

Strategies to Tackle the Issue of Motorcycle Helmet Use for Road Safety in the Asia-Pacific Region: Implementation Framework





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Executive Summary

Road safety is a critical issue for sustainable development. Each year more than 1.35 million people are killed globally on roads. In the ESCAP region, road traffic deaths increased by 3.5 per cent each year between 2013 and 2016. Road traffic crashes result in enormous social costs for individuals, families and communities. In the ESCAP region, the vulnerable road users including pedestrians, bicyclist and motorized 2- and 3 -wheelers accounted for 54.8 per cent of all road deaths in 2016. Among the vulnerable road users, the motorized 2 and 3-wheelers were the most vulnerable which accounted for 39.21 per cent of all road deaths.

In recognition of the road safety related global challenges, on 31 August 2020 the United Nations General Assembly resolution 74/299 proclaimed the period 2021-2030 as the Second Decade of Action for Road Safety with a goal of reducing the road traffic deaths and injuries by at least 50 per cent from 2021 to 2030. The resolution invites the Member States that have not done so to consider adopting comprehensive legislation on key risk factors including the non-use of motorcycle helmets; and encourages Member States to develop comprehensive policies related to motorcyclists.

Under this study, the status of motorcycle helmet use law and the rate of helmet use in the ESCAP region have been reviewed. The situation in Thailand has been further reviewed. The study has identified four different challenges regarding helmet use for the motorcycle users in the region: a) improper motorcycle helmet use, b) myths and arguments, c) inadequate attention to children motorcycle passengers and d) inefficient tracking and detection system for law enforcement regarding helmet use. The study has also identified four different opportunities: a) helmet use interventions, b) affordable motorcycle helmet pricing, c) good quality helmets, d) effective law enforcement and awareness building.

The recommendations of the study have been grouped into four categories: a) legislation and enforcement, b) education and awareness campaign, c) improved data collection, and d) improved detection system. The first group of recommendations focuses on legislation meeting best practice criteria and effective law enforcement towards increased motorcycle helmet wearing rate. The second group of recommendations focuses on education and awareness campaign towards having positive effect on changing motorcycle riders' behaviour and reducing road traffic crashes. The third group of recommendations focuses on improvement of the quality of road crash data which could be used towards setting realistic targets and priorities by the Governments. The fourth group focuses on applying high technologies to improve the detection and tracking system for law enforcement of helmet wearing.

1. Introduction

1.1 Background

Road traffic crashes are a major public health and development threat. They are the 8th leading cause of death for people of all ages and the leading cause of death for children and young adults aged 5–29 years. Road traffic crashes cause millions of deaths and tens of injuries every year. The number of deaths caused by road traffic crashes has increased from 1.15 million in 2000 to 1.35 million in 2016, and the problem is getting worse. The burden of road traffic deaths is disproportionately high among low-income and middle-income countries relative to their populations. In 2013, 90% of road traffic deaths occurred in low- and middle-income countries, which has only 54% of the world's motor vehicle population. The road traffic death rate in low-income countries (24.1 per 100,000) was more than twice as high as in high-income countries (9.2 per 100,000) in 2013. There is very little progress in reducing road traffic deaths in low-income countries. Out of 28 low-income countries, 27 countries have seen a rise in road traffic deaths between 2013 and 2016, and one country has barely seen any change. Although low- and middle-income countries account for only 60% of the world's registered motor vehicles and 85% of the world's population, 93% of road traffic deaths occurred in these countries in 2016.

Road traffic injury is the leading cause of death among infants and children in both developed and developing countries. One-fifth of road traffic deaths involve children, with an estimated 262,000 killed and 10 million injured annually. Globally, road traffic injuries are ranked as the third-most-popular cause of death of children aged less than five years of age, but ranked tenth compared to fatal road traffic injuries for children aged 1–4 years. Children are more likely to be injured from road traffic crashes than adults and are more susceptible to intracranial damage, one of the most common fatal injuries.

The economic cost of road traffic crashes is high. The road traffic injuries cost 1% of their gross national product (GNP) in low-income countries and 1.5% in middle-income countries – more than the total development aid received by these countries. The direct economic costs of global road traffic crashes have been estimated at US\$ 518 billion, of which low-income countries account for US\$ 65 billion. It is highly probable that the economic cost of road traffic crashes is significantly underestimated for low-income and middle-income countries.

The road safety issue has received greater attention, and governments are increasingly being urged to implement interventions. The World Health Organization (WHO), in its report published in 2004 on road traffic injury prevention, presented the magnitude, risk factors, and the impact of road traffic injuries, and it also suggested ways to prevent and diminish the impact of road crashes. In its 2009 report, the Commission for Global Road Safety issued a call for a

