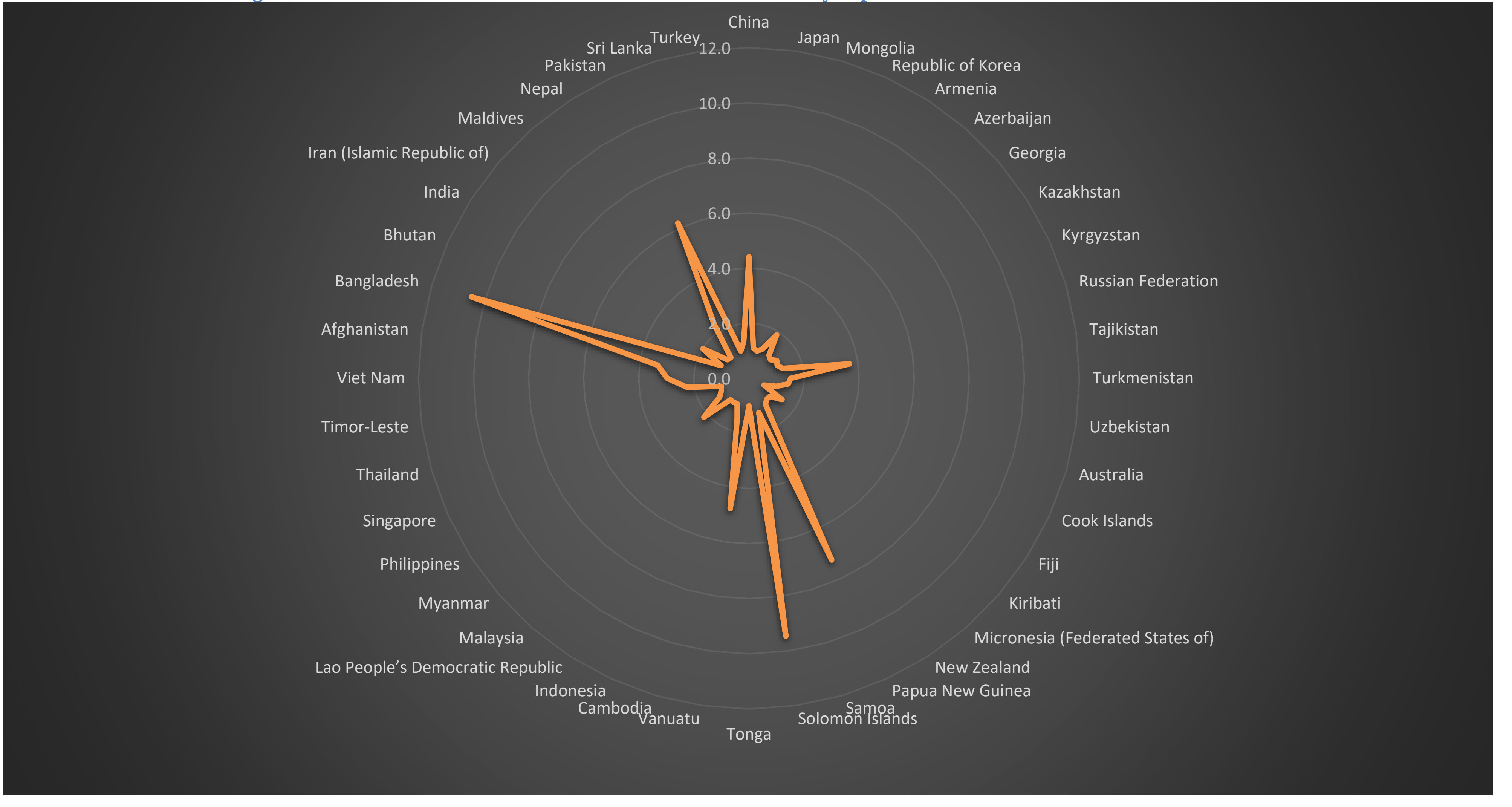
The WHO Global status report on road safety 2018[28]provides road death data at the global level. Forty-three of the 53 ESCAP member States and one associate member country are covered by that report, including four countries in East and North-East Asia, nine countries in North and Central Asia, 11 countries in the Pacific, 10 countries in South-East Asia, and 10 countries in South and South-West Asia. The absence of data in the report on 14 ESCAP member and associate member countries reflects the significant lack of accurate crash data in the region. Summary data for the ESCAP member and associate member countries covered in the report are provided in table 13 in Appendix A of the present report. Of those countries, only six are categorized as high-income countries, while three countries are categorized as low-income countries, 20 as lower-middle-income countries, and 15 as upper-middle-income countries.

According to the report, the 43 ESCAP member States and one associate member country surveyed lost a total of 372,395 lives in 2016. However, this is considered a significant underestimation of fatalities due to underreporting of crashes and deaths in those countries. Indeed, WHO estimates that a total of 812,995 lives were lost during that year. Only four countries, namely Kiribati, Micronesia, Tonga and Maldives, reported fatality figures that matched their WHO estimates. The number of deaths reported by the Cook Islands was higher than the WHO estimate but the figures reported by all other countries were lower than the relevant WHO estimate, with larger discrepancies between the two figures apparent for low- and middle-income countries, including, in particular, Afghanistan, Armenia, Bangladesh, Cambodia, China, India, Myanmar, Nepal, Pakistan Papua New Guinea, Solomon Islands, Tajikistan, Timor-Leste, Turkmenistan, Vanuatu and Viet Nam (see figure 8 for further details).

WHO estimates of the total number of road deaths in 2016 ranged from 2 (Micronesia) to 299,091 (India) and road death rates per 100,000 inhabitants ranged from 0.9 (Maldives) to 32.7 (Thailand) (see figure 9). The ESCAP average of 18.38 deaths per 100,000 inhabitants was higher than the global average of 18.06. All the countries with average death rates above the ESCAP average of 18.38, namely India, Islamic Republic of Iran, Malaysia, Myanmar, Thailand and Viet Nam, were middle-income countries. The death rate in the South and South-West Asia subregion (20.31) was also higher than the ESCAP average.

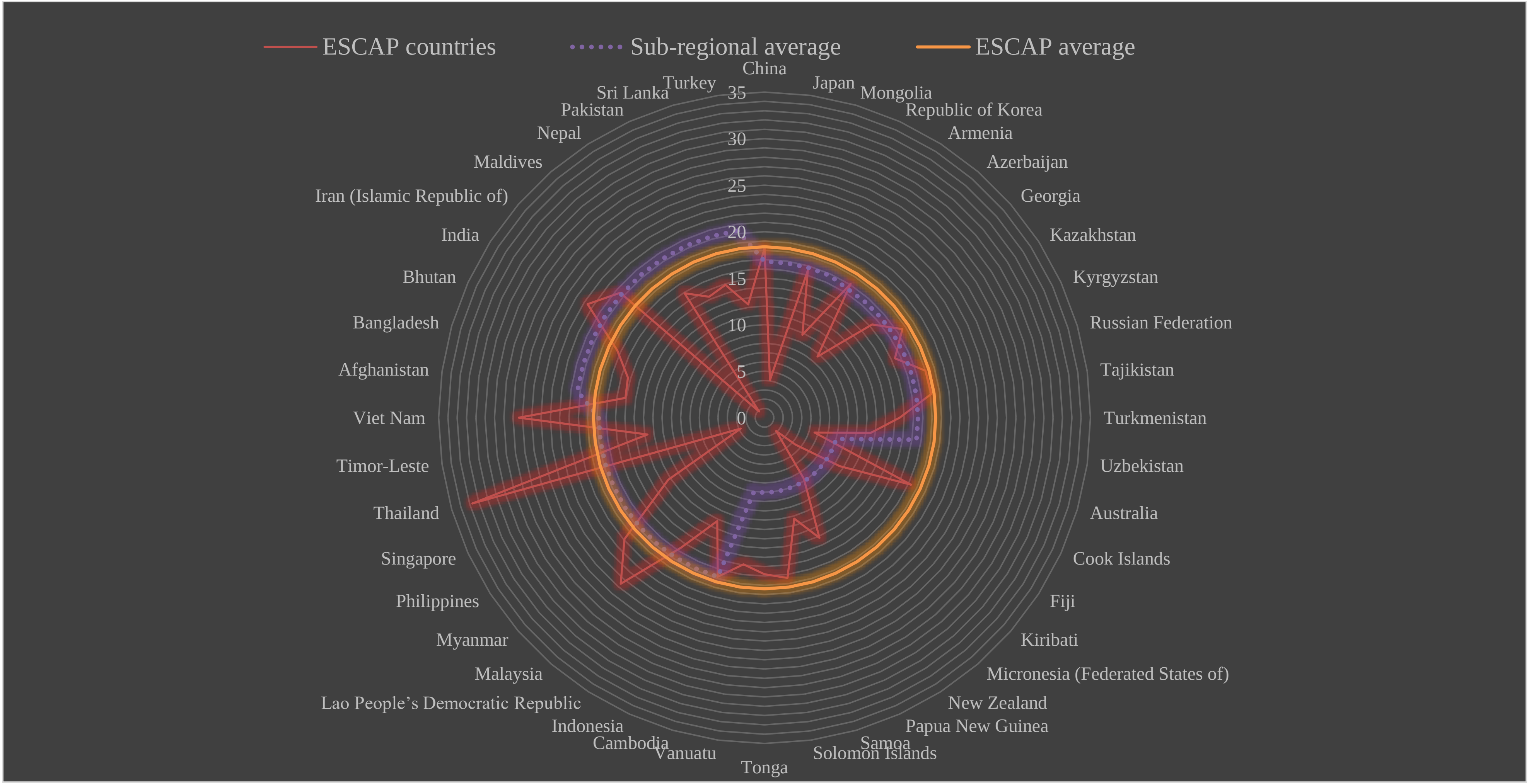
[27] Australia, Bureau of Infrastructure, Transport, Cities and Regional Development, *Road trauma Australia: 2018 statistical summary* (Canberra, 2018).
[28] WHO, Global status report on road safety 2018.

**Figure 8. Ratio of WHO estimated road crash deaths to country-reported road crash deaths in 2016.**




Source: WHO, *Global status report on road safety 2018*

**Figure 9. WHO estimated road crash death rate per 100,000 inhabitants in ESCAP countries, subregions, and the ESCAP region as a whole in 2016.**




Source: WHO, *Global status report on road safety 2018*

While there is little or no data on road user deaths in some countries, it is clear that vulnerable road users, including, in particular, pedestrians and those travelling on two- or three-wheeled vehicles, account for a disproportionate number of deaths (see figure 10). In Cambodia, Indonesia, Maldives, Myanmar and Thailand, those travelling on two- and three-wheeled vehicles account for between 65 and 75 per cent of road deaths, and in many countries, pedestrians make up between 30 and 50 per cent of fatalities. Overall, vulnerable road users in ESCAP member States make up 54.85 per cent of deaths, whereas drivers of cars and light vehicles account for only 20.21 per cent. Vulnerable road user deaths are particularly prevalent in South-East Asia, where they account for 75.17 per cent of fatalities, and East and North East Asia, where they account for 66.13 per cent (see figure 11). While some research suggests that speeding is very common in South-East Asia[29], insufficient data are available to ascertain the extent to which speeding exacerbates crash death figures in different countries and there is broad consensus that it is difficult to ascertain from police reports whether speed was a contributing factor in road crashes.[30] The extent to which high speeds contribute to crashes is often underestimated in police statistics because in many crashes caused, at least in part, by excessive vehicular speeds, this is no longer apparent after the crash has occurred.[31] It should be noted, however, that, while an official survey conducted in Australia on the basis on police reports estimated that speeding contributes to between 35 and 40 per cent of fatal crashes in the state of New South Wales, a survey conducted on the basis of data obtained from fixed speed cameras in the state revealed a 71 per cent reduction in speeding and an 89 per cent reduction in fatalities at speed camera locations[32]. That data clearly suggests that, rather than a mere 35 to 40 per cent, speeding is a contributing factor in the majority of fatal crashes, at least at the locations where the speed cameras were installed. Furthermore, if a crash investigation indicates that a driver had alcohol in his or her bloodstream at the time of the crash, drink-driving rather than speeding is likely to be recorded as the primary contributing factor. It is possible, however, that the driver involved may have been both speeding and under the influence of alcohol: That combination often causes more severe crashes as drunk drivers have slower reaction times than sober drivers. In spite of a lack of precise data, it is clear that excessive speed is, by the fundamental laws of physics, always a factor that can exacerbate the severity of a crash.

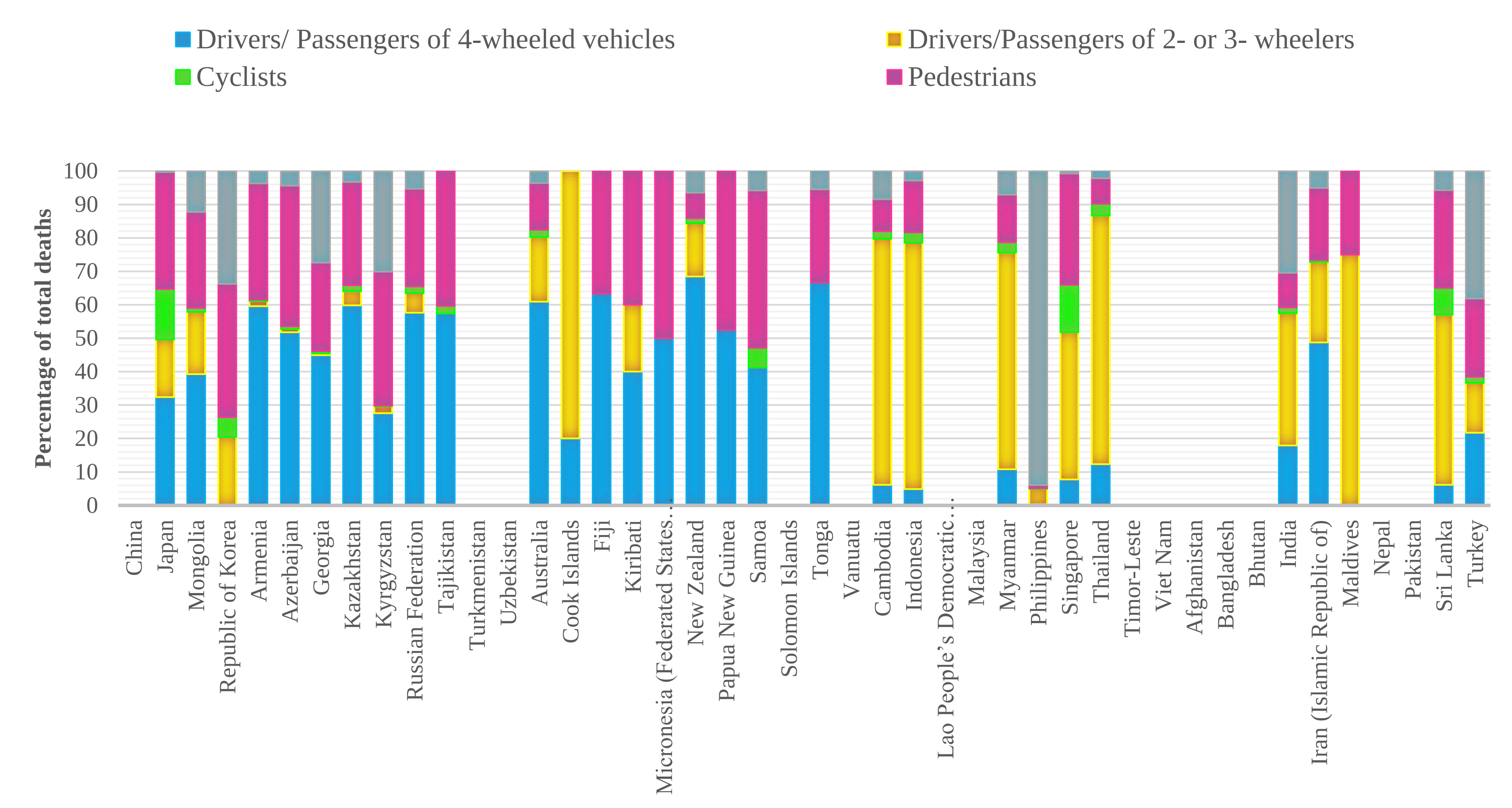
[29] Abdulgafoor Bachani and others, "Speeding in urban South East Asia: results from a multi-site observational study," *Journal of the Australasian College of Road Safety*, vol. 28(2) (2017), pp. 27-35.

[30] Howard and others, Speed management: a road safety manual for decision-makers and practitioners.

[31] Chika Sakashita and Soames Job, "Management of speed: the low-cost, rapidly implementable effective road safety action to deliver the 2020 road safety targets" *Journal of the Australasian College of Road Safety* vol. 27(2) (2016), pp. 65-70. Available at: acrs.org.au/wp-content/uploads/Vol27No2_Web.pdf (accessed on 18 November 2019)

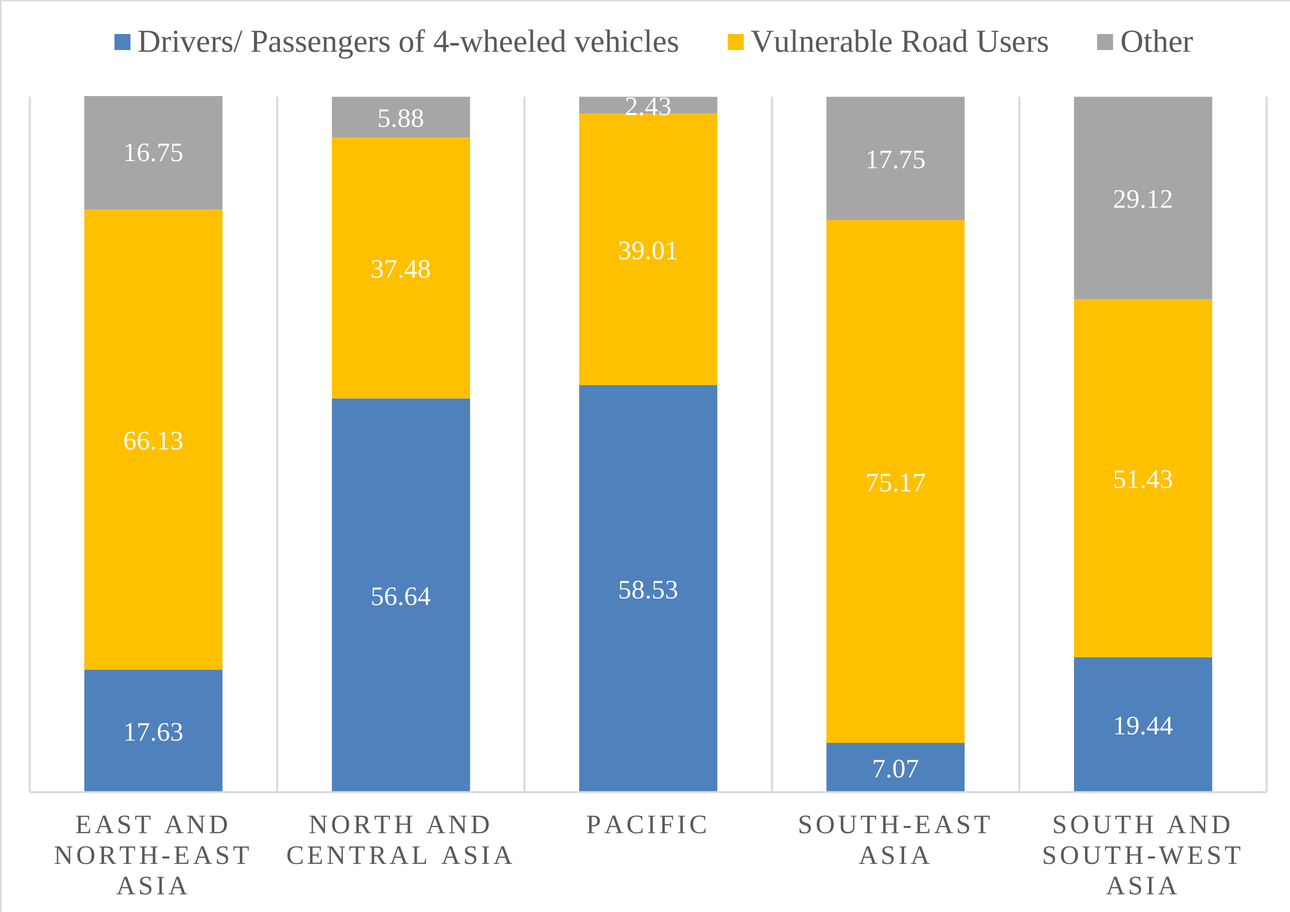
[32] Soames Job, "Applications of Safe System Principles in Australia", paper presented at the 2012 Australasian Road Safety Research, Policing and Education Conference, Wellington, New Zealand, October, 2012.

**Figure 10. Proportion of total deaths by road user category in individual ESCAP countries.**




Source: WHO, *Global status report on road safety 2018*

**Figure 11. Proportion of total deaths by road user category in different ESCAP subregions.**




Source: WHO, *Global status report on road safety 2018*

## 2.2 Speed management measures implemented by ESCAP member countries, as reported in the WHO Global status report on road safety 2018

To review the speed management measures taken by different countries, the authors of the WHO Global status report on road safety 2018 considered the following seven parameters:[33]

(a) Presence or otherwise of a national speed limit law;
(b) Maximum urban speed limit;
(c) Maximum rural speed limit;
(d) Maximum motorway speed limit;
(e) Local authorities' legal power to modify national speed limits to take into account local conditions (for example, the power to reduce speed limits in residential areas to 30km/h);
(f) Enforcement of speed laws (self-rated on a scale of 0 to 10);
(g) Predominant type of enforcement.

Data obtained from that review are presented in table 14 in Appendix B of the present report for the 43 ESCAP member States and one associate member country that were surveyed for the WHO Global status report on road safety 2018. A summary of the status quo, as outlined in the 2018 report, is provided in table 1 below:

[33] WHO, Global status report on road safety 2018.

**Table 1. Number of ESCAP member countries that have implemented various speed management measures.**

| Speed management measure | Total number of countries | East and North-East Asia | North and Central Asia | Pacific | South-East Asia | South and South-West Asia |
|---|---|---|---|---|---|---|
| **Presence of national speed limit law** | 43 | 4 | 9 | 10 (all but Vanuatu) | 10 | 10 |
| **Max urban speed limit of 30 km/h** | 2 | 0 | 0 | 0 | 0 | 2 – Bhutan, Maldives |
| **Max urban speed limit of 40 km/h** | 6 | 0 | 0 | 2 – Kiribati, Micronesia | 3 – Cambodia, Lao People's Democratic Republic, Philippines | 1 – Nepal |
| **Max urban speed limit of 50 km/h** | 11 | 1 – China | 0 | 5 – Australia, Fiji, New Zealand, Tonga, Cook Islands | 3 – Indonesia, Myanmar, Timor-Leste | 2 – Sri Lanka, Turkey |
| **Max urban speed limit above 50 km/h** | 23 | 3 – Japan, Mongolia, Republic of Korea | All 9 | 2 – Papua New Guinea, Samoa | 4 – Malaysia, Singapore, Thailand, Viet Nam | 5 – Afghanistan, Bangladesh, India, I.R of Iran, Pakistan |
| **Max urban speed limit – data unavailable** | 2 | 0 | 0 | 2 – Solomon Islands, Vanuatu | 0 | 0 |
| **Max rural speed limit of between 30 and 50 km/h** | 3 | 0 | 0 | 1 –Micronesia | 0 | 2 – Bhutan, Maldives |
| **Max rural speed limit of between 50 and 60 km/h** | 4 | 1 – Japan | 0 | 3 – Kiribati, Samoa, Cook Islands | 0 | 0 |
| **Max rural speed limit of 70km/h** | 3 | 1 – China | 0 | 1 – Tonga | 0 | 1 – Sri Lanka |
| **Max rural speed limit of 80 km/h** | 8 | 2 – Mongolia, Republic of Korea | 0 | 2 – Fiji, Papua New Guinea | 3 – Indonesia, Myanmar, Philippines | 1 – Nepal |
| **Max rural speed limit of 90 km/h** | 14 | 0 | 7 – Armenia, Azerbaijan, Georgia, Kyrgyzstan, Russian Federation, Tajikistan, Turkmenistan | 0 | 6 – Cambodia, Lao PDR, Malaysia, Thailand, Timor-Leste, Viet Nam | 1 – Afghanistan |

| Speed management measure | Total number of countries | East and North-East Asia | North and Central Asia | Pacific | South-East Asia | South and South-West Asia |
|---|---|---|---|---|---|---|
| **Max rural speed limit of 100 km/h or higher** | 9 | 0 | 2 – Kazakhstan, Uzbekistan | 2 – Australia, New Zealand | 0 | 5 – Bangladesh, India, I. R. of Iran, Pakistan, Turkey |
| **Max rural speed limit – data unavailable** | 2 | 0 | 0 | 2 – Solomon Islands, Vanuatu | 0 | 0 |
| **No rural roads** | 1 | 0 | 0 | 0 | 1 – Singapore | 0 |
| **Max motorway speed limit of 90 km/h** | 8 | 0 | 0 | 4 – Cook Islands, Kiribati, Micronesia, Tonga | 1 – Singapore | 3 – Afghanistan, Bhutan, Nepal |
| **Max motorway speed limit of 100 km/h or higher** | 26 | All four countries surveyed | All countries except Uzbekistan | 2 – Australia, New Zealand | 6 – Cambodia, Indonesia, Malaysia, Thailand, Timor-Leste, Viet Nam | 6 – Bangladesh, India, Iran, Pakistan, Sri Lanka, Turkey |
| **Max motorway speed limit – data unavailable** | 5 | 0 | 0 | 4 – Papua New Guinea, Samoa, Solomon Islands, Vanuatu | 1 – Lao People's Democratic Republic | 0 |
| **No motorways** | 4 | 0 | 1 – Uzbekistan | 0 | 2 – Myanmar, Philippines | 1 – Maldives |
| **Local authorities can modify speed limits** | 15 | 3 – China, Japan, Republic of Korea | 2 – Russian Federation, Turkmenistan | 4 – Australia, Micronesia, New Zealand, Solomon Islands | 3 – Indonesia, Malaysia, Philippines | 3 – India, Pakistan, Turkey |
| **Automated enforcement** | 8 | 2 – China, Republic of Korea | 5 – Armenia, Azerbaijan, Georgia, Kazakhstan, Russian Federation | 0 | 1 – Myanmar | 0 |
| **Manual enforcement** | 23 | 1 – Japan | 2 – Tajikistan, Uzbekistan | 6 – Cook Islands, Kiribati, Micronesia, Samoa, Solomon Islands, Tonga | 7 – Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Philippines, Thailand, Timor-Leste | 7 – Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka |
| **Automated and manual enforcement** | 10 | 1 – Mongolia | 2 – Kyrgyzstan, Turkmenistan | 3 – Australia, Fiji, New Zealand | 2 – Singapore, Viet Nam | 2 – Iran, Turkey |

| Speed management measure | Total number of countries | East and North-East Asia | North and Central Asia | Pacific | South-East Asia | South and South-West Asia |
|---|---|---|---|---|---|---|
| **Enforcement type – data unavailable** | 3 | 0 | 0 | 2 – Papua New Guinea, Vanuatu | 0 | 1 – Afghanistan |
| **Average self-rating of speed law enforcement** | 6.3 | 7 | 7.7 | 6.3 | 6 | 5.2 |

Source: WHO, *Global status report on road safety 2018.*

With the exception of Vanuatu, all of the 43 ESCAP member States and the one associate member country that participated in the review have adopted a national speed limit law. Only two countries, namely Bhutan and Maldives, have imposed a maximum urban speed limit of 30 km/h, however, and more than half of the ESCAP member countries (23 countries) have imposed urban speed limits greater than 50 km/h, which put vulnerable road users at significant risk of death in the event of a crash. Only 10 countries, namely China and Japan in the East and North-East Asia subregion, the Cook Islands, Kiribati, Micronesia, Samoa and Tonga in the Pacific subregion, and Bhutan, Maldives and Sri Lanka in the South and South-West Asia subregion, have imposed a maximum rural speed limit of between 30 and 70 km/h. Again, more than half of ESCAP member countries (23 countries) have imposed a maximum rural speed limit of more than 90 km/h, which is higher than speeds at which those involved in crashes are likely to survive. Such high limits are of particular concern on undivided roads and at poorly designed intersections[34]. The maximum motorway speed limit is 100 km/h or higher in 26 countries and this is likely to be excessive particularly in low- and middle-income countries, where unsafe vehicles are common. It should, moreover, be underscored that the traditional speed limits imposed on top quality motorways, namely speed limits of between 90 and 130 km/h,[35] were set prior to recent advances in our understanding of crash dynamics and the adoption of the "Safe System" approach to road safety, and are also higher than the most economically efficient speeds, which were outlined earlier in the present report.

Local authorities have the power to modify speed limits in 15 countries. However, the advantage of this is dependent on whether or not those authorities use their powers to set sensible speed limits. For example, if national speed limit laws already promote the safety of all road users, then an increase in those speed limits by a local authority will be harmful. On the other hand, if national speed limit laws do not uphold the safety of all road users, then the ability of local authorities to lower those speed limits will be beneficial. Hence, the ability of local authorities to modify speed limits does not, by itself, promote good practice and road safety.

A total of 23 countries still rely exclusively on manual speed law enforcement mechanisms and only 18 ESCAP member countries use automated enforcement technologies. The average self-rated enforcement scores across all ESCAP subregions range from 5.2 out of 10 in the South and South-West Asia subregion to 7.7 out of 10 in the North and Central Asia subregion. However, those self-rated scores should not be considered objective and, in the absence of objective data, it is difficult to assess and compare the effectiveness of enforcement mechanisms in different ESCAP countries.

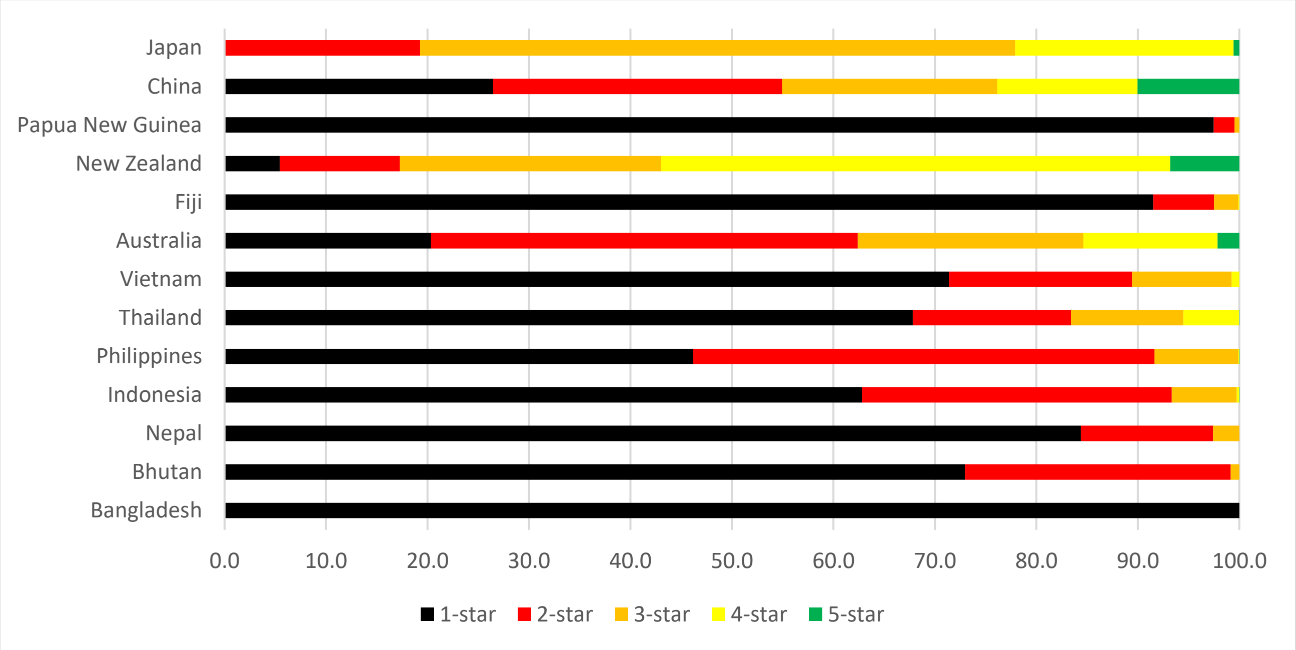
[34] Blair Turner and Tariro Makwasha, "Methods for reducing speeds on rural roads: compendium of good practice", Austroads publication No. AP-R449/14, (Sydney, NSW, Austroads, 2014).
[35] OECD and European Conference of Ministers of Transport, *Speed Management. Report of the Transport Research Centre*.

## 2.3 Speed management in ESCAP member countries, as highlighted in International Road Assessment Programme data

Information provided by the International Road Assessment Programme (iRAP)[36] following the submission of data requests revealed that roads in 13 ESCAP member countries, namely China and Japan in the East and North-East Asia subregion, Australia, Fiji, New Zealand and Papua New Guinea in the Pacific subregion, Indonesia, Philippines, Thailand and Viet Nam in the South-East Asia subregion and Bangladesh, Bhutan, and Nepal in the South and South-West Asia subregion, have been assessed for safety, and that star ratings have been assigned to those roads on the basis of a simple, objective, evidence-based road safety assessment for all road users (see table 15 in Appendix C). However, the types of road network sampled in each country vary considerably and a degree of caution is advisable when comparing data from different countries.[37]

The proportions of one-, two, three- four- and five-star ratings for pedestrians that iRAP has awarded to assessed roads in 13 ESCAP member States is shown in figure 12, while the proportions of the different star ratings for motorcyclists and car occupants on the same roads is shown in figures 13 and 14, respectively. The star ratings are inversely related to speed: as speeds decrease on a road, its star rating goes up. Roads awarded a five-star rating are the safest and those assigned a one-star rating are the least safe. Operating speed is a key factor in safety ratings: fewer serious crashes are likely to occur on a even a moderately safe road if speeds on that road are managed down.

**Figure 12. Proportions of iRAP star ratings for pedestrians on assessed roads in ESCAP member countries.**



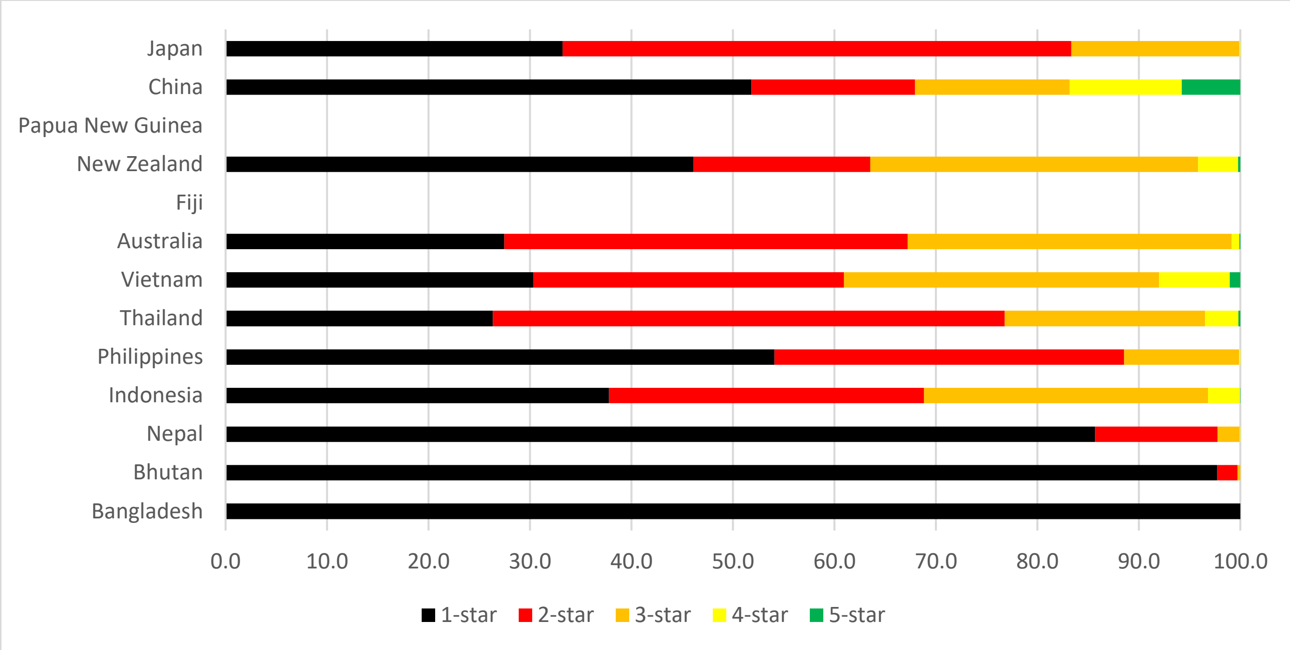

Source: iRAP (2018)[38]

[36] The umbrella programme for road assessment programmes worldwide. It has adopted a robust, evidence-based approach to prevent unnecessary deaths and suffering and has developed a series of risk mapping, star rating and other road assessment tools. For further information, see: www.irap.org (accessed on 18 November 2019)

[37] iRAP has not yet made available any data on the highest volume roads in each country, which would allow for in-depth comparisons among countries.

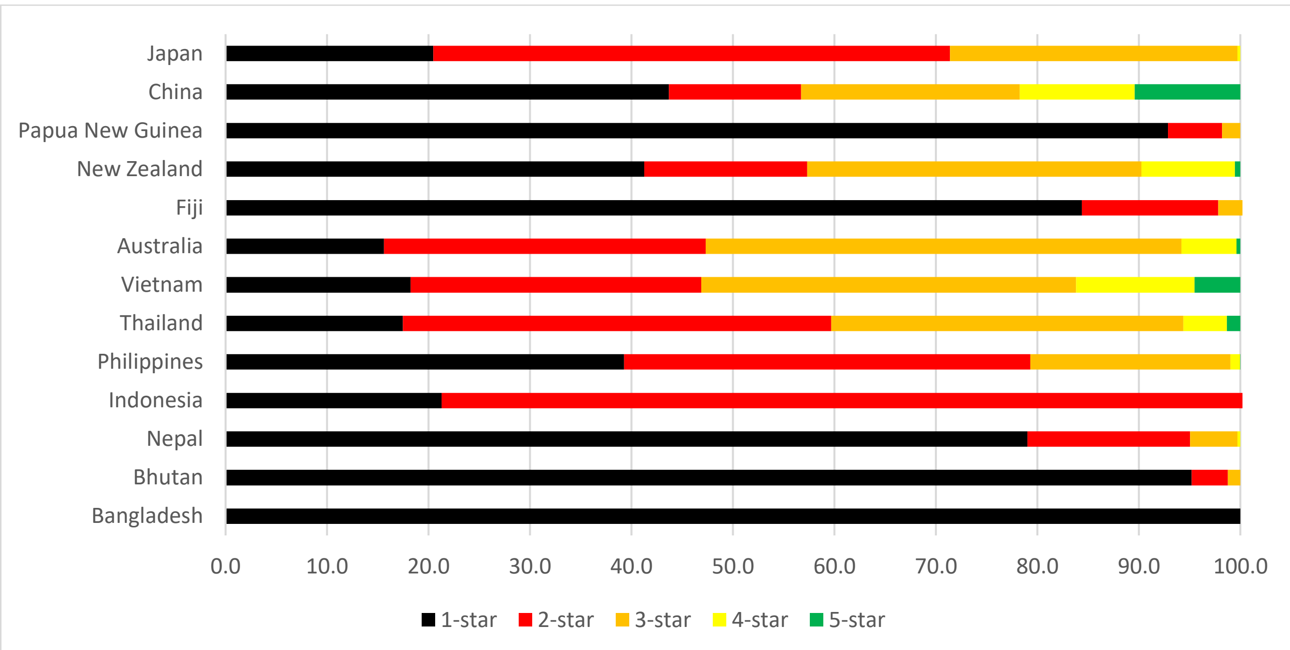
[38] iRAP, *Vaccines for Roads IV* (2018). Available at: www.vaccinesforroads.org/irap-big-data-tool/ (accessed on 18 November 2019)

**Figure 13. Proportions of iRAP star ratings for motorcyclists on assessed roads in ESCAP member countries.**




Source: iRAP, *Vaccines for Roads IV* (2018).

**Figure 14. Proportions of iRAP star ratings for vehicle occupants on assessed roads in ESCAP member countries.**

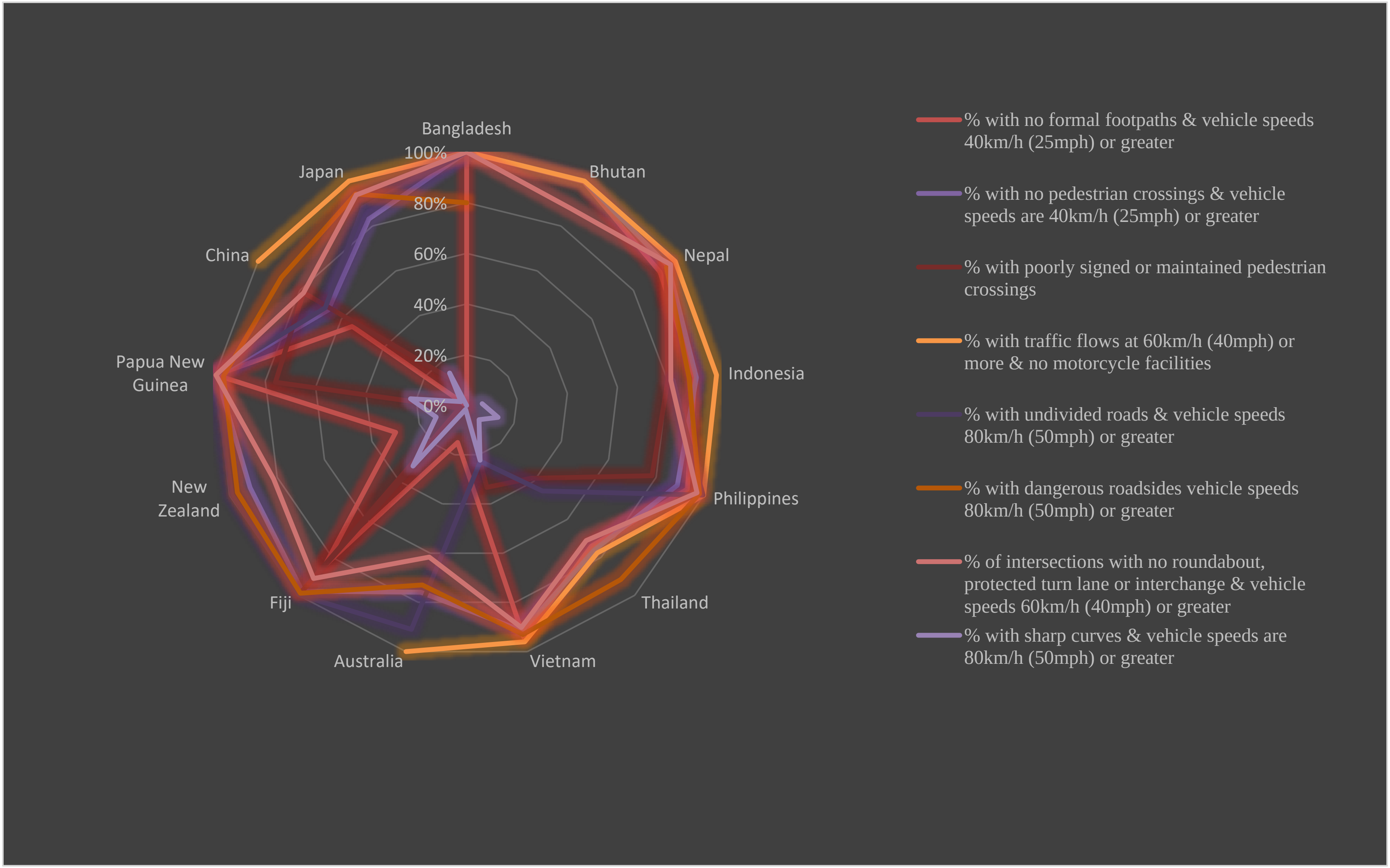



Source: iRAP, *Vaccines for Roads IV* (2018).

Overall, the proportion of one- or two-star roads is higher in low- and middle-income countries than in high-income countries. In some countries, between 70 and 100 per cent of iRAP assessed roads are one-star for pedestrians (Bangladesh, Bhutan, Nepal, Viet Nam, Fiji and Papua New Guinea), motorcyclists (Bangladesh, Bhutan and Nepal), and car occupants (Bangladesh, Bhutan, Nepal, Fiji and Papua New Guinea). Overall, most iRAP assessed roads in ESCAP member countries are one- or two-star for pedestrians (an average of 82.6 per cent of roads across the 13 countries surveyed) and motorcyclists (an average of 71.3 per cent across the 13 countries). Even for vehicle occupants, some 52.7 per cent of assessed roads have been assigned only a one- or two-star rating.