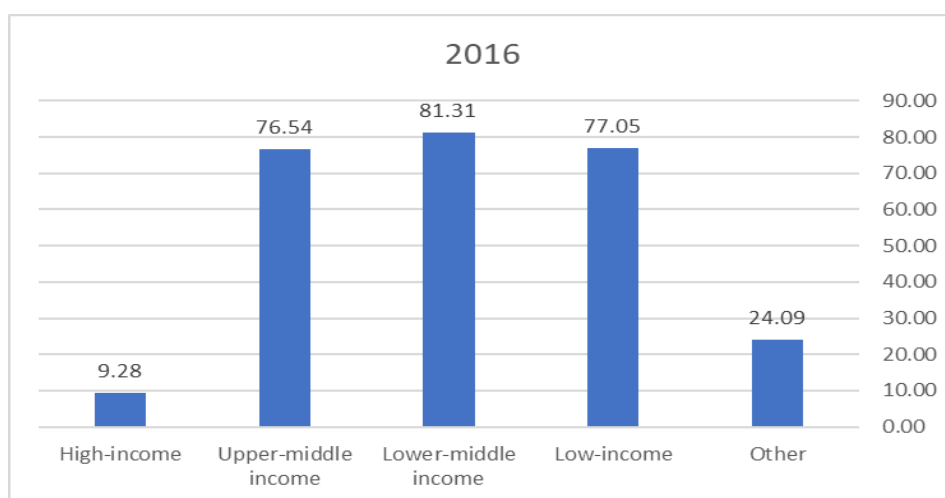
Decade of Action for Road Safety. In 2010 the United Nations General Assembly resolution proclaimed a Decade of Action for Road Safety 2011–2020 to stabilize and then reduce the forecasted level of road traffic fatalities around the world. In 2015, the United Nations General Assembly adopted a series of SDGs with specific road safety targets, intending to halve the number of global deaths and injuries from road traffic crashes by 2020. In 2017, member states, with the support of WHO, UNECE, UNICEF, adopted 12 global voluntary performance targets for road safety risk factors and service delivery mechanisms.

1.2 Road traffic death trends in ESCAP member countries

There is an upward trend in total road traffic deaths in ESCAP member countries. The total number of road traffic deaths in ESCAP member countries increased from 733,541 in 2013 to 812,995 in 2016. If the same growth continues, the number of road traffic deaths in ESCAP member countries in 2020 is estimated to be over 900,000. One of the contributing factors for the growing number of road traffic deaths is the rapid increase in motorization without sufficient improvement in road safety strategies and land use planning. The riders of motorized two-and three-wheelers represent 43% and 36% of all deaths respectively in South-East Asia and the Western Pacific and 39.21% of all deaths in ESCAP member countries.

Though the average fatality rate per 100,000 vehicles in ESCAP decreased from 82.23 to 77.21 between 2013 and 2016, there is a disproportionate burden of road traffic deaths on low-and middle-income countries. While the fatality rate per 100,000 vehicles is 9.28 in high-income countries, it was over 75 in low-and middle-income countries in UNESCAP in 2016 (see Figure 1). The challenge today is to replicate the downward trend in road traffic deaths observed in high-income countries to other low-and middle-income countries.

Figure 1. Fatality rate per 100,000 vehicles (2016).



Source: ESCAP calculations based on data from the Global Status Report on Road Safety 2018.

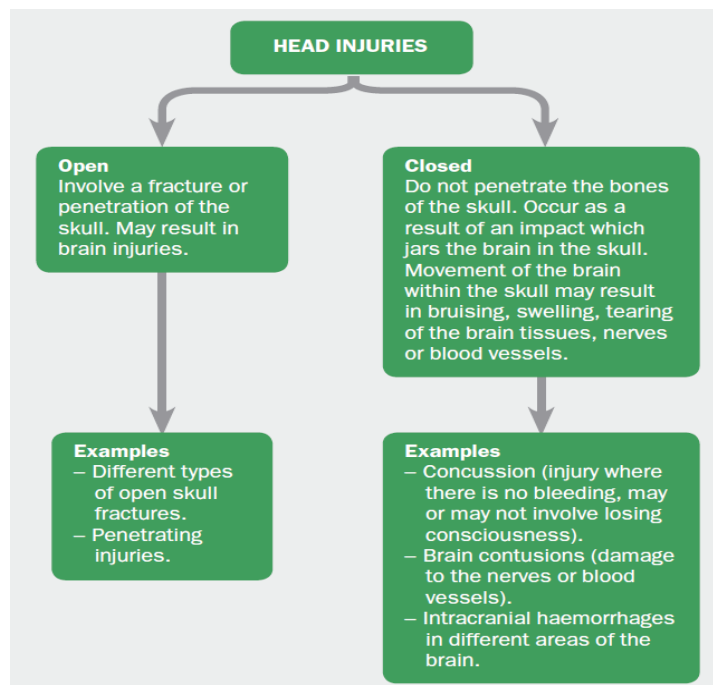
1.3 Why is motorcycle helmet wearing important?

With the rapidly increasing use of motorized 2- and 3-wheelers in many places, especially in many low- and middle-income countries, there are growing fatalities and injuries among users of motorized 2- and 3-wheelers, and a large proportion of the motorcycle crashes deaths and severe injuries result from injuries to the head.

A motorcycle crash may cause head injuries, either through direct contact with hard objects or through excessive acceleration-deceleration (see Figure 2). The motorcycle helmet is designed to minimize the likelihood and severity of all kinds of head injuries by reducing the impact of a force or collision to the head. Wearing a proper motorcycle helmet can have three functions:

- It reduces the deceleration of the skull, and hence the brain movement, by managing the impact. The soft material incorporated in the helmet absorbs some of the impact bringing the head to a slow halt.
- It spreads the forces of the impact over a greater surface area so that it is not concentrated on the skull areas.
- It prevents direct contact between the skull and the impacting object by acting as a mechanical barrier between the head and the object.