Operating speeds are also poorly managed on many assessed roads (see figure 15). For example, in many countries, including Bangladesh, Bhutan, Fiji, Indonesia, Nepal, Papua New Guinea, the Philippines and Viet Nam, operating speeds on between 90 and 100 per cent of assessed roads with no formal footpaths running alongside them can reach 40 km/h or faster. Furthermore, on the majority of assessed ESCAP roads with operating speeds of 60 km/h or more no measures have been taken to enhance the safety of motorcyclists. Meanwhile, in Australia, Bangladesh, Fiji, Indonesia, Japan, New Zealand, Papua New Guinea and the Philippines, between 80 and 100 per cent of assessed roads with operating speeds of 80 km/h or more are undivided, and this significantly increases the risk of severe head-on crashes. Clearly, ESCAP countries are failing to manage speeds on many of their roads through effective infrastructure investments and the imposition of appropriate speed limits, which could all significantly enhance the safety of pedestrians, motorcyclists and vehicle occupants.

**Figure 15. Proportion of iRAP assessed roads without appropriate speed limits or appropriate road infrastructure for the safety of pedestrians, motorcyclists and vehicle occupants in ESCAP member countries.**




Source: iRAP, *Vaccines for Roads IV* (2018)

## 2.4 Speed management measures implemented by ESCAP member countries, as reported in a survey conducted by ESCAP

All ESCAP member States were invited to take part in a survey tin 2019 that had been developed to facilitate the drafting of the present report.[39]. A total of 18 countries completed the survey in English and the Russian Federation completed the survey in Russian. The responses of the 18 countries that completed the survey in English, namely Afghanistan, Armenia, Australia, Azerbaijan, Bhutan, Cambodia, India, Indonesia, Kazakhstan, Kyrgyzstan, Lao People's Democratic Republic, Nepal, Philippines, Singapore, Sri Lanka, Tajikistan, Thailand and Viet Nam are discussed below. The failure of a number of ESCAP member States to complete the survey mean that the information obtained is somewhat limited in scope. The survey questionnaire can be found in Appendix D.

The most common urban speed limit in each country is between 20 and 90 km/h. In 12 of the 18 countries, the most common urban speed limit is greater than 30 km/h – above the survivable speed limit for vulnerable road users. Countries that impose an urban  speed limit of 30 km/h report that they impose that limit on urban local roads (Afghanistan, Bhutan, Cambodia (for two and three-wheelers only), Nepal and the Philippines) and less commonly on urban collectors and urban arterials (Bhutan, Nepal and the Philippines). Sri Lanka reported that a 20 km/h speed limit is imposed on urban local roads.

The most common urban speed limit imposed in each country at locations with significant numbers of pedestrians but no pedestrian foot bridges for crossing the road ranged from 20 km/h to 90 km/h. In 11 of the 18 countries, the most common speed limit was greater than 30 km/h, and was therefore above the survivable speed for vulnerable road users. However, Bhutan reported that it imposed a 30 km/h limit, Nepal reported that it used a limit that was less than 30 km/h, and the Philippines and Sri Lanka reported that they imposed a 20 km/h limit. Afghanistan reported using a 30 km/h limit on urban local roads and urban collectors. Tajikistan reported using a 30 km/h limit on urban arterials.

The most common rural speed limit in each country is between 20 and 110 km/h. In 11 of the 18 countries, the most common rural limit is greater than 50 km/h – above the survivable speed limit, particularly in poorly managed intersections where side-impact crashes are more likely to occur. Nepal reported that it imposes a 20 km/h speed limit on rural local roads and a limit of 40 km/h on rural collectors and rural arterials. Sri Lanka reported that it imposes a 20 km/h limit on rural local roads but a 70 km/h speed limit on rural collector and arterial roads. The Philippines reported that it imposes a 30 km/h limit on all rural roads, while Bhutan and Singapore reported using 50 km/h limits on all rural roads. Afghanistan reported that it imposes a 30 km/h limit on rural local roads and rural collectors but a limit of 50 km/h on rural arterials. Kazakhstan reported that it imposes a limit of 50 km/h on rural collectors and a limit of 60 km/h on rural local roads and rural arterials.

The most common motorway speed limit in each country is between 30 km/h and 120 km/h. In 10 out of the 18 countries, a motorway limit of 70 km/h or below is imposed on at least one type of motorway. For example, Bhutan, Nepal and the Philippines reported that they impose a maximum speed limit of 30 km/h on motorways within cities, while Indonesia imposes a limit of 30 km/h on suburban motorways. Afghanistan, Armenia and Tajikistan reported a maximum speed limit of 60 km/h on motorways within cities, while India and Indonesia impose limits on motorways within cities of 70 and 50 km/h, respectively. On suburban motorways, Afghanistan and Nepal impose a 60 km/h limit, Bhutan a 50 km/h limit and the Philippines a 40 km/h limit. Cambodia reported that it imposes a motorcycle speed limit of 60 km/h on intercity motorways. The Philippines imposes a 50 km/h limit for heavy vehicles only on intercity motorways, while Kyrgyzstan and Bhutan impose speed limits of 60 and 50 km/h, respectively, on intercity motorways. However, 13 of the 18 countries also

[39] ESCAP, Transport Division, "Tackling main causes of road traffic crashes, fatalities and injuries in Asia-Pacific countries to achieve road safety targets of the Sustainable Development Goals" (ESCAP. *date??*). Survey available at: www.research.net/r/tackling-causes-of-traffic-issues (accessed on 18 November 2019)

reported imposing a speed limit of 90 km/h or above on at least one type of motorway – above the survivable speed on undivided roads where head-on crashes are more likely to occur. In Australia, Azerbaijan, India, Kazakhstan, Lao People's Democratic Republic, Nepal, Sri Lanka, Tajikistan, Thailand and Viet Nam, the motorway speed limit is 100 km/h or higher, which is likely to be excessively fast, particularly on substandard roads and where unsafe vehicles such as motorcycles are common.

The lowest speed limit in each country ranged from 5km/h in Kazakhstan and Viet Nam to 40 km/h in Kyrgyzstan, Lao People's Democratic Republic and Singapore. The lowest speed limits typically occurred around schools (16 out of 18 countries), residential streets (15 out of 18 countries), in high pedestrian activity areas (11 out of 18 countries), through villages or built up areas on highways (9 out of 18 countries), or local traffic areas (7 out of 18 countries). Afghanistan, Azerbaijan, Kyrgyzstan, Lao People's Democratic Republic, the Philippines, Tajikistan and Viet Nam reported the lowest speed limits in all the aforementioned areas. India reported the lowest speed limits in the vicinity of hospitals and construction areas and Singapore in areas with high numbers of aged persons. These are all examples of good speed management practice.

The highest speed limit in each country ranged from 50km/h (Bhutan) to 140 km/h (Afghanistan). The highest speed limits were typically imposed on motorways/highways (17 out of 18 countries), rural divided roads (5 out of 18 countries) and rural undivided roads (4 out of 18 countries). Most countries (15 out of 18) reported the highest speed limit to be above 70 km/h, a speed at which survivability rates are low, especially on undivided roads.

Most countries (13 out of 18 countries) reported that they had formulated guidelines or policies to help their relevant national authorities determine speed limits. However, Armenia, Lao People's Democratic Republic, Nepal, Singapore and Thailand reported that they had yet to formulate any guidelines or policies in that area. Fifteen of the 18 countries reported that the national government determines speed limits. Eight of the 18 countries reported that states set speed limits, while eight other countries reported that speed limits are set by local governments. Although Afghanistan, India, Indonesia, Kazakhstan and Sri Lanka reported that all three levels of government in those countries can set speed limits, only one level of government has responsibility for setting speed limits in the other 10 countries.

Overall, these figures suggest that there are ample opportunities for many countries to reduce the enormous costs resulting from speeding-related deaths and serious injuries by lowering their speed limits. Area-wide speed limit reviews should therefore be undertaken in all ESCAP member countries.

With the exception of Sri Lanka, all of the 18 countries reported using speed humps/bumps to help reduce speeds. Many countries also reported using roundabouts (14 out of 18 countries), rumble strips (13 countries), median barriers (12 countries), roadside barriers (11 countries), raised pedestrian crossings (11 countries), chicanes (seven countries) and narrow travel lanes (six countries) to manage speeds. Afghanistan reported that it used all those infrastructure modifications. Some countries also reported using speed tables (eight out of 18 countries), lanes painted in different colours (six countries), special lighting (one country: Kazakhstan), or signs saying "slow" or showing drivers' speeds (one country: Singapore). Greater use could be made in many countries of those good speed management practices, which can all improve driver compliance with speed limits and reduce traffic speeds to survivable levels.

Many countries reported that they used fixed-location speed limit enforcement mechanisms (15 out of 18 countries), while some used speed cameras only (Armenia and Singapore), police speed traps only (Bhutan, Indonesia, Nepal and Sri Lanka) or both speed cameras and police speed traps (nine out of 18 countries). Many countries also reported employing radar/laser/lidar speed guns (15 countries) or police following travelling vehicles (11 countries). Some countries reported that they used both speed and red-light cameras (nine countries), moveable speed cameras (eight countries) and point-to-point cameras (six countries). Afghanistan and Australia reported employing all those enforcement methods but Lao People's Democratic Republic reported that it used none of those methods. There are clearly opportunities to strengthen speeding deterrence in many countries by increasing the number of speed limit enforcement locations.

The minimum level of speeding at which penalties are applied ranges from zero km/h over the speed limit (good practice) to 60 km/h over the speed limit. Some countries, namely Afghanistan, India, the Philippines and Tajikistan, reported that speeds of up to 60 per cent over the speed limit are tolerated. Among the countries that reported that moderate speeding is sometimes tolerated, tolerance of speeds of between 10 and 20 km/h over the speed limit is common. Many countries could significantly reduce their tolerance margins, which would further deter speeding. Australia reported that tolerance margins are not publicly disclosed, an example of good practice in the area of speed management. Indonesia and Lao People's Democratic Republic did not response to the survey question on speeding tolerance.

All countries reported that they impose speeding fines. Some countries reported that they can also suspend drivers' licences or disqualify them from driving (11 out of 18 countries), impose points on drivers' licences (7 countries) and impound vehicles (5 countries) for speeding offences. Australia and Tajikistan reported that they employ all those penalties for speeding. Indonesia also reported that custodial sentences can also be handed down by the courts for speeding offences. In countries that reported the maximum number of points that a driver can incur before his or her licence is suspended and the minimum and maximum points given for speeding, drivers can be caught speeding between 10 and 12 times before their licences are suspended: a high number of speeding offences before any significant action is taken. In other words, those countries' licence points systems are unlikely to deter drivers from speeding to any significant extent. Many countries could, moreover, significantly bolster their speeding deterrence regimes by imposing a range of penalties, rather than imposing only monetary fines.

Most of the countries that took part in the survey conduct speeding enforcement in urban areas (15 out of 18 countries), rural areas (10 countries), at specific times of day (eight countries), at crash blackspots (10 countries), and at high death and injury blackspots (10 countries). Armenia, Azerbaijan, India, the Philippines and Thailand reported that they seek to enforce speed limits on all roads in the country. Australia declined to provide responses in that regard as enforcement practices vary greatly state by state. For countries that reported that enforcement takes place at specific times of day, enforcement tends to take place during peak traffic hours (Afghanistan and Bhutan) or during daylight hours (Cambodia and Indonesia). Some countries reported that they enforce speed limits on highways (India, Indonesia, Kyrgyzstan and Viet Nam), while Viet Nam also reported that it conducts speeding enforcement at random locations. Enforcement outside urban areas and daylight hours could help strengthen deterrence in many countries.

Fourteen of the 18 countries reported that they monitor the number of speeding penalties issued each year, while seven of the countries also monitor whether those speeding fines are paid. The reported percentage of paid speeding fines is low in some countries (only 5 per cent in Bhutan, 10 per cent in Thailand and 20 per cent in Afghanistan). For certain other countries the reported percentage is much higher (75 per cent in Armenia, 82 per cent in Azerbaijan, 90 per cent in Viet Nam and 100 per cent in Kyrgyzstan and Sri Lanka). Failure to pay speeding fines can make it impossible for a driver to renew his or her licence (four out of 18 countries), result in licence suspension/disqualification (9 countries) or have no repercussions (one country). Other consequences include the sending of a payment demand letter from the competent government authority (Armenia), a court summons (Cambodia, Kyrgyzstan and Singapore), vehicle impoundment (Nepal), or the prevention of vehicle registration renewal (Thailand). The deterrence effect of fines is seriously undermined if there are no negative repercussions for drivers who fail to pay their speeding fines. Efforts should therefore be made to strengthen mechanisms to follow up on speeding fine payments.

## 3. Challenges in ESCAP member countries with respect to speed management

The 53 ESCAP member countries, and especially the 42 low- and middle-income countries in the ESCAP region, face a number of challenges related to speed management, including the following:

- Leadership on speed management remains weak due to limited data on the role of speed in fatal and serious crashes as well as a lack of data on the extent of speeding. Michael Bloomberg, an American businessman, politician, author, and philanthropist, was once quoted as saying "If you can't measure it, you can't manage it". The real-world impact of speed on road death and injury figures is often significantly underestimated because, in many crashes in which speed was a contributing factor, this is not apparent after the crash has occurred[40]. Yet evaluations of speed management interventions that reduce driving speeds often show that those interventions have significantly reduced death and injury figures and provide evidence that speed is often a significant contributing factor in crashes. Furthermore the many discrepancies between the figures for WHO estimated deaths and country-reported deaths also suggest that road crash deaths are underreported to a significant extent, particularly in low- and middle-income countries. Data on the extent of speeding is also unavailable or incomplete in many ESCAP member countries[41] and in low- and middle-income countries in particular, that data may only be available in hard copy paper files, impeding data analysis. Incomplete data is no excuse for inaction, however. Indeed, even limited country-level crash data can be used as a starting point for the development of strategies for improving speed management, and the diverse mix of road users, including vulnerable road users, on the roads of many ESCAP countries makes it imperative for those countries to implement appropriate speed reduction measures.

- There is a lack of sustained commitment to speed management. Even countries with effective road safety regimes in place can suffer from a sense of complacency and politicians often seek to undermine or undo the very interventions that successfully led to a reduction in injuries and fatalities on those countries' roads. Whilst target 3.6 of the Sustainable Development Goals, namely to halve the number of global deaths and injuries from road traffic accidents by 2020, may have been ambitious, that target is in reach if evidence-based interventions are effectively implemented. The reason why many countries have not achieved a 50 per cent reduction in deaths and injuries in the last decade is because of a lack of political will and commitment to implement evidence-based road safety interventions. One of the key challenges that we need to tackle in low- and middle-income countries (and, indeed, in high-income countries too), is to strengthen and sustain effective leadership in the area of speed management and road safety.

- There is a misconception that road safety expenditure is a cost rather than an investment. Many countries commit substantially more funding to road infrastructure developments that increase travel speeds than to road projects that prevent deaths and injuries because they do not consider the costs associated with preventative measures as legitimate economic investments. This is hardly surprising as the transport authorities who bear most road infrastructure costs do not reap the benefits associated with reduced speeds, namely lower health sector costs as a result of fewer road injuries and deaths. It should be noted, however, that the countries with the lowest speed limits and the best road safety records, namely the Netherlands, Sweden and Switzerland, have very strong economies, and low- and middle-income countries, some of which have expressed concerns regarding the affordability of road safety

[40] Job and Sakashita, "Management of speed: the low-cost, rapidly implementable effective road safety action to deliver the 2020 road safety targets".

[41] See for example: Maxwell Barffour and others, "Evidence-based road safety practice in India: assessment of the adequacy of publicly available data in meeting requirements for comprehensive road safety data systems", *Traffic Injury Prevention*, vol. 13 (suppl. 1) (2012), pp.17-23.

measures, will in fact be able to strengthen their economies by investing in road safety. Indeed, a World Bank analysis of five middle-income countries concluded that halving the number of road crash deaths and injuries, an achievable goal if travel speeds are reduced, would generate substantial additional income flows, with GDP growth of as much as 7.2 per cent in the Philippines, 14 per cent in India, 15 per cent in China and 22.2 per cent in Thailand over the next 24 years.[42]

- Speed limits are often increased after taking into consideration the economic benefits of reduced travel times but not the economic costs of more frequent crashes, injuries and deaths. A common misconception is that higher speeds foster economic growth. This view is often promoted by transport companies, many of which believe that they can increase profits by moving goods and people at higher speeds. However, international studies have shown that higher open road/highway speeds actually increase the net costs of transport[43] and much of the cost of speed, which includes the costs associated with deaths, injuries and greenhouse gas emissions, is not incurred by transport companies themselves, but is borne by governments and by broader society, to the detriment of economic growth.[44]

- There is a general acceptance among members of society that road crash deaths and injuries are an inevitable price of increased motorization. While mobility can improve people's quality of life and help stimulate economic activity, death and injury should not be the inevitable price of that mobility. Instead, measures to keep road users safe and prevent unnecessary road deaths and injuries must lie at the heart of any mobility strategy. Safety is in fact recognized as one of the four key pillars of sustainable mobility.[45]

- Priority attention is usually given to motorized vehicles in the design of roads and road networks. Pedestrians, cyclists and motorcyclists are at risk of serious injury or death at much lower speeds than vehicle occupants.[46] Overall, such vulnerable road users account for 56.4 per cent of road deaths in ESCAP member countries.[47] Indeed, in large cities such as Bandung and Mumbai, over 90 per cent of those killed on the roads are vulnerable road users.[48] Despite the very large numbers of vulnerable road users in many ESCAP member countries, as confirmed in the present analysis (and as illustrated in photo 1 below), those responsible for planning, designing and operating roads continue to prioritize cars and other large motorized vehicles, and often set speed limits that are far too high for vulnerable road users to travel safely, as clearly evidenced by the aforementioned iRAP and WHO data.

[42] World Bank, *The high toll of traffic injuries: unacceptable and preventable* (Washington, D.C., World Bank, 2017). Available at: openknowledge.worldbank.org/handle/10986/29129
[43] See for example: Cameron, "Potential benefits and costs of speed changes on rural roads"; Cameron, "Optimum speeds on rural roads based on "willingness to pay" values of road trauma"; Elvik, "The Power Model of the relationship between speed and road safety: update and new analyses"; Hosseinlou, Kheyrabadi and Zolfaghari. "Determining optimal speed limits in traffic networks".
[44] World Bank, *The high toll of traffic injuries: unacceptable and preventable*.
[45] Sustainable Mobility for All, *Global Mobility Report 2017: Tracking Sector Performance* (Washington, D.C., 2017). Available at: sum4all.org/publications/global-mobility-report-2017 (accessed on 18 November 2019)
[46] Nilsson, "Traffic safety dimensions and the Power Model to describe the effect of speed on safety".
[47] WHO, *Global status report on road safety 2018*.
[48] Statistic provided by the Bloomberg Philanthropies Initiative for Global Road Safety. For further information, see: www.bloomberg.org/program/public-health/road-safety/ (accessed on 18 November 2019)

**Photo 1. Mix of pedestrians and vehicles on a street in India.**


Source: Global Road Safety Solutions Pty Ltd

- Police resources are often misdirected.[49] Police in many States, and particularly in low- and middle-income countries, are often more focused on motorcades, crime investigations and facilitating vehicle flows than on road safety management, including speed limit enforcement. The police may also view enforcement as confrontational and prefer to adopt less confrontational approaches in their interactions with the public, not all of which are evidence-based. While the imposition by the police of on-the-spot roadside fines may help the authorities sidestep a number of bureaucratic and administrative challenges, such as incomplete or out of date address and licence records and ineffective mechanisms for following up on unpaid fines, this can also breed corruption among those responsible for enforcement.

- Community demands for speed management are sometimes misrepresented. As speed management, by default, compels drivers to drive in a certain manner, speed management initiatives may be resisted by some groups within the community when they are first introduced. A vocal minority[50] may make misinformed claims in order to impede the implementation of evidence-based speed management measures and, on the basis on those inaccurate claims, governments may decline to take further action in the area of speed management. Contrary to the common belief among politicians that speed limit enforcement and speeding fines are unpopular and should therefore not be pursued as part of their policies, broad-based community surveys often show that the majority of the population supports speed enforcement initiatives. This has been observed in countries such as Australia, Switzerland and the United States of America, while the introduction of speed cameras in Bangalore, India has also been very successful among the city's residents. Road safety practitioners should therefore endeavour to

[49] Amy Aeron-Thomas, *Community traffic policing scoping study: final report*, United Kingdom Department for International Development, Project report No. PR/INT/265/2003 (London, 2003); Ray Shuey, "Sharing road safety education and enforcement knowledge and practice throughout developing nations - challenges create opportunities!", *Journal of the Australasian College of Road Safety*, vol. 30 (1) (2019), pp. 58-65.

[50] See for example: Australia, Bureau of Infrastructure, Transport, Cities and Regional Development, *Surveys of community attitudes to road safety.* Available at: www.infrastructure.gov.au/roads/safety/community_attitudes_survey/index.aspx (accessed on 18 November 2019).

educate politicians on why effective speed management, including through the use of speed cameras, is of critical importance, and how effective communication and engagement with communities can mobilize support for speed management initiatives. It should be underscored that carefully designed surveys to ascertain the views of communities in that regard are often useful tools.

- Behavioural change interventions for which there is only weak evidence proving their effectiveness may be favoured over interventions whose effectiveness is supported by strong evidence. While driver behaviour has traditionally been the focus of speed management initiatives in many countries, those initiatives have tended to place undue emphasis on interventions that have not proved to be particularly effective, such as awareness-raising campaigns that are conducted in isolation[51] while little emphasis has been given to effective interventions such as enforcement, engineering projects and the development and installation of advanced vehicle technologies. Implementation of speeding enforcement is often weak and this is often exacerbated in ESCAP member States by issues such as corruption and the fact that drivers who fail to pay speeding fines may suffer no adverse consequences. In many countries, little effort has been made to install road infrastructure that reduces driver speeds, such as raised platform crossings, speed humps and roundabouts. Furthermore, insufficient attention has been given to the development and deployment of in-vehicle speed managing technologies such as Intelligent Speed Adaptation (ISA) systems.

- Speed is prioritized by manufacturers and promoted through vehicle advertising. Automobiles are status symbols in many countries, and speed is often glamorized in automobile advertisements and is a popular selling feature[52]. Historically, the maximum speeds of private vehicles have not been regulated and manufacturers typically design cars to reach speeds that are higher than the legal speed limit in the countries in which they are sold.