Figure 2. Type of head injuries.



Source: WHO, FIA Foundation, GRSP and the World Bank, 2006, Helmets, a road safety manual for decision-makers and practitioners.

Wearing a motorcycle helmet decreases the risk and severity of injuries by about 72%. The likelihood of death goes down by 39%, with the probability depending on the speed of the motorcycle involved. Additionally, it reduces hospital costs related to motorcycle crashes. On an average, helmet use leads to hospital costs that are about 20%, or US\$ 6000, less than the costs for those who did not wear helmets, with the simple reason being patients who don't wear helmets are hospital longer.

The World Health Organization in the report published in 2017 on “Powered two- and three-wheeler safety: a road safety manual for decision-makers and practitioners” included seven proven measures and interventions for improved motorcycle safety. Two of those were directly related to helmets: a) mandatory helmets and b) helmet standards.



Source: Motorcycle Helmet use, China, Haocheng Hong, 2020.

2. Motorcycle helmet use in ESCAP member countries

2.1 Motorized 2- or 3-wheelers death in ESCAP member countries

Motorcycle crashes are the leading cause of road traffic deaths, causing 32.71% of all deaths in ESCAP member countries in 2010 and 39.21% in 2016. Riders of motorized 2-and 3-wheelers present a higher proportion of deaths (29.32% of all deaths in 2016) in ESCAP member countries than in the whole world. In the ESCAP region, death due to motorcycle crash is most severe in South-East Asia sub-region, accounting for 61.74% of deaths in that area. This is followed by South and South-West Asia sub-region, in which motorized 2- or 3-wheelers represent 38.19% of all road traffic deaths. The severity of death due to motorcycle crash is least acute in North and Central Asia sub-region, accounting for only 4.96% of all deaths.

The severity of the motorized 2- or 3- wheelers death problem is because a motorcycle is an increasingly common means of transport in many low-income and middle-income countries, which are the majority of the ESCAP member countries (only five countries are considered as high-income countries by World Bank in a group of 44 countries in ESCAP region). For example, motorcycle ownership increased from 23% to 63% between 1987 and 2001, with a corresponding increase in the proportion of traffic fatalities sustained by motorcyclists rising from 7.5% to 19% over the same period. The disproportionate impact caused by different levels of economic development is evident in the ESCAP region. The South-East Asia sub-region, where motorized 2- and 3- wheelers represent 61.74% of deaths, includes seven lower-middle-income countries, two upper-middle-income countries and one high-income country. While in North and Central Asia sub-region, where motorcycle crashes death is least serious, there are five upper-middle-income countries, three lower-middle-income countries, and one low-income country.

2.2 Helmet-wearing rates in ESCAP member countries

As information provided by the Global Status Report on Road Safety 2018, less than half of all participating countries have helmet-wearing rate data available, and most of these countries are high-income countries. In a group of 44 countries in the ESCAP region, only 20 countries (two high-income countries, eight upper-middle-income countries, ten lower-middle-income countries) have helmet-wearing rate data in 2016. None of the low-income countries in the ESCAP region has these data. As per good sense, high-income countries should do better on collecting data on the helmet-wearing rate. However, only 2 out of 5 high-income countries in ESCAP region have related data.

The collected data shows that even though most countries have national motorcycle helmet laws, many countries do not have high helmet-wearing rates owing to inefficient enforcement.

For example, though Pakistan has motorcycle helmet law since 1969, only 10% of all riders wore motorcycle helmets in 2016, and the enforcement of its helmet law is 3. While in Samoa where the enforcement rate is 10 (on a scale of 0 to 10), the motorcycle helmet-wearing rate is 100% for drivers and 100% for passengers. In the ESCAP region, only two countries (Australia and Samoa) had a 100% all riders helmet-wearing rate in 2016. More effort is needed to strengthen the effective enforcement of the law to increase the motorcycle helmet-wearing rate. Table 1 shows these data.

2.3 Helmet laws in ESCAP member countries

Most countries have national motorcycle helmet laws. Of the 44 countries in the ESCAP region, only one country (Afghanistan) does not have related regulations. However, the helmet law in many countries doesn't meet the best practice criteria. There are five best practice criteria for the assessment of motorcycle helmet law:

- Presence of a national motorcycle helmet law;
- Law applying to both drivers and passengers;
- Law applying to all road and engine types;
- Law specifying that helmet should be fastened;
- Law referring to/specifying a standard of helmets.

As shown in Table 1, of the 43 countries that have national motorcycle law, only 13 countries meet all the five best practice criteria. These include two high-income countries, seven lower-income countries, and four upper-income countries. Among those with laws that meet at least one best criterion, all countries have laws to protect all riders (drivers and passengers), 22 have laws requiring helmets to be fastened, and 17 refer to helmet standards in their laws. The low number of countries meeting all the five best practice criteria suggest that much stronger laws are needed in most part in the ESCAP region.

What's more, only 14 countries have laws applying to children passenger on the motorcycle. 13 countries specify a minimum age at which children can ride as passengers, ranging from 8 to 12 years old; 1 country (Myanmar) prohibits children riding a motorcycle. Most countries in the ESCAP region should continue to explore how to ensure the safety of children riding the motorcycle.