- Incentives for speeding can be powerful. Psychological research[53] suggests that speeding is related to a number of factors, such as the driver's personality (some drivers are "sensation seeking"), driver over-confidence and time-saving biases. Speeding can be a pleasurable experience and people may perceive they will get to a destination faster, even if that is not the case or if very little time is saved. Speeding enforcement is therefore critical and robust deterrence is needed to counter the short-term feeling of reward that people may experience from travelling faster than necessary.

- In many low- and middle-income countries, there are no vehicle safety standards. The safety performance of a vehicle is a key factor that determines the extent to which road users will be protected in the event of a crash. However, safety performance levels of vehicles vary and in many countries that have yet to adopt minimum vehicle safety standards there is no guarantee that the vehicles available for sale meet even basic safety requirements. Even basic safety technologies and devices, such as speedometers, seatbelts and airbags, may be missing or fail to function effectively in many vehicles currently on the roads of ESCAP member countries.

- Vehicle fleets in low- and middle-income countries are often old and fleet changeover speeds remain slow, delaying the adoption of advanced vehicle technology. Many low- and middle-income countries

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[51] See for example: Ian Roberts and Irene Kwan, "School-based driver education for the prevention of traffic crashes", *Cochrane Database of Systematic Reviews* (2001); Suzanne Zeedyk and others, "Children and road safety: increasing knowledge does not improve behaviour", *British Journal of Educational Psychology*, vol. 71(4) (2001), pp 573-594; Rune Elvik and others, eds. *The handbook of road safety measures* (Emerald Group Publishing, 2009).

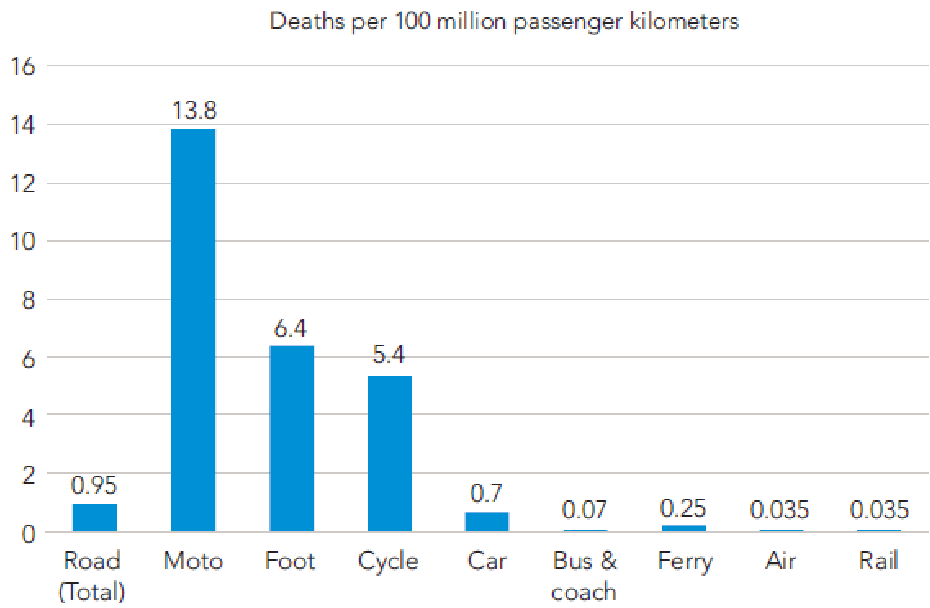
[52] Philip Shin and others, "Unsafe driving in North American automobile commercials", *Journal of Public Health*, vol. 27 (4) (2005).

[53] See for example: Ralston Fernandes, Julie Hatfield, and Soames Job, "A systematic investigation of the differential predictors for speeding, drink-driving, driving while fatigued, and not wearing a seat belt, among young drivers", *Transportation Research Part F: Traffic Psychology and Behaviour*, vol. 13(3) (2010), pp. 179-196; Eyal Peer, "Speeding and the time-saving bias: how drivers' estimations of time saved in higher speed affects their choice of speed", *Accident Analysis and Prevention*, vol. 42(6) (2010), pp. 1978-1982.

import secondhand vehicles from high-income countries, and vehicles equipped with advanced technology are often slow to reach consumers. Vehicle fleets in low- and middle-income countries also tend to be relatively old, and newer vehicles, which are usually safer than older cars are often out of reach of those who need them most, namely young and novice drivers, who are often unable to afford newer and safer cars. Advanced technologies such as ISA are highly unlikely to be adopted in low- and middle-income countries in the near future, as the successful implementation of that technology requires the development of reliable spatially-referenced speed zone databases indicating the location of all authorized speed limit signs and the zones they cover. The development of such databases in low- and middle-income countries is likely to take considerable time

- Inherently dangerous vehicles are highly common in many ESCAP member countries. Inherently dangerous vehicles such as motorcycles (including tuk-tuks) (see figure 16) are common means of transport in ESCAP member countries (see figure 17). Data from Australia also show that, for an equivalent distance travelled, the motorcyclist death rate is approximately 30 times the rate for car occupants[54]. Tractors, which are also disproportionately involved in fatal crashes,[55] are also used as passenger vehicles in some ESCAP member countries (see photo 2). Passengers may also be transported in vehicle cargo areas, where they are not provided with seat belts and often sit facing sideways to the direction of travel. Passengers transported in this manner are offered little effective protection and are at high risk of death and injury in the event of a crash (see photo 3).

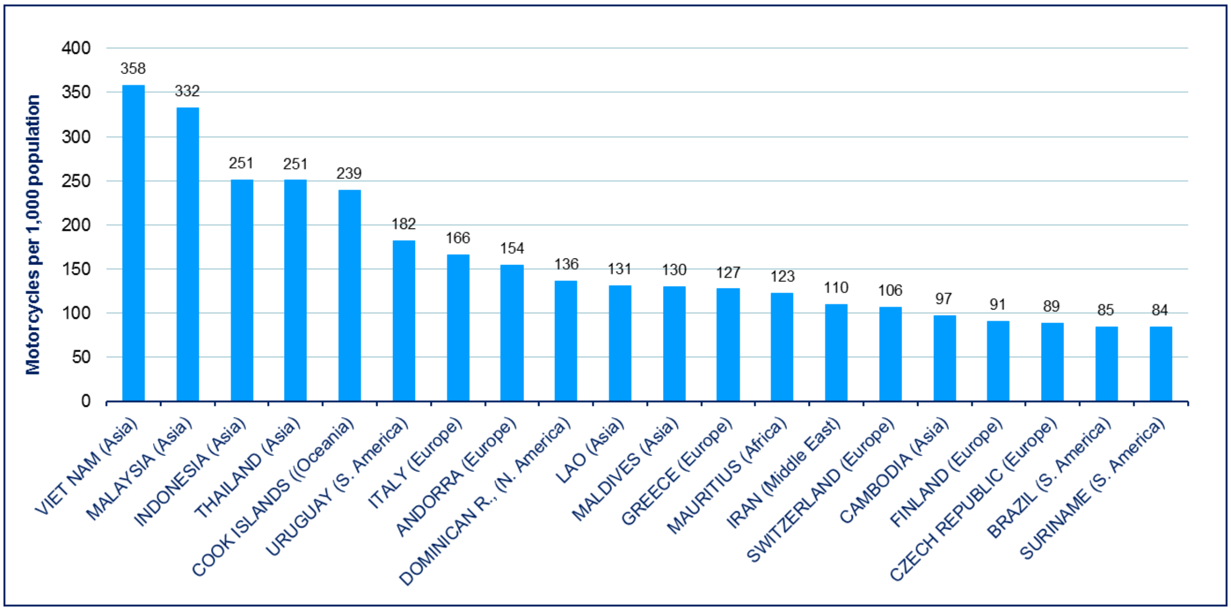
**Figure 16. Death risks of different forms of transport.**




Source: European Transport Safety Council (2003)

[54] Peter Johnston, Chris Brooks and Hamilton Savage, *Fatal and serious road crashes involving motorcyclists*, Australia, Department of Infrastructure, Transport, Regional Development and Local Government (Canberra, 2008). Available at: https://infrastructure.gov.au/roads/safety/publications/2008/pdf/mono20.pdf (accessed on 18 November 2019).
[55] Mathew Ericson, "Two-wheel tractors: road safety issues in Laos and Cambodia" in Safety Science, vol. 48 (5) (June 2010), pp. 537-543.

**Figure 17. The 20 countries with the greatest number of motorcycles per 1,000 population.**




Source: Nguyen[56] using WHO data[57]

**Photo 2. Use of tractors as passenger vehicles in Lao People's Democratic Republic.**

Source: Global Road Safety Solutions Pty Ltd

[56] Huy Nguyen, "A comprehensive review of motorcycle safety situation in Asian countries", *Journal of Society for Transportation and Traffic Studies*, vol.4 (3) (2013).
[57] WHO, Global status report on road safety 2015 (Geneva, 2015). Available at: https://www.who.int/violence_injury_prevention/road_safety_status/2015/en/ (accessed on 18 November 2019).

**Photo 3. Passengers transported in cargo areas with no seat belts and facing sideways to the direction of travel in the Philippines.**

Source: Global Road Safety Solutions Pty Ltd

- There are often few alternatives to private transport, such as public transport and active transport options. While infrastructure developments for high speed roads are often prioritized, the transport needs of certain sections of the community, including those who do not have access to private motorized vehicles, persons with disabilities, pedestrians and cyclists, are often neglected. Alternative transport options, such as public transport and facilities for active transport such as walking and cycling (such as footpaths, safe crossing opportunities, and cycle paths) are rare in most ESCAP member countries, compelling many people to travel unsafely on roads built primarily for cars. This may significantly restrict many people's mobility and their access to job opportunities, services, and markets. Public transport options, including trains and buses, are substantially safer than private vehicle transport (see figure 16). When public transport infrastructure is installed and restrictions are placed on the use of private motor vehicles, this can help reduce the travel speeds of private motor vehicles. In addition to that road safety benefit, roadway-capacity reductions can generate multiple other benefits, including a greater incentive to use public transport, which, ideally, should be faster than private transport options, as well as more equitable access to transport, health benefits via increased use of active transport options (for example walking and cycling to access public transport), improved air quality, reduced greenhouse gas emissions, and greater transport efficiency through reductions in congestion and increased passenger carrying capacities. The many benefits of roadway-capacity reductions coupled with public transport improvements have been demonstrated by numerous BRT projects, including, for example improvements to the transport network in Seoul, Republic of Korea)[58].

[58] Institute for Transportation and Development Policy, *BRT Planning Guide – Fourth Edition. Case Studies: roadway restrictions in Seoul*. Available at htbrtguide.itdp.org/branch/master/guide/transportation-demand-management-tdm/case-studies#roadway-restrictions-in-seoul (accessed on 18 November 2019).

# 4. Opportunities in ESCAP member countries with respect to speed management

International organizations have made available numerous manuals, recommendations and sets of guidelines on speed management. These include:

- Save LIVES - A road safety technical package (WHO)[59], which aims to:
    - Establish and enforce speed limit laws nationwide, locally and in cities;
    - Build or modify roads that calm traffic, including through the use of roundabouts, road narrowing, speed bumps, chicanes and rumble strips;
    - Require car makers to install new technologies, such as ISA, to encourage drivers to respect speed limits.
- Speed management: a road safety manual for decision-makers and practitioners (Global Road Safety Partnership)[60], which focuses on:
    - Speed zoning and speed limits;
    - Changing behaviour – regulating and enforcing speed limits;
    - Changing behaviour – public education;
    - Engineering projects.
- SPEED MANAGEMENT (OECD and European Conference of Ministers of Transport)[61], which focuses on:.
    - Road categorization and road engineering;
    - Setting speed limits;
    - Signs, signals and markings;
    - Vehicle technologies;
    - Education, training, information and incentives;
    - Enforcement

Overall, any effective speed management initiative is likely to include the following key elements:

1) Setting survivable speed limits;
2) Strengthening mechanisms to deter speeding;
3) Reducing speeds through road engineering interventions;
4) Reducing speeds through the use of relevant vehicle technologies.

The general principles of those initiatives and evidence of their effectiveness from international best practice examples are described below in this section. How those initiatives should be implemented in ESCAP member countries is described in Section 6 of the present report ( Recommendations and the proposed implementation framework).

## 4.1 Setting survivable speed limits

Use of legislation to regulate travel speeds via appropriate speed limit setting is critical for norm setting and for effective speed enforcement[62]. Speed limits broadly define acceptable speeds and provide a basic indicator to drivers of motorized vehicles of the maximum speed allowed under the law.

[59] WHO, Save LIVES: a road safety technical package (2017).
[60] Howard and others, *Speed management: a road safety manual for decision-makers and practitioners*.
[61] OECD and European Conference of Ministers of Transport, *Speed Management. Report of the Transport Research Centre*.
[62] Michael de Roos and Fabian Marsh, "Speed limits: Getting the limit right – the first step in effective Speed Management", *Journal of the Australasian College of Road Safety*, vol. 28(2) (2017), pp. 55-59.

As illustrated by the case study outlined in table 2, the link between speed limit reductions and casualty reductions is clear in jurisdictions where good data are available.

**Table 2. Case study: casualty reductions following speed limit reductions and casualty increases following speed limit increases in Australia and United States of America.**

| Intervention | Location | Effect |
|---|---|---|
| **Speed reductions** | | |
| Speed limit reduction from 110 km/h to 100 km/h | Rural highway in the state of New South Wales | 26.7% reduction in crashes involving casualties[63] |
| Speed limit reduction from 110 km/h to 100 km/h | State of South Australia | Crash and injury reductions by around 27% compared to roads which retained a speed limit of 110 km/h[64] |
| Speed limit reduction to 40 km/h | 820 locations at school zones in the state of New South Wales | Casualties involving those children between the ages of 5 and 16 decreased by 46% and overall pedestrian casualties decreased by 45%[65] |
| **Speed increases** | | |
| Speed limit increase from 100 km/h to 110 km/h | State of Victoria | Casualty crash rate increased by 25% (after political backlash regarding the unacceptable impacts of the higher speed on safety, the speed limit was decreased back to 100 km/h and the casualty crash rate then decreased by almost 20%)[66] |
| Speed limit increases in many part of the United States of America | Various states in the United States of America | A summary synthesis of numerous studies confirmed significant increases in the numbers of crashes and road crash-related deaths[67] |

Setting speed limits on a given section of road takes into account a wide variety of factors. These may include: the predominant types of road user; crash history; road shoulder width; pavement quality; road delineation; whether the road abuts land development; the nature of intersections; lane width; traffic volume; road function; number of lanes; horizontal and vertical alignment; presence of a median or service road; and adjacent speed limits. Under the Vision Zero approach, adopted first in Sweden,[68] the potential impact on human life (see figure 2 above) is the central consideration for determining speed limits on road networks[69]. Pedestrians and other vulnerable road users are unlikely to survive if hit by a car going faster than 30 km/h and therefore on roads

[63] Yashodhan Bhatnagar and others, "Changes to speed limits and crash outcome - Great Western Highway case study", paper prepared for the 2010 Australasian Road Safety Research, Policing and Education Conference, Canberra, Australia, 3l August to 3 September 2010.
[64] Jamie Mackenzie, Craig Kloeden and Paul Hutchinson "Reduction of speed limit from 110 km/h to 100 km/h on certain roads in South Australia: a follow up evaluation", research report, University of Adelaide Centre for Automotive Safety Research, 2014.
[65] Andrew Graham and P Sparkes, "Casualty reductions in NSW associated with the 40 km/h school zone initiative", 2010 Australasian Road Safety, Research, Policing and Education Conference, Canberra, Australia, August/September 2010.
[66] John Sliogeris, *110 kilometre per hour speed limit - evaluation of road safety effects* (Melbourne, Australia, VicRoads, 1992).
[67] Jack Stuster, Zail Coffman and Darvey Warren, *Synthesis of safety research related to speed and speed management*. (Publication no. FHWA-RD-98-154, United States of Federal Highway Administration, 1998).
[68] Vision Zero is a comprehensive road safety approach that was developed in Sweden on the premise that no one should be killed or seriously injured for life in road traffic.
[69] Swedish Transport Administration, *Vision Zero on the Move*, (Borlänge, Sweden, 2002). Available at: ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/20151210_1_sweden.pdf (accessed on 20 November 2019)

where there is a mixture of cars and pedestrians, a speed limit of 30 km/h or less is recommended. In a modern car, a car occupant wearing a seat belt will survive a side impact at not more than 50 km/h and therefore speed limits should not exceed 50 km/h at intersections, where side impacts are a significant risk. In addition, in a modern car, a car occupant wearing a seat belt will not survive a frontal impact with a similar car if the speed of the vehicles exceeds 70 km/h. On roads where there is a significant risk of frontal crashes, the speed limit should not therefore exceed 70 km/h. The erection of a median barrier that effectively prevents frontal crashes is recommended if higher speeds are desired. In general, higher speed limits are recommended only when roadsides are safe, median barriers have been installed, intersections are designed appropriately, and road users travelling at different speeds and in different directions are separated from each other. In recent years, a number of cities in Australia[70] and Japan[71] have achieved the Vision Zero goal of zero deaths in road traffic, thereby demonstrating that infrastructure modifications and other changes reflecting the Vision Zero approach can produce tangible results.

While WHO simply judges urban speeds to be good if the authorities impose 50km/h limits on urban roads, the two most successful countries, namely the Netherlands and Sweden, impose general urban limits of 40km/h, and 30km/h limits in pedestrian areas. Switzerland even imposes 20km/h speed limits in residential areas (see photo 4). These countries have road crash fatality rates of between 2 and 4 per 100,000 population.

**Photo 4. 20km/h speed limit in residential area in Switzerland.**


Source: Global Road Safety Solutions Pty Ltd

Generally speaking, national governments (or sometimes state governments) are empowered by law to set speed limits for different types of road. Local governments may also set local speed limits to ensure they are appropriate for local road conditions, which may not be taken into account in a country's national speed limit framework. The rules of the road, such as the rule specifying that a driver must not drive over the designated speed limit (and the various penalties for different levels of non-compliance) are usually stipulated in the country's transport or road safety act.

[70] Australia, Bureau of Infrastructure, Transport, Cities and Regional Development, *Vision Zero—years with zero road crash fatalities* (which shows the number of years of zero deaths from road crashes between 2008 and 2017 in all local government areas across Australia) (Canberra, 2018). Available at: bitre.gov.au/dashboards/#vision (accessed on 20 November 2019).

[71] For further details, see the Dekra Vision Zero Map, which shows towns and cities that have achieved zero deaths in the United States of America, Europe and Japan, on the basis of information contained in the International Road Traffic and Accident Database (IRTAD). Available at: https://www.dekra-vision-zero.com (accessed on 20 November 2019).

In order for speed limit reviews to be effective, speed limit laws and mechanisms for their enforcement must be in place. The law and regulations must clearly state the consequences for drivers who violate speed limits such as fines, licence points and the suspension of a driving licence, and speed limits must be enforced through mechanisms that ensure that there is no impunity for offenders.

## 4.2 Strengthening deterrence of speeding

The success of enforcement relies on the levels of deterrence generated.[72] People generally obey the speed limit, not because they believe it is safe, but because they believe that they will be caught by the police if they do not obey the speed limit. The fear of and/or actually being caught and penalized for speeding is, in fact, a much stronger deterrent than the fear of a crash, injury or death. Speeding enforcement and penalties for speeding are therefore key sources of deterrence.

There are two types of deterrence. Specific deterrence is the extent to which a person is deterred from a specific action because they have been caught and penalized for that action in the past. General deterrence is the extent to which people are deterred from a specific action, such as speeding, not because they have been caught, but because they believe they may be caught and the consequences are undesirable. The number of road users affected by specific deterrence of speeding increases when more road users are caught speeding and are penalized. General deterrence of speeding, which is generated by reminders and information to road users that speeding enforcement is occurring, that it is common, and that detection is likely, can potentially influence more road users than specific deterrence.

When considering speed management, it is critical to consider actions that enhance both general and specific deterrence. Nevertheless, in the light of the specific speeding problem that needs to be addressed in the country, a decision must be made to give priority attention to interventions and actions that increase either general or specific deterrence. In general, however, it is preferable to give priority attention to general deterrence for two reasons. Firstly, it can work without having to catch every offending driver, and secondly, it applies to a much larger sector of the community because, even if strong enforcement programmes are in place, most people are still not caught for speeding and other undesirable behaviour. In New South Wales in Australia, for example, despite extensive enforcement for many offences for which license point penalties are prescribed, and the many hundreds of speed cameras installed across the state, some 70 per cent of drivers still have had no points deducted from their licences.

When reduction in speeding over a wide road network is sought, it is important to focus on actions that will increase general deterrence. Speed enforcement in the same areas all the time is likely to result in drivers being deterred from speeding only in those specific areas. Adding signage that warns drivers of the location of cameras further narrows the effects of the enforcement. The unpredictability of where and when speed enforcement takes place will increase public perceptions that speed enforcement can happen anywhere and at any time. A mix of covert (invisible) speeding enforcement providing no warning at or near the enforcement location and overt (visible) enforcement ensuring that many people see patrol cars and speed cameras on the road increases the effects of general deterrence of speeding and this mix of covert and overt is more effective than overt alone[73]. However, the visibility of the operation is only useful if it does not create avoidance behaviours (such as slowing down just before the enforcement) because successful avoidance actions greatly damage both general deterrence (because drivers believe that enforcement can be avoided with the same tactics in the future) and specific deterrence (because those who successfully avoid detection are not caught).

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[72] Soames Job, Chika Sakashita and B. Watson, *Policing for Road Safety - A Guide for Effective Enforcement*. South Australia Police and Motor Accident Commission, (Adelaide, Australia, 2015).
[73] Michael Keall, Lynley Povey and William Frith, “The relative effectiveness of a hidden versus a visible speed camera programme” *Accident Analysis and Prevention*, vol. 33 (2) (2001), pp. 277–284.

General deterrence can also be strengthened by engaging with communities via the media (through paid advertising and news coverage, and on social media platforms) and awareness-raising talks with communities to draw road users' attention to:

- Speeding enforcement;
- The significant penalties for speeding;
- The unpredictability of speeding enforcement (anywhere, anytime);
- The unavoidability of detection, (even incorrect beliefs about how to avoid speeding enforcement should be dispelled);
- The certainty of punishment if a driver caught speeding;
- The swiftness of punishment for speeding offences.