In many countries, the enforcement of the law is still a big challenge. Only 17 countries in the ESCAP region rated their enforcement as good (eight or above on a scale of zero to ten, as rated by respondents) in 2016, which means that in the ESCAP region, more than half of countries are not reaping the full benefit of the law. Four countries do not have enforcement rate, and eight countries rated their enforcement equal or below 5. In most parts of the ESCAP region, enforcement of sufficient laws is too weak to allow the potential impact of these laws to be fully realized. Table 1 shows these data.

Table 1. National motorcycle helmet law in ESCAP region

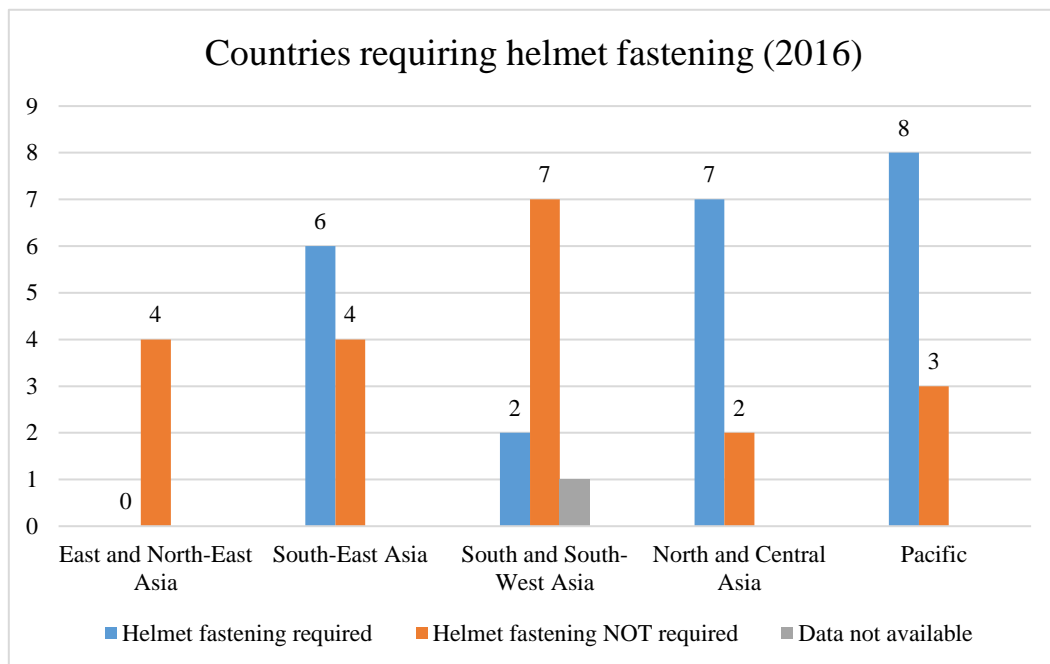
Country	Helmet Law	Applies to drivers and passengers	Helmet fastening required	Helmet standard referred to and/or specified	Children passengers	Apply to all road types and all engine types.	Enforcement	Helmet-wearing rate in 2016
Afghanistan	NO	—	—	—	—	—	—	—
Australia	YES	YES	NO	YES	prohibited under 8	YES	—	100% all riders
Azerbaijan	YES	YES	NO	NO	prohibited under 12	YES	6	—
Bangladesh	YES	YES	NO	YES	NO	YES	6	—
Bhutan	YES	YES	YES	YES	NO	YES	9	—
Cambodia	YES	YES	NO	YES	NO	YES	6	70% - 43% Drivers, 30% - 13% Passengers
China	YES	YES	NO	YES	prohibited under 12	YES	6	20% All riders
Cook Islands	YES	YES	NO	YES	NO	YES	5	—
Fiji	YES	YES	YES	NO	prohibited under 8	YES	8	80% Drivers; 80% Passengers
Georgia	YES	YES	YES	NO	prohibited under 12	YES	7	—
India	YES	YES	YES	YES	NO	YES	4	30% Drivers. <10% Passengers
Indonesia	YES	YES	NO	YES	NO	YES	9	71% All riders
Iran (Islamic Republic of)	YES	YES	NO	YES	NO	YES	5	59% Drivers, 20% Passengers
Japan	YES	YES	NO	YES	NO	YES	9	—

Kazakhstan	YES	YES	YES	NO	prohibited under 12	NO	7	—
Kiribati	YES	YES	NO	YES	NO	YES	—	—
Kyrgyzstan	YES	YES	YES	NO	prohibited under 12	YES	5	—
Lao People's Democratic Republic	YES	YES	NO	NO	NO	YES	7	—
Malaysia	YES	YES	YES	YES	NO	YES	8	91% Drivers, 87% Passengers
Maldives	YES	NO	NO	NO	NO	NO	5	—
Micronesia (Federated States of)	YES	YES	NO	NO	NO	YES	7	—
Mongolia	YES	YES	NO	NO	NO	YES	1	—
Myanmar	YES	YES	YES	NO	prohibited	YES	6	32% Drivers, 27% Passengers
Nepal	YES	YES	NO	NO	NO	YES	8	—
New Zealand	YES	YES	YES	YES	NO	YES	9	—
Pakistan	YES	YES	NO	NO	NO	YES	3	10% All riders
Papua New Guinea	YES	YES	YES	YES	NO	YES	—	7.9% All riders
Philippines	YES	YES	NO	YES	NO	YES	6	87% Drivers, 51% All riders
Republic of Korea	YES	YES	NO	YES	NO	YES	6	86% Drivers, 40% Passengers
Russian Federation	YES	YES	YES	YES	prohibited under 12	YES	4	—
Samoa	YES	YES	YES	NO	NO	YES	10	100% Drivers. 100% Passengers

Singapore	YES	YES	YES	YES	prohibited under 10	YES	9	—
Solomon Islands	YES	YES	YES	YES	NO	YES	6	—
Sri Lanka	YES	YES	NO	YES	NO	YES	9	95% All riders
Tajikistan	YES	YES	YES	NO	prohibited under 12	YES	6	—
Thailand	YES	YES	YES	YES	NO	YES	6	51% Drivers, 20% Passengers
Timor-Leste	YES	YES	YES	YES	NO	YES	7	—
Tonga	YES	YES	YES	YES	NO	YES	8	—
Turkey	YES	YES	NO	YES	NO	YES	9	75% All riders
Turkmenistan	YES	YES	NO	NO	prohibited under 12	YES	9	—
Uzbekistan	YES	YES	YES	NO	prohibited under 12	YES	10	—
Vanuatu	YES	YES	YES	YES	NO	YES	8	90% Drivers,90% Passengers
Viet Nam	YES	YES	YES	YES	NO	YES	8	81% Drivers,60% Passengers

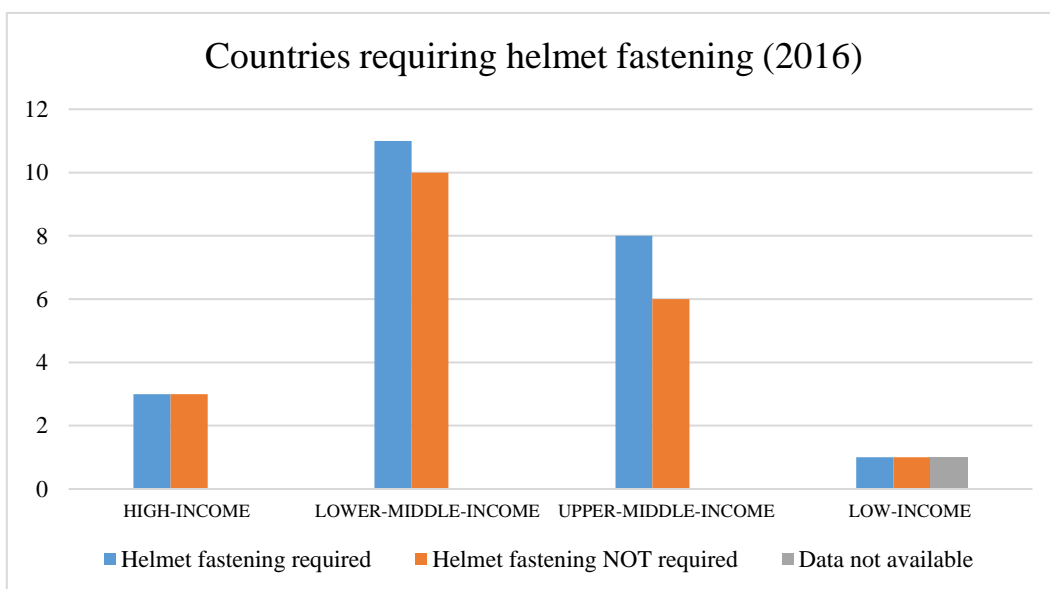
Source: based on data from the Global Status Report on Road Safety 2018.

Figure 3. Status of fastening requirement in motorcycle helmet law by subregion of ESCAP region (2016).



Source: ESCAP analysis based on data from the Global Status Report on Road Safety 2018.

Figure 4. Status of fastening requirement in motorcycle helmet law by country income level (2016).

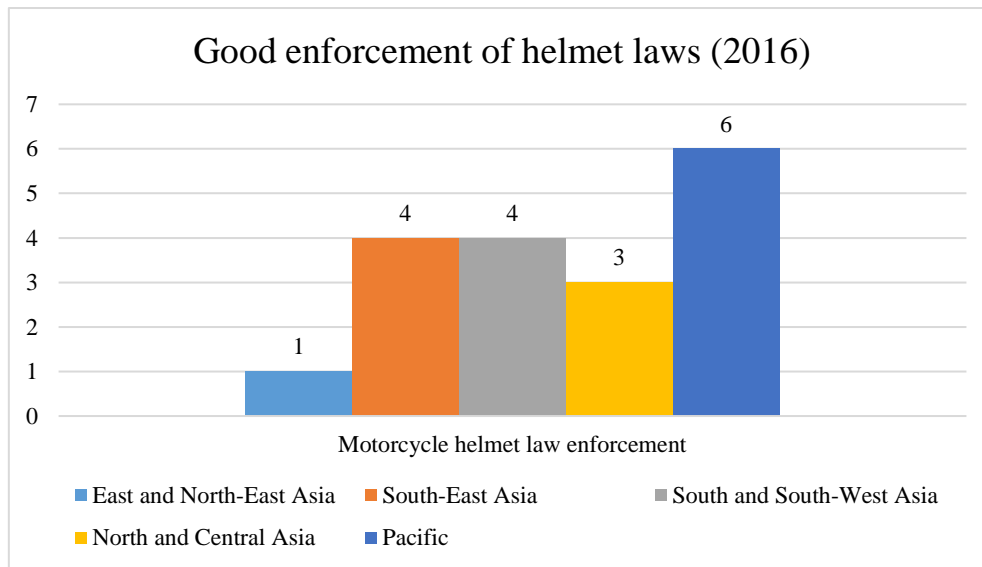


Source: ESCAP analysis based on data from the Global Status Report on Road Safety 2018.