When dealing with speeding for a particular target group, such as repeat offenders or novice drivers/riders, it is important to focus on actions that will increase specific deterrence. The effects of specific deterrence can be increased via the following methods:

- Covert speeding enforcement;
- Endeavouring to catch greater numbers of offenders;
- Imposing swift, effective and unavoidable punishments for speeding;
- Promoting technologies and mechanisms that impede repeat offending (e.g. ISA) while also imposing conventional penalties.

The authorities in New South Wales, Australia have demonstrated the effectiveness of targeting high risk groups, such as novice drivers, who are subject to higher penalties for speeding. Furthermore, in the light of many research studies showing that novice drivers are disproportionately likely to be involved in serious speeding crashes[74], changes to novice driver licence conditions were made, including that any speeding offence by a Provision 1 licence holder resulted in a three-month licence suspension, in addition to other penalties. The introduction of the new conditions resulted in an immediate 34 per cent reduction in speeding fatalities involving Provisional 1 drivers[75].

Ample evidence exists for the death and injury reduction benefits of different forms of speeding enforcement including fixed cameras, mobile cameras, and point-to-point or average speed cameras[76] and laws must support the use of these enforcement measures. The Cochrane Library review of the evidence in that area concluded that: "the consistency of reported reductions in speed and crash outcomes across all studies show that speed cameras are a worthwhile intervention for reducing the number of road traffic injuries and deaths."[77] Speed cameras not only deliver significant road safety benefits, but also provide government revenue that can be used

[74] Chika Sakashita and others, "Comparing provisional and unrestricted licence holders on speeding offences and crash rates", paper prepared for the 2010 Australasian Road Safety Research, Policing and Education Conference, Melbourne, Australia, 17-19 October 2007.
[75] Soames Job, "Pillar 1 Road Safety Management – Speed management", paper presented at the Transportation Research Board Annual Meeting - Sunday Workshop: Pivotal Role of Speed Management across the Five Road Safety Pillars, Washington, D.C., January 2013.
[76] See for example: Max Cameron, Antonietta Cavallo and Adrian Gilbert, "Crash based evaluation of the speed camera program in Victoria 1990-1991", Report 42 (Victoria, Australia, Monash University Accident Research Centre, 1992); Soames Job, "Applications of Safe System Principles in Australia"; Keall, Povey and Frith, "The relative effectiveness of a hidden versus a visible speed camera programme"; Adrian Gains and others, *The national safety camera programme -three-year evaluation report*. United Kingdom Department of Transport. Road Safety Division (London, 2004), pp. 1-110; International Traffic Safety Data and Analysis Group (IRTAD) *Road Safety Annual Report 2013.* (Paris, OECD Publishing, May 2013); OECD and European Conference of Ministers of Transport, *Speed Management. Report of the Transport Research Centre*; Cecilia Wilson and others, "Speed cameras for the prevention of road traffic injuries and deaths" *Cochrane Database of Systematic Reviews*, Issue 11 (2010).
[77] Cecilia Wilson and others, "Speed cameras for the prevention of road traffic injuries and deaths" *Cochrane Database of Systematic Reviews*.

to fund other road safety initiatives. Furthermore, cameras provide consistency of enforcement, reduce individual police discretion and remove point of interception collection of penalties, and thereby reduce the potential for corrupt enforcement practices.

However, enforcement tolerances[78] can impact the levels of general and specific deterrence of cameras. The speed measuring devices employed in enforcement are generally accurate to within a few kilometres per hour and in enforcement operations many countries tend to adopt a policy to only prosecute drivers for a measured speed that exceeds the limit by more than a certain level (i.e. there is a level of speeding tolerance) to prevent false alarms and sustain public acceptance of cameras. These often-undisclosed levels of tolerance create de facto speed limits which allow travel speeds that are higher than the intended speed limit and unsuitable for the road standard by which the intended speed limit was determined. Drivers may learn tolerances through rumour, the media, and knowledge of tickets issued, even if the tolerance is not officially disclosed, thereby damaging the deterrence effects of speeding enforcement. High levels of tolerance induce drivers to believe that a little bit of speeding is acceptable and that speed limits are not very strict. However, a low level tolerance is seen as socially necessary to allow the view that enforcement is fair. Evidence shows that reductions in enforcement tolerances lead to reductions in free speeds and in fatalities, particularly among vulnerable road users.[79] Tolerance margins should be set in a way that, as far as possible, facilitates safety but also allows some margin for possible error in speeding detection technology and promotes the acceptance of that technology by society. Victoria, one of the best road safety performing states in Australia, has a policy tolerance of 3km/h.

As speed management interventions necessarily restrict certain types of driving behaviour and must entail deterrence to be effective, negative reactions by some sections of the community are likely and must be carefully managed to gain and maintain community support and political commitment. Ideally those negative reactions are partly managed before they occur by creating fairness, such as warning people, say six weeks in advance of any increase in enforcement, change in tolerance, or increase in penalty. Support may also be engendered by engaging with the community via community discussion forums, representative groups and advisory councils as well as through print and advertising, often drawing attention to web-based material[80]. In general, public campaigns on how and why speed compliance is being sought and what the benefits are can significantly reduce potential community resistance towards aspects of speed management, including new legislation, stronger penalties, more enforcement and/or road infrastructure modifications.

The effectiveness of speed limits, enforcement, penalties and community education are inter-related, with each aspect dependent on the effectiveness of the other aspects. For example, communication campaigns on speeding enforcement are unlikely to have a significant impact if there is no enforcement, while increasing speeding fines is unlikely to be effective if there is no perception that you will be caught. However, speed reduction engineering measures have a distinct advantage in that they lead to reductions in speed regardless of whether other measures are implemented or successful. These are covered in the next section.

## 4.3 Road engineering measures to reduce speeds

Reduced speeds can also be achieved via good road design features[81]. While road assessments and engineering measures take time to roll out, once the infrastructure features are installed, their benefits are sustained without having to rely on other speed management interventions such as laws, enforcement regimes and penalties. Because these do not involve enforcement, they tend to be more accepted by the community, and indeed in many countries, local communities often install their own (possibly illegal) speed humps, such as thick ropes

[78] The level at which the police will penalize a driver for exceeding the speed limit.

[79] OECD and European Conference of Ministers of Transport, *Speed Management. Report of the Transport Research Centre*.

[80] Howard and others, *Speed management: a road safety manual for decision-makers and practitioners.*

[81] See for example: International Road Assessment Programme, *Road Safety Toolkit*. Available at: toolkit.irap.org/default.asp?page=treatment&id=33 (accessed 23 November 2019).

nailed across the road, earthen speed humps, tree trunks placed into a channel dug across the road, and thick tyre tread nailed across the road (see photo 5).

**Photo 5. Example of a community-created speed hump, indicating that people want lower speeds in their community.**

Source: Global Road Safety Solutions Pty Ltd

Numerous road engineering modifications can be used to reduce speed. See, for example the case study outlined below. Those speed reduction engineering modifications include:

- Chicanes;
- Signalized raised crossings;
- Well-designed roundabouts which, by forcing vehicles to turn to enter the roundabout, turn to negotiate the roundabout, and turn to exit the roundabout, can significantly reduce traffic speeds at road intersections;
- Lane narrowing at curves including painted markings to narrow the perceived lane width.

**Case study: Engineering modifications that can effectively reduce speed in ESCAP member countries**

Traffic calming measures that are particularly suited to urban areas and other locations where high numbers of pedestrians are likely to be present:[82]

**Photo 6. Example of speed hump on approach to pedestrian crossing in Nepal.**

Source: Global Road Safety Solutions Pty Ltd

**Photo 7. Example of raised platform crossing in Australia.**


Source: Global Road Safety Solutions Pty Ltd

[82] For further information see: Ben Welle and others, *Cities safer by design: urban design recommendations for healthier cities, fewer traffic fatalities*, World Resources Institute (July 2015); World Road Association, *Road safety manual: A manual for practitioners and decision makers on implementing safe system infrastructure* (Paris, 2015); *iRAP, Vaccines for Roads IV*.

**Photo 8. Example of rumble strips across the road that warn drivers of an approaching speed hump in Viet Nam.**

Source: Global Road Safety Solutions Pty Ltd

**Photo 9. Example of combined use of 30 km/h speed limit and speed hump in a rural town in Georgia (where there is an increase in roadside development and activity and where drivers are entering a low-speed environment)**


Source: Global Road Safety Solutions Pty Ltd

Gateway treatments[83] marking the transition from a high-speed road, such as a major through-road, to a lower speed environment, such as a village, are very common in New Zealand and Fiji.

The physical separation of vehicles of different masses and protection levels (e.g. cars vs motorcycles; cars vs trucks; cars vs agricultural vehicles) and vehicles travelling at different speeds (e.g. motorized vehicles vs cyclists and pedestrians) is another potential engineering modification.

**Photo 10. Motorcycle lane in Viet Nam**

Source: Global Road Safety Solutions Pty Ltd

[83] Tariro Makwasha and Blair Turner, "Evaluating the use of rural-urban gateway treatments in New Zealand", *Journal of the Australasian College of Road Safety*, Vol. 24, No. 4 (December 2013), pp. 14-20.

**Photo 11. Separation of motorcycles from other motorized vehicles by means of a dedicated motorcycle lane in Viet Nam**


Source: Global Road Safety Solutions Pty Ltd

## 4.4 Vehicle speed reduction technologies

Safe travel speeds can be ensured via technologies that control the speed of the vehicle. ISA, for example, which is designed to improve drivers' compliance with speed limits by alerting them when they are travelling above the posted speed limit, can reduce the number of collisions by 30 per cent and deaths by 20 per cent[84]. Different types of ISA system with varying levels of speed control have been developed:

- Advisory – the driver is informed of the speed limit and alerted when he or she travels above that limit;
- Supportive/override – when a vehicle starts travelling above the posted speed limit, the accelerator becomes harder to push down, but the driver can still override the system;
- Limiting – the car is limited to the posted speed limit.

The available evidence shows that advisory ISA systems reduce the incidence of collisions, but that speed limiting ISA systems are significantly more effective.[85] ISA can be an inexpensive vehicle technology, particularly if economies of scale are achieved by installing it in large numbers of vehicles.

Conventional cruise control (CCC) responds to speed changes caused by wind, rolling resistance or gradient by continuously adjusting the fuel supply to maintain the set speed.[86] However, CCC does not prevent the vehicle going past the selected speed when going downhill. The driver manually activates CCC when the vehicle has attained the desired speed and the set speed is maintained without further driver action until it is deactivated either manually or by applying the brakes. CCC reduces driver workload by monitoring the speed of the vehicle and keeping it within a desired speed range.

[84] European Transport Safety Council, *Briefing: Intelligent Speed Assistance* (September 2017). Available at: //etsc.eu/briefing-intelligent-speed-assistance-isa/ (accessed on 27 November 2019).
[85] Carsten OMJ, Fowkes M, Lai F, Chorlton K, Jamson S, Tate FN, Simpkin R, 2008.
[86] reliable spatially referenced speed zone database.

Adaptive cruise control (ACC) uses radar or laser sensors to detect and track vehicles on the road ahead and maintain a pre-selected time gap or headway by controlling the engine, power train and/or brakes. ACC is similar to CCC in that it allows the driver to select a cruising speed. He or she can adjust the time gap or headway (typically from 1 to 3 seconds) and can deactivate ACC by applying the brakes or switching it off. When a slower vehicle is detected in the travel lane, ACC reduces the engine fuel supply and if necessary, applies the brakes until the speed of the vehicle matches that of the lead vehicle or a set maximum speed is reached.

Specific speed restrictions may also be applied to high-risk vehicles such as trucks, mopeds and motorcycles. In some countries, motorcycle riders with limited riding experience (novice riders) are only permitted to operate larger motorcycles once they have gained a certain amount of riding experience on mopeds and smaller motorbikes with limited engine power. In the state of Victoria, Australia, where learner riders are now restricted from riding motorcycles with engines larger than 260 cc, the number of injuries per novice rider in the first year after passing a motorcycle riding test has fallen by around 33 per cent, compared with an 8 per cent increase for fully-licensed riders.[87] However, other evaluations show that vehicle performance is not necessarily related to the frequency of crashes[88] and engine restrictions require strong enforcement regimes to deter unlawful engine modifications.

Commercial vehicle speeding is a growing concern, particularly in high- and middle-income countries, due to the fact that modern lorries are now equipped with more powerful engines than older commercial vehicles so that they can carry heavier loads and reduce travel times to meet the demand for “just in time” delivery. The Australian transport authorities have sought to address commercial vehicle speeding by mandating that all heavy vehicles must be equipped with road speed limiters (RSLs), which limit the speed of vehicles to 100 km/h, even on roads with higher speed limits. In Europe, large buses are speed limited to 85 km/h, even on roads with higher speed limits. However, the illegal modification of RSLs to allow higher speeds is an ongoing problem. In addition, RSLs cannot prevent speeding on roads with speed limits below the RSL setting and on steep downhill gradients.

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[87] Troup, Torpey and Wood, “Engine Capacity Restrictions for Novice Motorcyclists: the Victorian Experience”, *Australian Road Research Board Proceedings* Vol. 12, Part 7 (1984).

[88] Hélène Fontaine, “High performance cars, age and sex of the drivers: effects on risk and safety”, paper presented at the 14th International Technical Conference on the Enhanced Safety of Vehicles, Munich, Germany, May 1994.

# 5. Conclusions

On the basis of multiple analyses of the current status of speed management in ESCAP member countries and drawing on international best practices, the following conclusions can be made:

## General

1. Travel speeds on the roads of ESCAP member countries are not adequately controlled through the imposition of survivable speed limits, speeding enforcement, road modifications or the promotion of safe vehicles. Many effective speed management interventions are available for adoption in ESCAP member countries.
2. A high proportion of crash casualties in ESCAP member countries are pedestrians and those travelling on and in two- and three-wheeled vehicles. Lower speeds enhance the safety of all road users and low speed limits, together speed reduction road engineering interventions, are sorely needed to reduce casualty crashes in ESCAP member countries.

## Speed limits

3. The imposition of appropriate speed limits is the most common means by which the authorities seek to reduce speeds on urban arterial roads and rural roads in ESCAP member countries. However, speed limits are generally set too high and inadequate attention has been given to the human life impact of speeding, particularly on vulnerable road users, and to enhancing the safety of road infrastructure and vehicle fleets in ESCAP member countries.
4. Of all speed management initiatives, speed limit reduction is the lowest-cost option that will deliver the quickest gains in terms of reducing the number of road crash fatalities and injuries,[89] and it is the most appropriate option for ESCAP countries, a high proportion of which are low and middle-income countries with limited financial resources.
5. The effectiveness of speed limits is dependent, primarily, on the negative repercussions for drivers who fail to respect the speed limit. Effective deterrence is crucial. On the whole, however, speeding deterrence remains weak in ESCAP member countries.

## Deterrence tools

6. Deterrence of speeding can be strengthened in ESCAP member countries through the adoption of laws and regulations that clearly state the negative repercussions for drivers who break the speed limit, such as fines, points on drivers' licences and licence suspensions. Enforcement mechanisms are also needed so that drivers who fail to respect speed limits do, in fact, suffer the consequences described in those laws and regulations.
7. Speed cameras have multiple advantages that are particularly useful in ESCAP member countries, including the delivery of significant reductions in death and injury rates; the generation of government revenue that can be used to fund further road safety initiatives; consistency of enforcement; a reduction in the scope of individual police officers to exercise discretion, and the removal of point of interception collection of penalties, thereby reducing the potential for corrupt enforcement practices.
8. Tolerance levels should be set in a way that, as far as possible, facilitates safety but also allows some margin for possible error in speeding detection technology and promotes the acceptance of that technology by society.

[89] Job and Sakashita, "Management of speed: the low-cost, rapidly implementable effective road safety action to deliver the 2020 road safety targets".

9. As speed management interventions necessarily restrict certain types of driving behaviour and must entail deterrence to be effective, negative reactions by some sections of the community are likely and must be carefully managed, including through public awareness-raising campaigns, in order to gain and maintain community support and political commitment.

## Infrastructure

10. Road infrastructure modifications to reduce speeds have a distinct advantage in that they can reduce speeds independently of other speed management interventions, while the effectiveness of speed limits, speed limit enforcement, penalties and public awareness-raising campaigns are all inter-dependent. Furthermore, road modifications self-enforce speed limits by design and therefore reduce the need for police enforcement, thereby reducing the scope for corruption by those responsible for enforcement. Indeed, because infrastructure modifications do not involve enforcement by the police, they are more likely to be welcomed by local communities than other initiatives to reduce road speeds.

## Vehicles

11. Vehicles of different masses and protection levels (e.g. cars and motorcycles; cars and trucks; cars and agricultural vehicles) and vehicles travelling at different speeds (e.g. motorized vehicles, cyclists and pedestrians) are rarely separated from each other on roads in ESCAP member countries, generating significant fatality and injury risks for all road users, particularly vulnerable road users.
12. In both rural and urban areas in ESCAP member States, pedestrian walkways alongside roads remain rare, even in areas where pedestrian numbers are very high. As a result, pedestrians are often compelled to walk on roads that have been designed for motorized vehicles travelling at much higher speeds than individuals travelling on foot.
13. In many ESCAP member States, the vehicles offered for sale do not always meet basic safety standards.
14. Vehicle fleets tend to be relatively old in any countries in the ESCAP region, and the transition to vehicles equipped with modern technology, such as ISA, is proceeding very slowly, particularly in low and middle-income ESCACP States. It is unrealistic to assume that authorities in those States will be able to rely on such technologies as part of their speed enforcement strategies over the short term.
15. Inherently dangerous vehicles, including motorcycles and tractors, are commonly found on the road in ESCAP member countries.

# 6. Recommendations, including an implementation framework

While some of the information contained in the present report did not originate in ESCAP member countries or associate members, the laws of physics and the relationship between impact speed and survivability for different crash scenarios, as illustrated in figure 2 above, are the same for all countries, and all ESCAP member States can therefore use data provided by countries in other regions to enhance their understanding of speeding and the ways in which it should be addressed.

Despite their differences, it is important to underscore the similarities among ESCAP member countries, which are encouraged to share information and best practices in this area with a view to developing effective speed reduction strategies. Even rough and approximate data can be used by decision makers. Indeed, by merely stepping outside and observing the significant number of vulnerable road users in traffic flows can give impetus to initiatives to lower speed limits.

Based on this analysis of speed management in ESCAP member countries and in the light of best practices identified, a number of speed management interventions are recommended. The particular circumstances of each country will determine which of the options outlined below is likely to produce the largest gains in terms of reductions to injury and fatality rates, and each country should endeavour to identify and give priority attention to their particular weak points. Each country should develop an action plan appropriate to its particular circumstances. The following framework as shown in Table 3 may be utilized.

**Table 3. Stepwise illustration of the implementation framework**

### 1. PROBLEM ASSESMENT

- How significant is the speed problem?
  - (i) In what proportion of serious casualty crashes is speed a contributing factor?
  - (ii) Where do casualty crashes involving speed occur?
- What is the profile of speed-related crash victims?
- What is the profile of speeders?
- To what extent do drivers comply with speed limits in various locations?
- Why do people speed in those locations?
- What are the speed limits, particularly in high-risk locations such as where traffic flows include significant numbers of vulnerable road users? How are speed limits set, communicated and enforced?
- What is the operating speed of traffic (mean traffic speed)?
- What legislation and regulations have been adopted with respect to speed management?
- What are the attitudes of communities towards speed management?

### 2. ASSEMBLE A LEADERSHIP TEAM

- Identify the road safety stakeholders who are concerned with or responsible for speed management.
- Secure the support and engagement of political leaders.
- Identify a coordinating agency or group.
- Earmark and commit financial resources to speed management.
- Sustain the involvement of all road safety stakeholders.

### 3. DEVELOP A STRATEGIC PLAN OF ACTION TO ADDRESS KEY CHALLENGES

- Formulate a plan of action on the basis of 1 and 2 above.
- Set programme objectives, targets and performance indicators.
- Decide on activities:
  - (i) Carrying out a speed limit review;
  - (ii) Strengthening speeding deterrence;
  - (iii) Implementing road infrastructure modifications to reduce speeds;
  - (iv) Promoting the use of safer vehicles.
- Identify required resources, legislative requirements and other mechanisms of delivery, and establish a time frame for roll-out and full implementation.
- Conduct public awareness-raising activities to mobilize and sustain the support and engagement of communities.
- Establish effective data collection mechanisms with a view to monitoring and evaluating the plan of action.

## 4. IMPLEMENT THE STRATEGIC PLAN OF ACTION

- Implement actions as per the aforementioned plan of action.
- Monitor progress against the plan and against performance indicators
- If target speed is achieved (as measured by speed measurement loops installed on roads), complete implementation and evaluate (go to 5)
- If target speed is not achieved (as measured by speed measurement loops installed on roads), review leadership and plan of action plan (go back to 2 and 3)

## 5. EVALUATION OF COUNTERMEASURES IMPLEMENTED

- Assess changes in baseline measurements collected during problem assessment:
  - (i) Has there been a reduction in speed-related casualties?
  - (ii) Has there been progress with regard to other aspects, such as the attitudes of communities?
- Identify lessons learned.
- Improve current and future programmes on the basis of evaluation results.
- Disseminate evaluation results to sustain political and community support.

A strategic plan of action on speed management should include at least one of the following four speed management activities:

(1) Speed limit review;
(Recommendations 1-5)

(2) Strengthening deterrence of speeding;
(Recommendations 6-15)

(3) Speed reduction road engineering treatments;
(Recommendations 16-23)

(4) Safer vehicles and other policy measures
(Recommendations 24-28)

Twenty-eight recommendations and suggested steps for their implementation are set forth below:

## 6.1 Speed limit review

**Recommendation 1: Carry out a speed limit review:**

The process of changing speed limit signs is much faster than most other speed management initiatives. It is strongly recommended that countries carry out a speed limit review as a matter of priority. Speed limit reviews may be conducted by following these 10 key steps:[90]

**Step 1**: Receive community requests or identify the need for a speed limit review.
**Step 2**: Conduct a crash analysis of the length of road under review to identify crash types and clusters and determine the nature and scale of the problem.
**Step 3**: Conduct an initial site inspection to collect information about the roadway and its characteristics and identify uniform lengths along the road where a single speed limit is appropriate, taking into account the recommended minimum lengths of speed limit zones.
**Step 4**: Conduct a speed survey (optional). Speed data can be collected automatically, inexpensively and with minimal effort by using simple robust technology that provides continuous data collection over days or weeks. Guidelines adopted by New Zealand suggest that, for a simple "before/after" or "change over time" survey, a sample of 200 vehicles over a minimum of two hours or a minimum of 300 vehicles over a one-hour period is required, ideally for each vehicle type or road user type.[91] Surveying sample speeds on a regular basis will provide an opportunity to monitor the impact of speed management programmes.
**Step 5**: Determine the survivable speed limit and the start and end points of the new speed limits.
**Step 6**: Consult with stakeholders before speed limits are changed and give due consideration to comments received before a final decision is made in that regard.
**Step 7**: Conduct a second site inspection to review the road where the new signs are to be installed.
**Step 8**: Authorize the removal of the old speed limit signs and the installation of the new signs.
**Step 9**: Communicate to key stakeholders and effected communities the reasons why speed limit changes are being made and raise awareness of the new speed limits before they come into effect. People will be more accepting of the changes and more likely to comply with new speed limits if they feel that they were informed prior to the enforcement of those new limits.
**Step 10**: Conduct a post-installation inspection to ensure that all old speed limit signs have been removed and that the new signs have been installed, in accordance with approved instructions in that regard.