2.4 Enforcement of helmet laws in ESCAP member countries

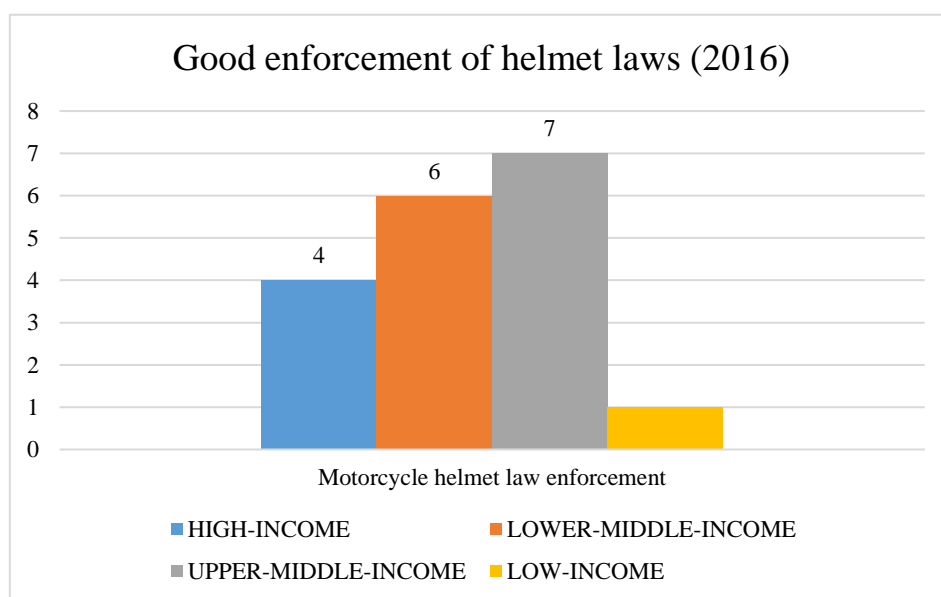
As published in the Global Status Report on Road Safety published in 2015 and 2018 by the World Health Organization, based on perception and country self-reporting, in 2013, 15 ESCAP member countries reported to have good enforcements of helmet use law, however, in 2015, this number increased and 18 ESCAP member countries reported the same.

Figure 5. Status of motorcycle helmet law enforcement by subregion of ESCAP region (2016).



Source: ESCAP analysis based on data from the Global Status Report on Road Safety 2018. Perceived level of 8 or better on a 10 scale is considered to be good in this study.

Figure 6. Status of motorcycle helmet law enforcement by country income level (2016).



Source: ESCAP analysis based on data from the Global Status Report on Road Safety 2018. Perceived level of 8 or better on a 10 scale is considered to be good in this study.



Source: Enforcement of Helmet Law in Thailand, Ishtiaque Ahmed, 2020.

3. Helmet wearing related situation in Thailand

3.1 Background

Thailand has the highest share of vulnerable road users (84.2%) in the ESCAP region in 2013 and 2016. In 2016, motorcycle death represented 39.21% of road traffic death in the ESCAP average, while the proportion in Thailand is 74%, nearly twice higher than the ESCAP average. The Thailand government takes many actions to reduce motorized 2- and 3-wheelers deaths. The national motorcycle helmet law for drivers in Thailand was passed in 1994 and for passengers in 2007. The Thailand Road Safety Action Plan (Year 2004 -2008) strengthens law enforcement and provides road safety educations. However, there are many loopholes. Helmet standards have not been specified for children. Moreover, current penalties do not include a provision for motorcycle impoundment. Also, Thailand does not have laws that require riders of three-wheeled motorcycles and electric motorcycles to wear helmets. (see Table 2)

Table 2. Checklist for Assessing the Comprehensiveness of Legislation on Motorcycle Helmets

	Yes	No
1. Helmet use		
Includes compulsory helmet-wearing for all riders (i.e. drivers and passengers)	✓	
Defines helmet-wearing as including proper strapping and wearing of a helmet that meets national standards	✓	
Requires all riders to wear a helmet on all roads	✓	
Requires riders of all motorized two-or three-wheeled motorized	✓	

vehicles (all engine types) to wear a helmet		
Sets a minimum age for riding a motorcycle	✓	
2. Helmet standards		
Specifies recognized helmet safety standards based on internationally recognized standards	✓	
Includes product labelling requirement and addresses tampering	✓	
Specifies requirements for child helmets (e.g. age or height) depending on the age at which children are allowed to ride on motorcycles		✓
3. Enforcement		
Specifies who has authority for enforcement	✓	
Allow primary enforcement: No other traffic offence is required to stop a violator and enforce helmet-wearing law	✓	
4. Penalties		
Specifies financial penalties	✓	
Includes provision for motorcycle impoundment		✓
5. Other regulatory measures for helmet-wearing		
Establishes penalties for sale of de-specified helmets	✓	
Establishes penalties for tampering with product labeling	✓	
Sets requirements for passenger helmet-wearing for public service two- and three-wheeled motorized vehicles	✓	

Source: WHO (2015), Road Safety Institutional and Legal Assessment, Thailand.