**Table 4. Recommended minimum length of speed zones**

| Speed limit (km/h) | Recommended minimum length of zone (km) |
|---|---|
| 40 | 0.2 |
| 50 (default urban limit) | Not applicable |
| 50, 60 | 0.5 |
| 70, 80, 90 | 2.0 |
| 100 | 3.0 |
| 110 | 10.0 |

Source: Bhatnagar and others (2010)[92]

[90] Yashodhan Bhatnagar and others, "Speed zoning guidelines–making NSW roads safer", 2010 Australasian Road Safety, Research, Policing and Education Conference, Canberra, Australia, August/September 2010.
[91] Land Transport Safety Authority of New Zealand, Guidelines for setting speed limits, standard method for conducting manual speed surveys, appendix 4, (1995).
[92] Bhatnagar and others, "Speed zoning guidelines–making NSW roads safer".

**Recommendation 2: Set speed limits on the basis of the human life impact of different speeds.**

Make the human life impact of speeds a key consideration when determining speed limits,[93] as per the survival curve illustrated in figure 2.

**Table 5. Appropriate speed limits for different scenarios in which severe crashes are possible**

| Scenario (traffic mix, road features and crash type) | Survivable speed limit |
|---|---|
| Vulnerable road users on a section of road (mixed traffic) | 30 km/h or lower |
| Intersections where right-angle, side-impact crashes are possible | 50 km/h or lower |
| Two-way traffic where there are no separating barriers between opposing traffic flows and thus head-on crashes are possible | 70 km/h or lower |
| Roads with unshielded roadside hazards such as poles and trees where hit-fixed-object crashes are possible | 40 km/h or lower |

Note: If more than one scenario is applicable to a length of road, the lowest survivable speed limit should be applied.

## Recommendation 3: Set speed limits in line with the safety performance of road infrastructure.

If the safety performance of road infrastructure is substandard and the country cannot afford road safety infrastructure upgrades, then speed limits should be set low enough to compensate for the substandard road infrastructure – see table 3 for guidance.

**Table 6. Appropriate speed limits for different road infrastructure safety levels.**

| Road type | Low standard road infrastructure | High standard road infrastructure |
|---|---|---|
| Roads with mixed traffic, including vulnerable road users | Speeds must be 30km/h or lower if vulnerable road users are present. This is particularly the case if #footpaths alongside the road are poorly demarcated or absent and if crossings are absent or do not effectively slow traffic. | Urban roads can be 5-star for pedestrians at low-speeds when basic features such as footpaths, pedestrian fencing, and safe speed-managed crossings are in place. |
| Rural roads | Speeds must be 50km/h or lower if a rural road is curvy, if there is no separation of high-speed traffic, if the condition of the road and signage is poor, and if multiple hazards that could prove fatal in a crash are present along the side of the road. | Rural roads can be 3-star or better for vehicle occupants at speeds of up to 110 km/h if they have been built with simple mechanisms to separate vehicles from oncoming traffic, such as central hatching or wide centrelines, and if roadsides are relatively free of hazards, the road is straight and well line-marked and intersections are limited. |
| Motorways | Speeds must be 70km/h or lower if medians will fail to prevent vehicle cross-over or head-on crashes, if roadsides have steep drainage channels or embankments, if there are many trees or poles at the side of the road, or if roads have narrow shoulders or poor signage or line-markings. | Motorways can be 4-star or better at speeds of up to 120km/h if concrete barriers separate vehicles from oncoming traffic, if wire rope barriers protect vehicles from roadside hazards, if they have wide shoulders and good line-markings, and if they are well lit at night. |

Source: iRAP, *Vaccines for Roads IV* (2018)

[93] Swedish Transport Administration, *Vision Zero on the Move.*

**Recommendation 4: Post clear and consistent speed limits in order to maximize driver compliance.**

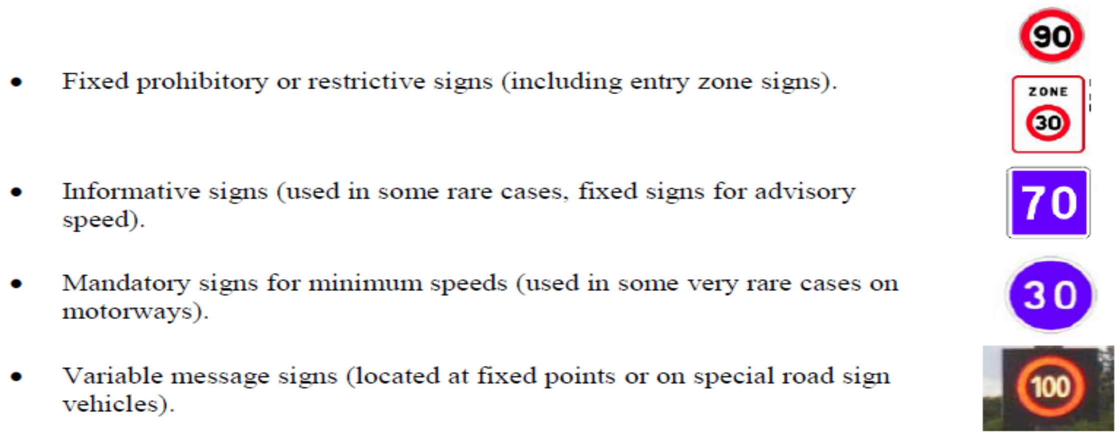
Speed limits should be posted in a clear, intelligible and consistent manner to ensure that the vast majority of drivers choose to respect those limits.

- A clear distinction should be made between speed limits on high-quality motorways, where high-speed limits may be allowed, and limits on other roads in built-up areas where there is often a mix of different road users, where low speeds are necessary;
- Speed limit changes must be clear and speed limit signage must be particularly prominent when drivers enter low speed zones, such as urban areas where the limit is often set at 30 km/h. This can be achieved, inter alia, by marking the limit with paint on all lanes of the roadway.
- Although the imposition of consistent speed limits in similar risk settings is highly desirable, substantial casualty risk variations across the road network may require the imposition of a range of speed limits, unless short-term infrastructure modifications are implemented to lower risks in high-risk road sections.
- In the long term, all measures must complement each other. In other words, speed limits, the road layout and signage must all consistently encourage drivers to travel at a certain fixed speed. This will engender public trust in the speed limit system and promote compliance with traffic laws and regulations.
- The installation of speed limit signs on roads or sections of roads, even if these indicate the limits applicable by default (such as signs indicating the speed limits applicable by law on motorways), will promote respect for speed limits among inexperienced drivers and those unfamiliar with the road network, including visitors.

**Recommendation 5: Take the necessary steps to accede to and implement the Convention on Road Signs and Signals.**

Road signs and markings should comply with the Vienna Convention on Road Signs and Signals 1968 (see figure 18), which was formulated to increase road safety and aid international road traffic by standardizing the signing system for road traffic (road signs, traffic lights and road markings) in use internationally. Speed limit signs should be manufactured using reflective material, especially on sections of roads that are not well lit at night. Variable speed limits that change under certain conditions, such as lower limits in wet or foggy conditions, or that change at certain times of day, such as lower limits during periods when most school children are travelling to or from school, should be displayed to drivers on electronic signs. While those signs are relatively expensive compared with other signs, they can be cost effective on high-traffic routes, or in areas with significant road safety risks. End of speed limit signs that rely on the fact that drivers know the default speed limits are not recommended. Instead, a sign showing the new speed limit should always be installed. Although minimum speed limits are used in certain countries, including the United States of America, this is done to improve traffic flow management (i.e. to maintain high speeds), and there is no evidence that minimum speed limits improve road safety.

**Figure 18. Speed limit signs provided under the Convention on Road Signs and Signals**




Source: OECD and European Conference of Ministers of Transport (2006)[94]

## 6.2 Strengthening deterrence of speeding

**Recommendation 6: Inform communities of any changes to road speed management.**

Communities should be made aware of upcoming changes to road speed management, such as increased speeding enforcement, the introduction of speed cameras, increased speeding penalties, the construction of speed humps in villages or the introduction of low speed limit zones in residential areas. Public awareness-raising campaigns should be conducted before the new measures take effect. Prior communication is critical, not only because it is important to inform communities about the changes that are about to be enacted, but also because it can forestall any adverse community reactions towards the authorities and strengthen driver compliance. Communities need to be given advance warnings of, and time to adjust to, the upcoming changes, and drivers will be more accepting of the changes in question if they feel that they were informed appropriately and given time to adjust their driving before suffering any negative repercussions, such as receiving a speeding fine. This helps to sustain political will for further speed management initiatives. Encouraging "opinion leaders" and celebrities to voice their support for speed management interventions can significantly enhance support for speed management changes among the public. In contrast, it is unhelpful if public officials or politicians are known to be flouting the law. In general, public awareness campaigns should focus on why the changes have been made (e.g. low speeds are required in areas with significant numbers of pedestrians and cyclists due to their high risk of death and injury at lower speeds than vehicle passengers), why speed compliance is being sought, and what the benefits of the changes will be, (e.g. your family will be able to travel home more safely). Such campaigns can mitigate any potential community resistance towards speed management.

**Recommendation 7: Ensure that, once public awareness-raising campaigns have been conducted, efforts are made to enforce the new speed limits.**

Speeding enforcement must follow any campaign informing communities about upcoming speed management changes. This is essential to strengthen the compliance of drivers/riders who might otherwise deliberately exceed the new speed limits. Public campaigns without follow-up enforcement or enforcement without public campaigns are unlikely to be particularly successful. Public campaigns combined with enforcement should be delivered as a single package to maximize driver compliance and achieve the desired road speed reductions.

[94] OECD and European Conference of Ministers of Transport, *Speed Management. Report of the Transport Research Centre*.

**Recommendation 8: Establish targeted enforcement zones.**

Increase speeding enforcement activities on roads where speeding and speed-related deaths and injuries are common and on roads where the speed limit has recently been lowered. Before and after analyses of speeding and speed-related deaths and injuries should be conducted to highlight the road safety benefits of speeding enforcement. Such analysis also facilitates efforts to explain to communities why speeding enforcement is necessary.

**Recommendation 9: Establish extended enforcement coverage zones.**

Over time, a transition from targeted to more unpredictable enforcement should take place by means of location and time changes and a mix of visible and covert enforcement methods. This is likely to deter speeding across the entire road network rather than only in specific locations. From time to time, campaigns should be conducted to remind drivers of speeding enforcement mechanisms. Unpredictable enforcement coupled with enforcement reminders will encourage more drivers to comply with speed limits and have an impact over a wider area than targeted enforcement regimes alone.

**Recommendation 10: Impose effective penalties:**

The authorities should impose penalties that are sufficiently severe to deter speed limit violations Those penalties should, moreover, become increasingly severe as the speed at which the driver was travelling rises. Furthermore, an effective fine payment follow-up system should be put in place to ensure that drivers who fail to pay their speeding fines are subject to additional penalties, which may include licence suspension. Table 5 provides an overview of the various penalties that may be imposed.

**Table 7. Possible penalties for speed limit violations**

| Penalty type | How it works |
|---|---|
| Warning notices | Issued in the time between any new law being passed and its full implementation. These notices inform drivers and riders that they have committed an offence under the new law, and that in the future a penalty will be imposed for failing to respect that law |
| Demerit points incurred towards licence suspension | When issued with a new licence, each driver starts with zero demerit points. Demerit points accumulate if a driver commits an offence for which demerit points are prescribed. Demerit points remain valid for a number of years and specific legislation sets forth the sanctions that are imposed when the number of points reaches a particular level, such as the cancellation of a driver's licence if he or she accumulates 12 or more points. A demerit point system thereby seeks to deter drivers from reoffending for a range of road-law-related offences. For a demerit point system to operate effectively, the licensing authority must maintain accurate records regarding all individuals holding licences so that every conviction for an offence can be recorded and attributed to the correct person. It is critical that speeding offences equate to sufficient points so that drivers do not develop a habit of speeding. For example, if demerit points are capped at 12, a minimum of four points should be incurred for low-level speeding offences (up to 10 km/h above the speed limit). That is to say, three low-level speeding offences will result in the suspension of the driver's licence. However, for high-level speeding offences (when a driver is caught travelling at more than 10 km/h above the speed limit) a higher number of points should be incurred, so that only one or two high-level speeding offences will result in the suspension of the driver's licence. |
| Fixed penalties | Issued with a written infringement notice that informs the offending driver or rider that he or she must pay a fine to a given department by a specified date. For this system of penalties to function effectively, a computerized database should be established to |

| | |
|---|---|
| | record all offences and licence holder contact details so that the relevant authorities can follow up on any unpaid fines. |
| On-the-spot fines | Issued with an immediate infringement notice requiring the payment of a fine. To prevent any opportunities for bribery, corruption or favouritism, it is critical that no money transactions take place at the police-offender interception point and that a complete record of any financial transactions is maintained. |
| Confiscation of licences/vehicle impoundment | Applied only for serious speeding offences, or to repeat offenders, the confiscation of a driver's licence or the impoundment of his or her vehicle is usually implemented only after other measures have been tried and found to be unsuccessful. |

**Recommendation 11- Develop speed camera systems.**

Countries should increase the resources allocated to speeding enforcement programmes and should develop effective administrative mechanisms to facilitate the introduction of reliable speed camera systems that enjoy broad community support. The following are prerequisites for an effective speed camera system:

- Reliable camera technology, including accurate speed measuring equipment, clarity of image capture and effective camera maintenance programmes;
- Certificates attesting to the accuracy of speed cameras, issued following a thorough test of the speed camera equipment used, which can be used as evidence in court cases;
- A reliable postal and property address system for the whole jurisdiction;
- Reliable and comprehensive, computer-based driver licensing and vehicle registration systems;
- Regular and accurate data capture, verification and transfer by the police and the court system to licensing and vehicle registration databases;
- An effective back-office processing system to facilitate the identification of the vehicle owner, sending of violation notices to the vehicle owner or the driver (as identified by the vehicle owner), tracking of paid and unpaid fines, and follow up procedures for the collection of unpaid fines;
- A system for preventing vandalism to speed camera equipment.
- An effective public relations mechanism to address any potential negative reactions from the media or communities, such as spurious claims that speed cameras have been installed only to raise government revenue rather than to improve road safety. A highly successful policy that can help forestall any negative reactions is to make a commitment to the public that all fine revenue from cameras will be used to enhance road safety (this can of course include the costs associated with running the speed camera system itself). Governments will still benefit from the reduced costs associated with crashes and hospital care and the community will enjoy further road safety improvements.

**Recommendation 12: Implement a robust speed camera programme.**

This may be initiated via the following steps:

**Step 1**: Determine the number, locations, prominence, and signage of cameras as well as their hours of operation, and select the most appropriate types of camera for the specific road safety issues to be addressed (see table 6).
**Step 2**: Review relevant legislation to forestall any court challenges. With the certificate of accuracy of the speed cameras, the onus of proof must lie with the driver to prove they were not speeding. The owner of the vehicle must also be responsible for the penalty or for providing in a statutory declaration the name and details of the driver at the time of the offence. The accuracy and currency of the address registered under the licence and registration must also be the legal responsibility of the licence holder and the vehicle owner so that claims of lost mail are not admissible defences.
**Step 3**: Purchase or lease cameras. Cameras may be purchased by public tender, and any public tender contract should cover the initial period of maintenance and establish how the cameras should be tested and what evidence

should be delivered to the authorities to prove that the cameras are working effectively. There are significant advantages to leasing speed enforcement equipment, however. Lease arrangements can cover all maintenance and testing and can set performance criteria in terms of the readability of the images produced by the cameras. If the authorities lease equipment under such an arrangement, they do not need to develop the technical expertise required to maintain and certify the cameras before launching a speed camera programme, and can therefore forestall any risk that speed camera equipment will be purchased but not used or maintained.

**Step 4**: Test and maintain cameras. A regular maintenance schedule and a variety of tests of the accuracy of the cameras should be established and certificates of accuracy issued for use as evidence in any potential court cases.

**Step 5**: Determine related policies:

- Tolerance margins: these should be set in a way that, as far as possible, facilitates safety but also allows some margin for possible error in speeding detection technology and promotes the acceptance of that technology by society. Certain ESCAP member States have set tolerance margins that are too high, compromising the deterrence effect of their speeding enforcement regimes;
- Visibility of cameras and if signage is to be used;
- Speed enforcement for unregistered vehicles and vehicles with obscured number plates;
- Protection of cameras from theft and damage;
- Back office processes and technology to issue infringement notices;
- Maximum time allowed between the perpetration of a speeding offence and the issuance of an infringement notice.

**Step 6**: Communicate with communities about cameras. It is important that the first news coverage of plans for the introduction of speed cameras is on the basis of a public announcement by the authorities rather than on the basis of information obtained via a tender or other process that reveals the authorities' intentions. This allows the authorities to have some control over news coverage and more effectively engage in dialogue with communities. The authorities must provide the media and the public with credible justifications for the launch of a speed camera programme as well as assurances regarding the accuracy of data obtained from the speed camera technology that is to be used.

**Step 7**: Set up back-office processes for handling images and sending infringement notices. This may be done by the police or other government authority or may be contracted out to a third party.

**Step 8**: Develop follow-up processes for the non-payment of speeding fines. Members of the public must be made aware that they cannot avoid the payment of penalties.

**Step 9**: Evaluate the impact of speed camera programmes. Evidence that road injury and fatality statistics have fallen since the introduction of a speed camera programme is crucial in maintaining community support for speed cameras.

**Table 7. Different types and uses of speed cameras**

| Camera type | Use |
|---|---|
| Fixed speed cameras | These speed cameras are installed permanently in fixed locations. In general, the impact of these cameras depends on how visible they are and how well motorists recognize where they are located. Some fixed cameras are inconspicuous, some are deliberately painted bright yellow, and others are not prominent but are still visible. Visibly signposted fixed speed cameras slow drivers down for around 500m[95] and can therefore be very effective on problem sections of road of approximately that length. However, non-signposted fixed speed cameras can achieve broader speed reductions across the road network. |

[95] Job, "Pillar 1 Road Safety Management – Speed management".

| | |
|---|---|
| Moveable speed cameras | Moveable cameras are left in a stationary operational mode on the side of the road and can be moved from one location to another. However, these cameras do not work while being driven around in a vehicle. Moveable cameras are effective in providing broad suppression of speeding across the road network.[96] |
| Mobile speed cameras | Mobile cameras can be used in stationary mode, like moveable cameras, or from inside moving vehicles. This functionality adds flexibility of use. It should be noted, however, that the term "mobile camera" is often also used to describe moveable cameras. |
| Combined red-light speed cameras | Red light speed cameras at traffic light-controlled intersections can be combined with speed cameras. They provide more significant road safety benefits at intersections than red-light only cameras[97] because they deter drivers from speeding up to get through the intersection before the light turns red. |
| Point-to-point (section control/average speed) cameras | Two separate cameras are placed some distance apart along a road. In New South Wales, Australia, for example, some cameras are placed over 4 km and others over 70 km stretches of road and are connected via automatic number plate recognition technology. The cameras record the exact time each vehicle passes as well as the license plate of the vehicle. The system matches the plates and computes the time taken to drive between the two cameras. If the time is too short then the vehicle must have been speeding, and a ticket is issued on that basis. |

**Recommendation 13: Conduct manual speed enforcement activities.**

It may not always be possible to use camera-based technologies to enforce speed limits. However, if motorists see the police using hand-held radar or laser devices while on their regular traffic patrols, this can have an immediate impact on driver speeds.

**Recommendation 14: Invest speeding fine revenue in road safety initiatives.**

If all revenue raised from speeding fines is reinvested in further road safety initiatives, there is likely to be much greater community acceptance of speeding enforcement measures.

**Recommendation 15: Engage with communities.**

Over time, regular campaigns to promote speed management should be conducted, with the long term goal of mobilizing greater community support for speed management and stronger political commitment to speed management initiatives. While highlighting the harm that can be caused by a speed-related road crash does not usually deter people from speeding, it can serve as a call to action to manage the problem of speed and speeding.[98] Often this is best achieved by seeking community advice on speed limits in their own streets, because people often want vehicles to travel at lower speeds on the streets on which they live on or in their local areas.

## 6.3 Road modifications to reduce speeds

A number of key road modifications that have been proven to reduce driving speeds are now being made to roads worldwide, including in ESCAP member countries. Certain road modifications can strengthen driver

[96] Charles Goldenbeld and Ingrid Schagen, "The effects of speed enforcement with mobile radar on speed and accidents. An evaluation study on rural roads in the Dutch province Friesland", *Accident Analysis and Prevention*, vol. 37 (2005), pp. 1135-1144.
[97] Richard Retting, Susan Ferguson and Shalom Hakkert, "Effects of red light cameras on violations and crashes: a review of the international literature" *Traffic Injury Prevention*, vol. 4 (1) (2003), pp. 17-23.
[98] Howard and others, *Speed management: a road safety manual for decision-makers and practitioners*.

compliance with speed limits and ensure that they travel at or below survivable travel speeds. Speed reduction engineering measures can help reduce speeds in areas where there are likely to be many pedestrians and cyclists on the roads, such as in residential areas and near schools, shops and markets.

**Recommendation 16: Improve road infrastructure in ways that promote safety.**

Road infrastructure modifications to improve safety should be made throughout the country's road network. Priority attention should be given to modifications to improve safety at high-risk locations where speed limit compliance is likely to be low and enforcement is often not feasible. Mobilizing the financial resources needed for such road infrastructure modifications is often challenging but is likely to become less so as increasing numbers of stakeholders come to understand how those modifications can help reduce injury and fatality rates.

**Recommendation 17: Use interim measures during road safety improvements.**

Implement speed limit reductions coupled with speeding enforcement as interim measures until best practice speed reduction engineering works are completed. Temporary measures, including temporary bollards and road marking, may also be used until the infrastructure upgrade is completed.