3.2 Issues and challenges in Thailand

While there are motorcycle helmet laws in Thailand, the helmet-wearing rate is still low. In 2010, the national helmet-wearing rate was 43.7%, 53.3% among drivers, and 19.3% among passengers. The situation was not getting any better. In 2016, the helmet-wearing rate was 51% among drivers - lower than 2010 levels, and 20% among passengers – the same as the rate in 2010. Campaigns and community activities do not increase the helmet-wearing rate significantly. According to the stakeholders in Thailand, the helmet-wearing rate has remained stable since the 1970s when national motorcycle law was first introduced. While in other countries with a high helmet-wearing rate, such as Armenia (95% among drivers and 90% among passengers), riders of motorized 2- and 3- wheelers present only 1% of the death. In 2020, WHO provides a qualitative assessment of status against each target in Thailand. In that assessment, the rate is moderate for the target – "By 2030, increase the proportion of motorcycle riders correctly using standard helmets to close to 100%." Because "Thailand has helmet wearing laws in place, however, the key issues are poor enforcement effectiveness and a lack of public awareness of the importance of helmet wearing, resulting in ongoing low wearing rates, particularly for pillion passengers."



Source: Use of helmet is an issue in Thailand, Ishtiaque Ahmed, 2020.

There are many reasons besides inefficient enforcement that keep the helmet-wearing rate from reaching 100%, which are listed as follows:

- Difficulty in collecting data, particularly in the provinces.
- While laws and judicial systems show promise in improving helmet-wearing rates, public perception turns out to be a critical issue. The police have attempted to address this issue. However, they have difficulties in achieving this alone.
- Although helmet-wearing rates are measured, there is little effort to translate this information into practice or to gauge the effectiveness of programs.
- The enforcement of this behaviour is relatively easy (mainly done by observation and does not require any special equipment). However, challenges continue due to limitations in police staff resources and lack of technology usage to support law enforcement; e.g., installation of cameras to detect motorcycle riders who are not wearing a helmet.
- The effectiveness of education campaigns and free-helmet programs are rarely evaluated.
- Lack of coordination – there are many uncoordinated efforts by different agencies and independent organizations.
- Lack of resources and personnel.

Sources: WHO (2015) Road Safety Institutional and Legal Assessment Thailand and WHO (2020) Thailand's status against Global Road Safety Performance Targets, Country Report on Road Safety Initiatives in Thailand, Disparity in motorcycle helmet use in Thailand.

3.3 Discussion and recommendations about the situation in Thailand

The population density and law enforcement activities are significantly associated with the helmet use rate in Thailand. According to the model used by Suriyawongpaisa et al., the conviction rate, a measure of law enforcement, linearly correlated with helmet-wearing rate. Increasing 1 unit of conviction rate increases the helmet-wearing rate by 3.9%. Moreover, the association between population density and helmet-wearing is also linear, increasing 1 unit of population density could increase the helmet-wearing rate by 6.8%.

Thailand has now adopted enforcement programs that help to increase the helmet-wearing rate and improve correct use that meets minimum standards:

- Introduction of a more efficient system that includes fines for non-helmet use
- Inclusion of helmet non-wearing in a demerit point system

The police also engage in public awareness campaigns to increase helmet-wearing rates amongst various populations, including road safety education in schools. In 2011, Kongsan Pongtreekaew et al. conducted a landmark study where they reviewed the state of the road safety laws in Thailand (i.e., Road Traffic Act, Highway Act, Motor Vehicle Act, and Transport Act). In the report, Pongtreekaew et al. provided the following recommendations that could help improve the Road Traffic Act for the helmet:

- Increase the severity of the punishment
- Enact a helmet law for children under 12

And in its report on Thailand's status against Global Road Safety Performance Targets, WHO also provides following recommendations to increase the helmet-wearing rate in Thailand:

- Establish stronger coordination between the agencies that regulate, enforce, and promote helmet use.
- Implement enhanced enforcement programs aimed at general deterrence of non-helmet-wearing and engaging the community to strengthen surveillance.
- Prioritize efforts to increase helmet-wearing rates with appropriate levels of resources and personnel.
- Enhance educational campaigns and programs at both central and local levels to reinforce the perception that wearing helmets save lives.
- Continue collection of helmet-wearing rates to assess the progress and effectiveness of programs/ initiatives.



Source: Driving on highways without a helmet is an issue in Thailand, Ishtiaque Ahmed, 2020.

4. Regional Challenges

4.1 Improper motorcycle helmet usage

It is proven that using a motorcycle helmet in a correct manner can positively improve the chance of surviving a traffic accident. However, many riders still do not fasten the helmets or use the proper size helmets. A study in Malaysia examined the compliance of helmet use in a typical Malaysian town. Of the 5000 motorcyclists studied, only 54% used helmets correctly, 21% used them incorrectly, and 24% did not wear them at all. Younger people, men, and those with less formal education were more likely to not wear helmets properly. The most common forms of incorrect helmet-wearing are not properly buckling the helmet, not buckling the helmet at all, and wearing the helmet backwards. Riders who use helmets improperly cannot reap the full benefit of motorcycle helmets.