**Recommendation 18: Install speed reduction elements to increase driver compliance with low speed limits.**

A number of road infrastructure elements that have been shown to reduce speeds can be installed to compel drivers to travel at or below survivable speed limits. (see table 9). Those elements are particularly useful in built-up areas, where there is often a vibrant mix of pedestrians, cyclists and motorized vehicles on the roads. Speed infrastructure measures are very effective in increasing driver compliance with speed limits in low-speed zones as well as on stretches of high-speed roads where speed reductions are required.

**Table 8. Road infrastructure elements that have been shown to reduce vehicle speeds**

| Speed reduction infrastructure | Design and use |
|---|---|
| Gateways | Gateways are devices used to mark an entrance to a different traffic environment where lower speeds are required from drivers – usually to a village or higher risk location on the road such as near schools and pedestrian crossings. Gateways usually include:<br>• large signs conveying the message that the driver is entering an area where pedestrians and other vulnerable road users are about to be encountered in greater numbers;<br>• road surface markings to narrow the perceived width of the carriageway, including painted central medians, perhaps for only short distances;<br>• large speed limit signs showing the lower speed limit that applies;<br>• architectural and rural elements such as picket fencing or gates, earth mounds and rock walls. |
| Gates | Constructions similar to medieval gates help indicate the change from one traffic environment to another where a new speed is required. Gates may be in the form of an actual building structure as in ancient times, but they may also be constructed using different forms of plantings, lighting etc. The speed reduction effect is greatest if the alignment makes a distinct steering manoeuvre necessary, and if a change in visual elements, road profile, road surface, and so on is made. |
| Speed humps | Speed humps are single raised structures in the roadway and are the most widely-used traffic calming measure. Types vary from the thermoplastic versions to raised |

| | |
|---|---|
| | junctions. The speed reduction effect – usually perceptible 50-60 meters before and after the humps[99] – is largely dependent on the hump heights and gradients. Raised pedestrian crossings and raised junctions rather than simple humps are particularly effective in an area-wide low speed limit zone. Cushions do not affect buses (in particular public transport buses) or trucks since their track (i.e. the distance between their front wheels or their back wheels) is larger than the width of the cushion. |
| Raised intersections[100] | Raised intersections are generally used on local roads and sometimes on arterials passing through areas where there is considerable activity. The entire intersection acts as a form of speed hump and is designed to reduce vehicle speeds to 50 km/h or less. Alternatively, raised stop lines can be used in advance of the intersection. The height of the intersection is often equal to that of the surrounding pedestrian pavement area, thereby facilitating the crossing of pedestrians. Raised intersections can be painted or paved in order to raise driver awareness of the intersection further. |
| Raised platforms[101] | Raised platforms at midblock sections are typically used to maintain lower speeds along a route. In high pedestrian activity areas, raised platforms at midblock generally include pedestrian crossing facilities. The raised pedestrian crossings have a similar profile and speed reduction effect as flat top speed humps but they differ in that they give priority to pedestrians rather than motorists. When designed with appropriate signs, markings and lighting, this provides improved pedestrian safety and mobility. |
| Central traffic islands | Central traffic islands separate two-way traffic, prevent overtaking and unwanted opposed turns. They also enable pedestrians to cross the road in two stages so that they are only exposed to one stream of traffic from one direction at a time. |
| Well-designed roundabouts | Well-designed roundabouts provide adequate deflection on approach and through the roundabout.[102] The construction of roundabouts is a very effective speed reduction measure at "at-grade" intersections on urban and rural roads. While traffic lights reduce the number of crashes at intersections, such crashes often result in serious injury or death. Roundabouts at intersections may not reduce the number of crashes but do reduce the severity of the crashes and thus the number of serious injuries and deaths. A crash in a roundabout is made less severe because the vehicles are effectively travelling at low speeds and in the same direction and the angle of impact is smaller than 90 degrees.[103] The desired effect on the speed of through-going vehicles depends on the precise design and construction of the roundabout, as well as the amount of traffic and the space available. Roundabouts with an outer diameter of between 30 and 50 meters, with one lane on the circle as well as on the entries and exits, are effective speed reduction measures. Small roundabouts with a diameter of between 24 and 30 metres may be built where it is not possible to build larger roundabouts, especially on urban access roads. There is insufficient data concerning the speed reduction effects of mini roundabouts with diameters of less than 24 metres.<br>However, drivers may fail to notice cyclists, pedestrian and motorcycle movements at roundabouts as they concentrate on the "give way" task inherent in travelling |

[99] Jia Huang and others, "Evaluating the speed reduction effectiveness of speed bump on local streets", *Towards Sustainable Transportation Systems* (2011), pp. 2348-2357.
[100] Tariro Makwasha and Blair Turner, "Safety of raised platforms on urban roads", *Journal of the Australasian College of Road Safety*, Vol. 28(2) (2017), pp. 20-27.
[101] ibid.
[102] Blair Turner, Tariro Makwasha and Paul Hillier, "Infrastructure treatments for managing speeds on rural and urban arterial roads", *Journal of the Australasian College of Road Safety*, vol. 28(2) (2017), pp. 13-20.
[103] Elvik and others, eds., *The handbook of road safety measures.*

| | |
|---|---|
| | through a busy roundabout. The nature of the traffic must be investigated and taken into account in determining whether or not a roundabout should be built and, if so, how it should be designed. Signalized roundabouts may be viable for many urban arterial intersections to enhance vulnerable road user safety and mobility while maintaining higher traffic volumes than traditional roundabouts.[104] |
| Rumble strips | Rumble strips provide audio and tactile signals when driven over and can give the driver the feeling of accelerating and thus encourage the driver to slow down. Rumble strips may be installed across the lane of travel approaching a changed traffic condition such as an intersection, pedestrian crossing, speed hump, curve or other hazardous location, such as blackspots identified by casualty crash data, and at the entrance to low speed limit zones, including villages and near schools, as part of a gateway infrastructure project. However, due to the noise they generate, rumble strips may not always be the best solution. |
| Narrowing of apparent lane width | Perceived narrow lane widths encourage drivers to travel at lower speeds, possibly because the perceived margin for error is smaller. Travel lanes may be narrowed through the use of painted line markings that make the road shoulder wider and the travel lane narrower. Combining a wide centreline with a lower speed limit has been demonstrated to be particularly effective in certain higher risk rural road environments.[105] |
| Road diet[106] | A road diet involves converting a four-lane road with two lanes in each direction into a road with only one lane in each direction, and either a two-way left or right hand turn lane. A road diet can also provide enough space for the installation of a bicycle lane or on-street parking. Road diets are particularly effective on urban arterial roads. However, road narrowing should only be considered in very low speed environments, such as 20 km/h zones in residential areas, and should not be adopted as a strategy for reducing speeds in higher speed environments. This is because the narrowing of rural roads increases the risk of crashes. Road narrowing can be made either from the middle of the road or from the sides by constructing middle islands, narrowing road pavements, or by establishing roadside reservations. Kerb extensions can help pedestrians to cross the road safely by reducing crossing distances and the area and time in which they are at risk. This is particularly helpful for older pedestrians or pedestrians with disabilities, who may have difficulty in identifying safe gaps in traffic at conventional crossing points. |
| Chicanes or pinch points | A chicane is a serpentine curve in a road, added by design rather than dictated by geography. Chicanes add extra turns and therefore force drivers to reduce speed. |
| Vehicle Activated Signs [107] | Vehicle Activated Signs (VAS) are increasingly in use on curves on rural roads. VAS are usually activated for a short time (around 4 seconds) when an approaching vehicle exceeds a threshold speed limit (normally set at the 50th percentile speed as measured prior to the introduction of the signs). Once triggered, the sign displays the hazard, and may include a message to slow down. VAS may also be used at intersections to remind drivers of the speed limit. These are triggered by vehicles approaching the intersection from a side road. |

**Recommendation 19: Install complementary warning signs or infrastructure to maximize the impact of speed reduction measures.**

[104] Turner, Makwasha and Hillier, "Infrastructure treatments for managing speeds on rural and urban arterial roads".
[105] ibid.
[106] ibid.
[107] ibid.

When traffic calming measures such as speed humps are installed, drivers should be warned well in advance via rumble strips across the road or signs indicating that they are approaching a traffic calming measure and a section of road with a lower speed limit so that they can reduce their travel speeds appropriately.

**Recommendation 20. Prohibit through traffic in certain areas.**

The authorities should consider prohibiting through traffic from using streets in areas where there is a high risk of crashes and where low speeds are required, such as on residential streets or in areas near schools, shops and markets.

**Recommendation 21: Make evidence-based road safety infrastructure improvements.**

Road infrastructure improvements should be made to rural and urban arterial roads that carry a significant risk of death and injury, including roads that have dangerous curves, intersections and roadsides. The type of infrastructure improvements made should have a proven track record of reducing speeds and the number of crashes. Crash modification factors (CMFs) indicate the expected number of crashes in the after-installation period where a CMF of less than 1.0 indicates the crash reduction effect of the infrastructure change. For example, a CMF of 0.6 indicates a 40 per cent reduction in the number of crashes. A number of possible infrastructure improvements are listed in table 10 together with their corresponding CMFs. These and other road infrastructure interventions should, however be adjusted and calibrated in line with local conditions in ESCAP member countries.

**Table 9. Infrastructure improvements on rural and urban arterial roads with a proven track record of reducing speeds and the number of crashes**

| Location | Treatment | Crash modification factor (CMF) | Speed reduction |
|---|---|---|---|
| Rural bends | Advance warning signs, chevrons and speed advisory signs | 0.60-0.75 | - |
| | Other delineation | 0.80-0.95 | - |
| | Vehicle activated signs | 0.65 | 6km/h |
| Rural intersections | Roundabouts | 0.30 | 4 km/h |
| | Vehicle activated signs | 0.30 | 5 km/h |
| Transition zones | Gateways | 0.65 | 25 km/h |
| Rural routes and networks | Speed limit | | 4 km/h |
| | Wide centrelines | 0.40 | - |
| Urban intersections | Roundabouts | 0.25 | 10 km/h |
| | Raised intersections | 0.60 | 8 km/h |
| | Dwell-on-red signals | 0.55 | 11 km/h |
| Urban arterial midblock | Humps/platforms | 0.50 | 5 km/h |
| | Wombat crossing | 0.40 | 6km/h |
| | Speed limit | 0.75 | 6 km/h |
| | Variable speed limits | 0.92 | - |
| | Road diet | 0.65 | 5 km/h |

Source: Turner, Makwasha and Hillier (2017)[108]

**Recommendation 22: Make road improvements to reduce the severity of crashes.**

[108] ibid.

Table 11 lists a number of infrastructure and other road improvements that can be made to prevent serious crashes on high speed roads.

**Table 10. Possible road modifications that can reduce the incidence of severe crashes on high speed roads**

| High risk scenarios on high speed roads | Possible road modifications |
|---|---|
| Drivers running off the road and colliding with road side objects in single vehicle crashes | Removal of roadside obstacles such as trees, utility and sign poles, or protection via roadside barriers |
| Head-on crashes | Installation of median barriers for separation of two-way traffic |
| Brake failure of heavy vehicles | At the approach to a downhill section on rural roads and motorways, a sign may be installed to indicate the gradient of the slope and recommend that heavy vehicle drivers change to a lower gear. Some hilly countries may also provide arrester beds in case of brake failure in heavy trucks. |

**Recommendation 23: Separate different types of road user**

Efforts should be made to separate different types of road user. It should be noted, for example that:

- The installation of footpaths and fencing can significantly enhance the safety of pedestrians by directing large pedestrian flows away from roads and random crossing locations to safer walking routes and crossing points;
- Separate lanes for two and three-wheelers and for non-motorized traffic such as bicycles, tricycles, and cycle rickshaws can also reduce the risks posed by traffic mismatches;
- Unlike bicycle paths, bicycle lanes are not physically separated from driving lanes, but are only visually separated from the rest of the road by longitudinal markings (continuous or broken lines, sometimes of a different colour). Motorized vehicles must be prohibited by law from entering bicycle lanes if the latter are to have any long-term impact on motorized traffic speeds and road casualty figures;
- Separate lanes/roads may be made available for agricultural vehicles and those travelling on horseback in rural areas.

If high speeds must be maintained, it is imperative that vulnerable road users are separated from other road users. Regrettably, however, countries often build high-speed roads without taking into consideration the needs of those users, who often have no choice but to share the road with high-speed traffic. The construction of separate lanes or roads can be expensive and take time, and there may not always be sufficient land available for the construction of separate lanes or roads. However, if it is not possible to separate vulnerable road users physically from high-speed traffic or provide them with alternative transport routes, the authorities must protected them by mandating speed limits of 30 km/h or lower, in accordance with survival curve data.

## 6.4 Safer vehicles

**Recommendation 24- Adopt regulations to promote vehicle fleet improvements**

ESCAP member States should adopt regulations that enhance the safety of their vehicle fleets. Those regulations should provide for mandatory vehicle inspections to ensure that a vehicle's brakes, steering, lights, tyres and speedometer all function correctly. Repairs must be made if the vehicle fails a safety inspection. The regulations should also set forth the minimum safety standards that must be met by all imported or locally-manufactured vehicles.

**Recommendation 25- Promote the purchase of vehicles on the basis of safety star ratings:**

States should draw attention to the safety ratings of vehicles, which are awarded on the basis of crash tests conducted by car assessment programmes (see table 10) and should encourage their citizens to buy the safest car they can afford.

**Table 11. Car assessment programmes in the ESCAP region**

| Name | Countries | Website |
|---|---|---|
| Australasian New Car Assessment Program | Australia, New Zealand | www.ancap.com.au/ |
| New Car Assessment Programme for Southeast Asia | Brunei, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Viet Nam | www.aseancap.org/v2/ |
| China New Car Assessment Programme | China | www.c-ncap.org/ |
| Japan New Car Assessment Program | Japan | nasva.go.jp/mamoru/en/ |
| Korean New Car Assessment Program | Republic of Korea | www.car.go.kr/jsp/kncap_eng/introduction.jsp |

**Recommendation 26: Restrict the use of slow-moving vehicles on high-speed roads/highways.**

Implement regulations and policies to minimize the use of slow-moving vehicles, informal vehicles and inherently dangerous vehicles, such as informal passenger carriers and passenger vehicles without seat belts, on high-speed roads and access-controlled roads.

**Recommendation 27: Formulate schemes to incentivize the purchase and use of safer vehicles.**

Incentives may be provided to people to encourage them to purchase safer vehicles with good star ratings. Disincentives for use of unsafe vehicles may also be considered, such as higher registration costs for motorcycles and high penalties for motorcyclists riding or parking on footpaths.

**Recommendation 28: Encourage a paradigm shift from private vehicles to public transport and active transport.**

Improve public transport while simultaneously reducing roadway-capacity, removing parking spaces and enforcing parking restrictions for private vehicles, including motorcycles. The Institute for Transportation and Development Policy BRT Planning Guide[109] may be used to guide best-practice public transport improvements. In addition, create and upgrade facilities for active transport, such as walking and cycling. Guidelines on that subject have been drawn up by a number of countries, including Australia.[110]

Public transport infrastructure on existing roadways that reduce road space for private motor vehicles creates a powerful incentive for motorists to shift to public transport use. On the other hand, public transport infrastructure accompanied with additional road construction results in more traffic and, eventually, more overall congestion. More extensive road infrastructure not only promotes further private vehicle usage, and thus more intense traffic, but also allows higher travel speeds for private vehicles.

Public transport infrastructure development should also be accompanied by the removal of parking spaces and enforcement of parking restrictions for private vehicles, including motorcycles. This can promote a shift away from private vehicle use and encourage people to use public transport. Physical structures, such as very high curbs and bollards and/or streetscape elements such as trees, may be necessary to keep motor vehicles, including motorcycles, off footpaths. Bicycle parking structures may also be used as bollards, and can generate further demand for active transport. Former parking spaces may also be converted into attractive new pedestrian environments. BRT projects have been extremely successful in numerous cities, including Bogotá, the capital of Colombia, where the authorities have removed approximately one third of all parking spaces in the city's central areas.[111] Governments may also reduce the supply of privately controlled parking spaces by increasing the cost of maintaining each space via taxes and levies. Taxing parking revenue can effectively reduce commercial parking profitability, and thus the number of commercial parking spaces. An annual parking tax or levy on all non-residential parking spaces can incentivize property owners to convert underutilized or unprofitable spaces to uses other than parking. These taxes and levies can also be used to fund further speed management initiatives and/or public transport development.

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[109] Institute for Transportation and Development Policy, *BRT Planning Guide – Fourth Edition.* Available at brtguide.itdp.org/branch/master/guide/ (accessed on 20 November 2019).

[110] See for example: Australia, Bureau of Infrastructure, Transport, Cities and Regional Development, *Active transport – walking and cycling*. Available at: www.infrastructure.gov.au/infrastructure/pab/active_transport/index.aspx (accessed on 27 November 2019).

[111] See for example: Institute for Transportation and Development Policy, *BRT Planning Guide – Fourth Edition. Supply-based strategies.* Available at: brtguide.itdp.org/branch/master/guide/transportation-demand-management-tdm/supply-based-strategies (accessed on 27 November 2019).

# Appendix

# Appendix A.

### Table 12. Type and number of road deaths in ESCAP member States by subregion

| | Data availability (number of countries) | Estimated fatality rate (/100,000 pop) | Estimated fatality numbers | 4-wheeled vehicles (%) | Other or unspecified users (%) | Pedestrians (%) | Cyclists (%) | 2-3 wheelers (%) | VRU fatalities (Pedestrians, cyclists, 2- 3 wheelers) (%) |
|---|---|---|---|---|---|---|---|---|---|
| **East and North-East Asia** | **4** | **16.80** | **266 893** | **17.63** | **16.75** | **36.99** | **10.17** | **18.97** | **66.13** |
| China | | 18.20 | 256 180 | | | | | | |
| Democratic People's Republic of Korea | | | | | | | | | |
| Hong Kong, China | | | | | | | | | |
| Japan | | 4.10 | 5 224 | 32.40 | 1 | 35.0 | 15.1 | 17.2 | 67.3 |
| Macao, China | | | | | | | | | |
| Mongolia | | 16.50 | 499 | 39.30 | 12.20 | 28.7 | 1.2 | 18.6 | 48.5 |
| Republic of Korea | | 9.80 | 4 990 | | 33.70 | 39.9 | 5.9 | 20.5 | 66.3 |
| | | | | | | | | | |
| **South-East Asia** | **10** | **17.81** | **114 030** | **7.07** | **17.75** | **10.66** | **2.77** | **61.74** | **75.17** |
| Brunei Darussalam | | | | | | | | | |
| Cambodia | | 17.80 | 2 803 | 6.20 | 8.40 | 9.6 | 2.3 | 73.5 | 85.4 |
| Indonesia | | 12.20 | 31 726 | 4.90 | 2.70 | 15.5 | 3.2 | 73.6 | 92.3 |
| Lao People's Democratic Republic | | 16.60 | 1 120 | | | | | | |
| Malaysia | | 23.60 | 7 374 | | | | | | |
| Myanmar | | 19.90 | 10 540 | 10.80 | 7.10 | 14.2 | 3.1 | 64.8 | 82.1 |
| Philippines | | 12.30 | 12 690 | 0.30 | 93.90 | 1.0 | 0.1 | 4.7 | 5.8 |
| Singapore | | 2.80 | 155 | 7.80 | 0.70 | 33.3 | 14.2 | 44.0 | 91.5 |
| Thailand | | 32.70 | 22 491 | 12.30 | 2.30 | 7.6 | 3.5 | 74.4 | 85.5 |
| Timor-Leste | | 12.70 | 161 | | | | | | |
| Viet Nam | | 26.40 | 24 970 | | | | | | |
| | | | | | | | | | |

| | Data availability (number of countries) | Estimated fatality rate (/100,000 pop) | Estimated fatality numbers | 4-wheeled vehicles (%) | Other or unspecified users (%) | Pedestrians (%) | Cyclists (%) | 2-3 wheelers (%) | VRU fatalities (Pedestrians, cyclists, 2- 3 wheelers) (%) |
|---|---|---|---|---|---|---|---|---|---|
| **South and South-West Asia** | **10** | **20.31** | **390 926** | **19.44** | **29.12** | **11.52** | **1.71** | **38.19** | **51.43** |
| Afghanistan | | 15.10 | 5 230 | | | | | | |
| Bangladesh | | 15.30 | 24 954 | | | | | | 0.0 |
| Bhutan | | 17.40 | 139 | | | | | | 0.0 |
| India | | 22.60 | 299 091 | 17.90 | 30.40 | 10.4 | 1.7 | 39.6 | 51.7 |
| Iran | | 20.50 | 16 426 | 48.70 | 5.00 | 21.6 | 0.6 | 24.1 | 46.3 |
| Maldives | | 0.90 | 4 | 0.0 | 0.00 | 25.0 | 0.0 | 75.0 | 100.0 |
| Nepal | | 15.90 | 4 622 | | | | | | 0.0 |
| Pakistan | | 14.30 | 27 582 | | | | | | 0.0 |
| Sri Lanka | | 14.90 | 3 096 | 6.20 | 5.70 | 29.2 | 8.1 | 50.8 | 88.1 |
| Turkey | | 12.30 | 9 782 | 21.70 | 38.00 | 23.4 | 1.9 | 14.9 | 40.2 |
| | | | | | | | | | |
| **North and Central Asia** | **9** | **17.35** | **33 563.00** | **56.64** | **5.88** | **30.53** | **1.86** | **5.08** | **37.48** |
| Armenia | | 17.10 | 499 | 59.60 | 3.70 | 34.8 | 0.4 | 1.5 | 36.7 |
| Azerbaijan | | 8.70 | 845 | 51.80 | 4.30 | 42.0 | 0.9 | 0.9 | 43.8 |
| Georgia | | 15.30 | 599 | 44.90 | 27.40 | 26.5 | 0.7 | 0.5 | 27.7 |
| Kazakhstan | | 17.60 | 3 158 | 59.80 | 3.30 | 30.9 | 1.7 | 4.3 | 36.9 |
| Kyrgyzstan | | 15.40 | 916 | 27.60 | 30.00 | 40.0 | 0.2 | 2.1 | 42.3 |
| Russian Federation | | 18.00 | 25 969 | 57.60 | 5.30 | 29.2 | 2.0 | 5.9 | 37.1 |
| Tajikistan | | 18.10 | 1 577 | 57.40 | 0.00 | 40.3 | 2.3 | 0.0 | 42.6 |
| Turkmenistan | | 14.50 | | | | | | | |
| Uzbekistan | | 11.50 | | | | | | | |
| | | | | | | | | | |
| **Pacific** | **11** | **7.97** | **3 100** | **58.53** | **2.43** | **27.04** | **1.22** | **10.76** | **39.01** |
| American Samoa | | | | | | | | | |

| | Data availability (number of countries) | Estimated fatality rate (/100,000 pop) | Estimated fatality numbers | 4-wheeled vehicles (%) | Other or unspecified users (%) | Pedestrians (%) | Cyclists (%) | 2-3 wheelers (%) | VRU fatalities (Pedestrians, cyclists, 2- 3 wheelers) (%) |
|---|---|---|---|---|---|---|---|---|---|
| Australia | | 5.60 | 1 351 | 60.90 | 3.50 | 14.0 | 2.2 | 19.3 | 35.5 |
| Cook Islands | | 17.30 | 3 | 20.00 | 0.00 | 0.0 | 0.0 | 80.0 | 80.0 |
| Fiji | | 9.60 | 86 | 63.30 | 0.00 | 36.7 | 0.0 | 0.0 | 36.7 |
| French Polynesia | | | | | | | | | |
| Guam | | | | | | | | | |
| Kiribati | | 4.40 | 5 | 40.00 | 0.00 | 40.0 | 0.0 | 20.0 | 60.0 |
| Marshall Islands | | | | | | | | | |
| Micronesia | | 1.90 | 2 | 50.00 | 0.00 | 50.0 | 0.0 | 0.0 | |
| Nauru | | | | | | | | | |
| New Caledonia | | | | | | | | | |
| New Zealand | | 7.80 | 364 | 68.50 | 6.40 | 7.6 | 1.5 | 15.9 | 25.0 |
| Niue | | | | | | | | | |
| Northern Mariana Islands | | | | | | | | | |
| Palau | | | | | | | | | |
| Papua New Guinea | | 14.20 | 1 145 | 52.50 | 0.00 | 47.5 | 0.0 | 0.0 | 47.5 |
| Samoa | | 11.30 | 22 | 41.20 | 5.90 | 47.1 | 5.9 | 0.0 | 53.0 |
| Solomon Islands | | 17.40 | 104 | | | | | | |
| Tonga | | 16.80 | 18 | 66.70 | 5.60 | 27.8 | 0.0 | 0.0 | 27.8 |
| Tuvalu | | | | | | | | | |
| Vanuatu | | 15.90 | | | | | | | |
| | | | | | | | | | |
| **Asia and the Pacific** | **44** | **18.43** | **808 512** | **20.21%** | **24.94%** | **13.47%** | **2.10%** | **39.28%** | **54.85%** |

Source: WHO, *Global status report on road safety 2018*

# Appendix B.

**Table 13. Levels of speed management in ESCAP member countries by subregion based on criteria set forth in the WHO Global status report on road safety 2018**

| Country/Area | (1) National speed limit law | (2) Modifications allowed by local authorities | Maximum default[112] speed limits (km/h) | | | (6) Enforcement | 7) Predominant type of enforcement |
|---|---|---|---|---|---|---|---|
| | | | (3) urban | (4) rural | (5) motorway | | |
| **East and North-East Asia** | | | | | | | |
| China | Yes | Yes | 50 km/h | 70 km/h | 120 km/h | 8 | Automated |
| Japan | Yes | Yes | 60 km/h | 60 km/h | 100 km/h | 7 | Manual |
| Mongolia | Yes | No | 60 km/h | 80 km/h | 100 km/h | 5 | Manual and automated |
| Republic of Korea | Yes | Yes | 80 km/h | 80 km/h | 120 km/h | 8 | Automated |
| **North and Central Asia** | | | | | | | |
| Armenia | Yes | No | 90 km/h[c] | 90 km/h | 110 km/h | 8 | Automated |
| Azerbaijan | Yes | No | 60 km/h | 90 km/h | 110 km/h | 8 | Automated |
| Georgia | Yes | No | 60 km/h | 90 km/h | 110 km/h | 6 | Automated |
| Kazakhstan | Yes | No | 60 km/h[x] | 110 km/h | 140 km/h | 7 | Automated |
| Kyrgyzstan | Yes | No | 60 km/h | 90 km/h | 110 km/h | 5 | Manual and automated |
| Russian Federation | Yes | Yes[af] | 60 km/h | 90 km/h | 110 km/h | 8 | Automated |
| Tajikistan | Yes | No | 60 km/h | 90 km/h | 110 km/h | 9 | Manual |
| Turkmenistan | Yes | Yes | 60 km/h | 90 km/h | 110 km/h | 10 | Manual and automated |
| Uzbekistan | Yes | No | 70 km/h | 100 km/h | No | 8 | Manual |
| **Pacific** | | | | | | | |
| Australia | Yes | Yes | 50 km/h | 100 - 130 km/h | 100 - 130 km/h | 8 | Manual and automated |
| Cook Islands | Yes | Yes | 50 km/h | 50 km/h | 50 km/h | 6 | Manual |
| Fiji | Yes | No | 50 km/h | 80 km/h | – | 7 | Manual and automated |
| Kiribati | Yes | No | 40 km/h | 60 km/h | 60 km/h | 5 | Manual |
| Micronesia | Yes[ac] | Yes | ~ 40 km/h | ~ 40 km/h | ~ 40 km/h | 3 | Manual |

[112] Approved general speed limits are not usually signposted but these are nevertheless clear to experienced and new drivers (including visitors) entering the road network.

| Country/Area | (1) National speed limit law | (2) Modifications allowed by local authorities | Maximum default[112] speed limits (km/h) | | | (6) Enforcement | 7) Predominant type of enforcement |
|---|---|---|---|---|---|---|---|
| | | | (3) urban | (4) rural | (5) motorway | | |
| New Zealand | Yes | Yes | 50 km/h | 100 km/h | 100 km/h | 7 | Manual and automated |
| Papua New Guinea | Yes | No | 60 km/h | 75 km/h | – | – | – |
| Samoa | Yes | No | ~ 56 km/h | ~ 56 km/h | –[q] | 9 | Manual |
| Solomon Islands | Yes[am] | Yes | – | – | – | 5 | Manual |
| Tonga | Yes | No | 50 km/h | 70 km/h | 70 km/h | 7 | Manual |
| Vanuatu | No | No | – | – | – | – | – |
| **South-East Asia** | | | | | | | |
| Cambodia | Yes | No | 40 km/h | 90 km/h | 100 km/h | 5 | Manual |
| Indonesia | Yes | Yes | 50 km/h | 80 km/h | 100 km/h | 8 | Manual |
| Lao People's Democratic Republic | Yes | No | 40 km/h | 90 km/h | –[q] | 5 | Manual |
| Malaysia | Yes | Yes | 90 km/h[aa] | 90 km/h[aa] | 110 km/h[aa] | 6 | Manual |
| Myanmar | Yes | No | 48 km/h | 80 km/h | No | 6 | Automated |
| Philippines | Yes | Yes | 40 km/h | 80 km/h | No | 5 | Manual |
| Singapore | Yes | No | 70 km/h[aj] | –[ak] | 90 km/h | 8 | Manual and automated |
| Thailand | Yes | No | 80 km/h | 90 km/h | 120 km/h | 5 | Manual |
| Timor-Leste | Yes | No | 50 km/h | 90 km/h | 120 km/h | 5 | Manual |
| Viet Nam | yes | No | 60 km/h | 90 km/h | 120 km/h | 7 | Manual and automated |
| **South and South-West Asia** | | | | | | | |
| Afghanistan | Yes | No | 90 km/h[a] | 90 km/h[a] | 90 km/h[a] | 4 | – |
| Bangladesh | Yes | No | ~ 112 km/h[d] | ~ 112 km/h[d] | ~ 112 km/h[d] | 5 | Manual |
| Bhutan | Yes | No | 30 km/h | 50 km/h | 50 km/h | 6 | Manual |
| India | Yes | Yes | 100 km/h[v] | 100 km/h[v] | 100 km/h[v] | 3 | Manual |
| Iran | Yes | No | 60 km/h | 95 km/h | 120 km/h | 7 | Manual and automated |
| Maldives | Yes | No | 30 km/h[ab] | 30 km/h[ab] | No | 3 | Manual |
| Nepal | Yes | No | 40 km/h[ad] | 80 km/h[ad] | 80 km/h[ad] | 2 | Manual |
| Pakistan | Yes | Yes | 90 km/h | 110 km/h | 130 km/h | 4 | Manual |

| Country/Area | (1) National speed limit law | (2) Modifications allowed by local authorities | Maximum default[112] speed limits (km/h) | | | (6) Enforcement | 7) Predominant type of enforcement |
|---|---|---|---|---|---|---|---|
| | | | (3) urban | (4) rural | (5) motorway | | |
| Sri Lanka | Yes | No | 50 km/h | 70 km/h | 100 km/h | 9 | Manual |
| Turkey | Yes | Yes | 50 km/h | 110 km/h[ao] | 120 km/h[ao] | 9 | Manual and automated |

a. Speed limit set per vehicle type with a maximum speed limit of 90 km/h for fast moving vehicles, decreased by 20 km/h on roads in mountainous areas.
c. The limit in residential area is reduced to 60km/h.

d. Speed limit set per vehicle type with a maximum speed limit of 70 miles per hour (112 km/h) for light vehicles.

q. No motorways in the country.

v. Speed limit set per vehicle type with a maximum speed limit of 100 km/h for passenger cars comprising not more than eight seats in addition to the driver's seat.

x. Can be increased up to 90 km/h.

aa. Speed limit set per vehicle and road type with a maximum speed limit for passenger cars of 110km/h on highways and 90 km/h on other roads.

ab. Speed limit set per vehicle type with a maximum speed limit of 30 km/h for specified vehicles, except in designated areas with higher limits.

ac. Speed limit may be increased by the governor (islands of Kosrae and Yap) or by the director of the department of public safety (island of Pohnpei).

ad. Speed limit set per vehicle type with a maximum speed limit of 80 km/h for specified vehicles including cars, and a maximum limit of 40 km/h in densely built-up areas.

af. Local authorities can modify national speed limits through the posting of speed signs.

aj. Different speed limits are set in urban areas ranging from 30 km/h to 70km/h.

ak. No rural roads in Singapore.

am. Speed limits are established locally per vehicle type and/or per road names or areas.

ao. Ministry of Interior can increase speed limits by 20 km/h for automobiles.

Source: WHO, *Global status report on road safety 2018*.

# Appendix C.

**Table 14. Levels of speed management and iRAP star ratings assigned to assessed roads in ESCAP member countries by subregion**

| Country name | Pedestrians: Road length assessed (km) | % of road length assessed: 1-star | 2-star | 3-star | 4-star | 5-star | % with no formal footpaths and vehicle speeds of 40km/h (25mph) or greater | % with no pedestrian crossings and vehicle speeds of 40km/h (25mph) or greater | % with poorly signed or maintained pedestrian crossings |
|---|---|---|---|---|---|---|---|---|---|
| **Pacific** | | | | | | | | | |
| Australia | 42.3 | 20.3 | 42.1 | 22.2 | 13.2 | 2.1 | 15 | 76 | 1 |
| Fiji | 442.8 | 91.5 | 6.0 | 2.4 | 0.1 | 0.0 | 84 | 98 | 98 |
| New Zealand | 3 246.3 | 5.4 | 11.8 | 25.7 | 50.2 | 6.8 | 30 | 91 | 3 |
| Papua New Guinea | 3 660.2 | 97.5 | 2.0 | 0.5 | 0.0 | 0.0 | 100 | 99 | 76 |
| **South and South-West Asia** | | | | | | | | | |
| Bangladesh | 0.5 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100 | 100 | |
| Bhutan | 346.9 | 73.0 | 26.2 | 0.8 | 0.0 | 0.0 | 100 | 100 | |
| Nepal | 700.1 | 84.4 | 13.0 | 2.6 | 0.0 | 0.0 | 93 | 97 | 96 |
| **East and North-East Asia** | | | | | | | | | |
| China | 763.1 | 26.5 | 28.5 | 21.2 | 13.8 | 10.0 | 55 | 66 | 78 |
| Japan | 35.8 | 0.0 | 19.3 | 58.7 | 21.5 | 0.6 | 0 | 83 | 11 |
| **South-East Asia** | | | | | | | | | |
| Indonesia | 6 916.9 | 62.8 | 30.6 | 6.4 | 0.2 | 0.0 | 91 | 91 | 80 |
| Philippines | 6 221.7 | 46.2 | 45.5 | 8.2 | 0.1 | 0.0 | 93 | 89 | 78 |
| Thailand | 542.3 | 67.8 | 15.6 | 11.0 | 5.5 | 0.0 | 74 | 76 | 38 |
| Viet Nam | 3 640.7 | 71.4 | 18.1 | 9.8 | 0.8 | 0.0 | 94 | 91 | 33 |
| **Total** | **11 4967.7** | **48.4** | **34.2** | **12.5** | **3.6** | **1.3** | **85** | **92** | **22** |

| Country Name | Motorcyclists | | | | | | |
|---|---|---|---|---|---|---|---|
| | Road length assessed | % of road length assessed | | | | | % with traffic flows at 60km/h (40mph) or more and no motorcycle facilities |
| | | 1-star | 2-star | 3-star | 4-star | 5-star | |
| **Pacific** | | | | | | | |
| Australia | 52 215.8 | 27.5 | 39.7 | 31.9 | 0.8 | 0.1 | 100 |
| Fiji | | | | | | | |
| New Zealand | 6 333.2 | 46.1 | 17.5 | 32.3 | 4.0 | 0.2 | 100 |
| Papua New Guinea | | | | | | | |
| **South and South-West Asia** | | | | | | | |
| Bangladesh | 0.5 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100 |
| Bhutan | 346.9 | 97.7 | 2.0 | 0.3 | 0.0 | 0.0 | 100 |
| Nepal | 717.5 | 85.7 | 12.1 | 2.2 | 0.1 | 0.0 | 100 |
| **East and North-East Asia** | | | | | | | |
| China | 1 382.6 | 51.8 | 16.1 | 15.2 | 11.1 | 5.8 | 100 |
| Japan | 112.9 | 33.2 | 50.1 | 16.6 | 0.1 | 0.0 | 100 |
| **South-East Asia** | | | | | | | |
| Indonesia | 9 267 | 37.8 | 31.0 | 28.0 | 3.1 | 0.0 | 99 |
| Philippines | 6 337.3 | 54.1 | 34.5 | 11.3 | 0.1 | 0.0 | 100 |
| Thailand | 620 | 26.4 | 50.4 | 19.7 | 3.3 | 0.2 | 78 |
| Viet Nam | 3 667.4 | 30.3 | 30.6 | 31.0 | 7.0 | 1.0 | 96 |
| **Total** | **26 4965.9** | **35.3** | **36.0** | **24.7** | **2.8** | **1.3** | |

| Country Name | Vehicles | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Road length assessed | % of road length assessed | | | | | % with undivided roads and vehicle speeds of 80km/h (50mph) or greater | % with dangerous roadsides and vehicle speeds of 80km/h (50mph) or greater | % of intersections with no roundabouts, protected turn lanes or interchanges and vehicle speeds of 60km/h (40mph) or greater | % with sharp curves and vehicle speeds of 80km/h (50mph) or greater |
| **Pacific** | | | | | | | | | | |
| Australia | 117 939.9 | 15.6 | 31.7 | 46.9 | 5.4 | 0.4 | 91 | 73 | 62 | 2 |
| Fiji | 576.6 | 84.4 | 13.4 | 33.0 | 12.5 | 11.1 | 100 | 99 | 91 | 32 |
| New Zealand | 6 333.2 | 41.3 | 16.1 | 33.0 | 9.2 | 0.5 | 99 | 97 | 82 | 13 |
| Papua New Guinea | 3 660.2 | 92.9 | 5.3 | 1.8 | 0.0 | 0.0 | 100 | 97 | 100 | 22 |
| **South and South-West Asia** | | | | | | | | | | |
| Bangladesh | 0.5 | 100.0 | 0.0 | 0.0 | 0.0 | 0.0 | 100 | 80 | 100 | 0 |
| Bhutan | 346.9 | 95.2 | 3.5 | 1.2 | 0.0 | 0.0 | | | 88 | |
| Nepal | 717.5 | 79.0 | 16.1 | 4.6 | 0.3 | 0.0 | | 96 | 98 | |
| **East and North-East Asia** | | | | | | | | | | |
| China | 1 482.9 | 43.7 | 13.0 | 21.6 | 11.3 | 10.4 | 68 | 89 | 78 | 3 |
| Japan | 112.9 | 20.5 | 50.9 | 28.3 | 0.3 | 0.0 | 88 | 94 | 94 | 14 |
| **South-East Asia** | | | | | | | | | | |
| Indonesia | 9 267 | 21.3 | 110.1 | 176.0 | 31.5 | 8.1 | 82 | 88 | 81 | 6 |
| Philippines | 6 337.3 | 39.3 | 40.0 | 19.7 | 1.0 | 0.0 | 100 | 98 | 97 | 13 |
| Thailand | 627.1 | 17.5 | 42.2 | 34.7 | 4.3 | 1.3 | 45 | 92 | 71 | 7 |
| Viet Nam | 3 699.1 | 18.2 | 28.6 | 37.0 | 11.7 | 4.5 | 23 | 93 | 90 | 22 |
| **Total** | **358 503.9** | **20.3** | **32.4** | **40.4** | **5.3** | **1.6** | **81** | **79** | **73** | **3** |

Source: iRAP, *Vaccines for Roads IV* (2018).

# Appendix D.

## Survey Questionnaire

**QUESTIONS ON SPEEDING ISSUES**

1. Please provide information about speed limits in your country

   Any specific comments: ___________________________________________
   _____________________________________________________________________
   _____________________________________________________________________
   _____________________________________________________________________

2. What is the speed limit (the maximum legal speed permitted) on motorways/freeways? (km/h)

   ☐ Intercity Highways/Motorways __________________________
   ☐ Suburban Highways/Motorways __________________________
   ☐ Within the City Highways/ Motorways____________________________

3. What is the default or most common speed limit on rural roads? (km/h)

   ☐ Rural Arterials ____________________________________________
   ☐ Rural Collectors ___________________________________________
   ☐ Rural Local Roads _________________________________________
   ☐ Others, if applicable ________________________________________

4. What is the default or most common speed limit on urban roads? (km/h)

   ☐ Urban Arterials ____________________________________________
   ☐ Urban Collectors ___________________________________________
   ☐ Urban Local Roads _________________________________________
   ☐ Others, if applicable ________________________________________

5. What is the default or most common speed limit on urban roads with significant pedestrian movements with no foot over bridges provided? (km/h)

   ☐ Urban Arterials ____________________________________________
   ☐ Urban Collectors ___________________________________________
   ☐ Urban Local Roads _________________________________________
   ☐ Others, if applicable ________________________________________

6. What is the lowest speed limit (not the minimum speed limit) in your

   Jurisdiction (work area) (km/h) ___________________________
   Country (national) (km/h) ___________________________

7. Where does the lowest speed limit typically occur (select all that apply)?

□ High pedestrian activity areas
□ Local traffic areas
□ School zones / around schools
□ Through villages / built up areas on highways
□ Residential streets
□ Other – please specify_______________________________________________

8. What is the maximum allowable speed limit in general? (km/h) ___________________________

9. Where does the maximum allowable speed limit typically occur (select all that apply)?

□ Motorways/ Expressways
□ Rural divided roads
□ Rural undivided roads
□ Other – please specify_______________________________________________

10. Do you have guidelines / policy on how to set speed limits?

□ Yes
□ No

Guideline names or any specific comments: __________________________________________
___________________________________________________________________
(Please mention name of the entity and the title of the guidelines)

11. Who is/are responsible for setting speed limits? (Mark all that are applicable)

□ National authority – please specify name: _______________________________________
□ State authority – please specify name: __________________________________________
□ Local authority – please specify name: __________________________________________
□ Other – please specify_________________________________________________

12. What road engineering measures are used to reduce travel speeds (select all that apply)?

□ Speed humps
□ Speed bumps
□ Speed table
□ Rumble strips
□ Roadside barriers
□ Median barriers
□ Roundabouts
□ Raised pedestrian crossings
□ Narrowing of travel lanes
□ Chicanes
□ Lanes painted in different colors
□ Other – please specify____________________________________________________

13. What type of speed limit signs are posted (select all that apply)?

□ Sign on posts (road side)

□ Over-head sign
□ Sign located at other places on the road
□ Electronic sign
□ Electronic warning sings showing comparison between the speed limit and the driving speed
□ Variable message signs_____________________________________________________
Please provide details how the posted speed limits vary
□ Other – please specify_____________________________________________________

14. What type/s of enforcements are carried out for speeding behaviours (select all that apply)?

□ Stationary / fixed location police enforcement ____________________________________
□ Stationary / fixed location speed camera enforcement _____________________________
□ Moveable speed camera enforcement ___________________________________________
□ Combined speed and red-light camera enforcement _______________________________
□ Point-to-point (average / section control) speed camera enforcement _________________
□ Speed radar / laser gun enforcement __________________________________________
□ Police following travelling vehicles
□ Other – please specify______________________________________________________

15. What is the minimum level of speeding for which penalty is applied?

□ ____ km/h over speed limit – please specify
□ ____ % over speed limit – please specify
□ Other – please specify______________________________________________________

16. What types of penalties are applied for speeding (select all that apply)?

□ Monetary fines → what is the lowest and highest level of fine one can receive for speeding? Lowest _________ Highest _________ **<u>Please specify currency</u>**
□ License points → what is the lowest and highest level of points one can receive for speeding? Lowest _________ Highest _________
□ Vehicle impoundment
□ Licence suspension / disqualification
□ Other – please specify________________________________________________________

17. If you have a license point system how many points can one accumulate until his/her license is suspended/disqualified? ______ points

18. Where does speeding enforcement generally practiced (select all that apply)?

□ Everywhere
□ Urban areas
□ Rural areas
□ Sub-urban areas
□ Others- please specify_________________________________________________________

□ Set times of day: please specify ________________________________________________
□ High crash locations

□ High death and injury locations
□ Other – please specify_______________________________________________________

19. Do you monitor the number of speeding penalties issued each year?

□ Yes
□ No

20. Each year what percentage of speeding fines issued are paid?

□ ____ % – please specify
□ Not monitored
□ Comments, if any ___________________________________________________________

21. What happens to the offender when a speeding fine is not paid?

□ Unable to renew license until the fine is paid
□ License is suspended/disqualified
□ Nothing
Other – please specify________________________________________________________