It is in part because of the lack of knowledge. Due to the lack of funding and poor coordination, road safety programs and activities continue to be fragmented. Many riders don't know how to wear improper motorcycle helmets properly, especially in a poor area where there is a lack of community intervention programs.



Source: Motorcyclists without helmets in China, Haocheng Hong, 2020.

4.2 Myths and arguments

While 43 out of 44 countries in the ESCAP region have national motorcycle helmet laws. The helmet-wearing rate is still low, especially in low-and middle-income countries. The reluctance to wear helmets is often a result of a lack of knowledge and weak enforcement. But the other arguments and myths also lead to a different set of reasons for rejecting to wear helmets, which is peer pressure among young riders, e.g., ridiculing helmet-wearers:

- Helmets are needed only for long trips (even though most accidents occur close to home);
- Helmets are considered hot and uncomfortable, e.g., in regions with tropical climates;
- The damaging effect on women's hairstyles, whether it is a traditional hairstyle or simply fashion;
- The issue of special headgear, e.g., turban;
- The practical issue of what to do with the helmet when it is not being worn;
- Hygiene, if the rider does not own the helmet.

Some common myths about helmets are:

- Helmets cause neck or spinal cord injuries.
- Helmets impair hearing and sight.
- Motorcycle helmet laws violate individual rights.

- Fatality rates are lower in places without helmet laws.
- There is no need to make helmet use mandatory for all: age-specific motorcycle helmet laws are effective/sufficient.
- Motorcycles are a small percentage of registered vehicles; thus, motorcycle crashes represent a minor burden to society.
- UN Regulation No. 22 approved helmets are not suitable for tropical climate.
- Motorcycles helmets in accordance with UN Regulation No. 22 are too expensive for users in low-income countries.

All these myths and arguments influence rider behaviour.

Sources: World Health Organization (WHO) (2006). Helmets: a road safety manual for decision-makers and practitioners and United Nations Economic Commission for Europe (2016). The United Nations Motorcycle Helmet Study.

4.3 Inadequate attention towards child passengers on motorcycles

Though most countries in the ESCAP region have a national motorcycle helmet law, only 13 countries meet all the five best practice criteria. There are loopholes in existing helmet laws in many countries.

One main loophole is that helmet laws don't restrict child passengers on the motorcycle in many countries. Of the 44 ESCAP member countries, only 14 countries have laws applying to child passengers on motorcycles, 13 countries specify a minimum age (8 to 12 years of age) at which children can ride as passengers, and the helmet-wearing rate among child passengers on motorcycles is significantly lower than the rate among adult motorcycle passengers. As a part of a cross-sectional observation survey of helmet-use among 6- to 12-year-old child pillion riders in Malaysia, 712 riders and 913 young pillion passengers were observed. The number of children wearing a helmet on the route to school was only 134 (14.7%), and the number of riders wearing a helmet was 468 (66.8%). Many countries do not set national child helmet standards, which is another reason for the low children helmet-wearing rate.

4.4 Inefficient tracking and detection system for law enforcement of helmet-wearing

The helmet law has been poorly enforced as a result of the inefficient detection of helmets on motorcyclists. For example, in Thailand, police officers need to set up checkpoints to charge motorcyclists without a helmet. Many times, accidents occur at the checkpoint because guilty motorcyclists attempt to escape. While some countries use CCTV cameras to detect motorcyclists without helmet automatically, there are also problems with CCTV camera detecting system. (1) Temporal changes in environmental conditions such as illumination and shadows increase the complexity of tasks like background modelling. (2) Generally, CCTV cameras capture low-resolution video. Also, conditions such as low light, bad weather

complicate it further. Due to such limitations, tasks such as segmentation, classification, and tracking become even more difficult. (3) 3-dimensional objects, in general, have different appearances from different angles. It is well known that the accuracy of classifiers depends on features used, which in turn depends on the angle to some extent. A good example is to consider the appearance of a bike- rider from the front view and side view. (4) In real-life scenarios, the dynamic objects usually occlude each other due to which object of interest may only be partially visible. Segmentation and classification become difficult for these partially visible objects.

The detection of a helmet on motorcyclist is now possible with high accuracy as described in helmet detection on motorcyclists using image descriptors and classifiers. While sufficient work on automatic detection of bike-riders without helmet using surveillance videos in real-time and using convolutional neural network have been done, they have not been reported to be used by any officials.

5. Regional Opportunities

5.1 Helmet use intervention

Helmet use intervention can significantly increase the helmet-wearing rate. A recent study demonstrated that community participation through public information, public consultation, public meetings, and participative decision-making can raise awareness about the importance of wearing helmets and increase usage rate by 10%. There are many examples to present the impact of helmet use intervention. With the introduction of helmet use legislation for drivers and passengers in Thailand and Vietnam, both countries observed a significant increase in helmet use. What's more, multi-sectoral or community intervention programs in localized areas in Laos and Thailand lead to a substantial increase in motorcycle helmet use in pre-post and controlled study designs. Finally, a school-based program combining teacher and student safety education, and the provision of helmets in Laos lead to a significant increase in helmet use compared to prior to the intervention.

Research has already shown the effectiveness of community activities. Community-based initiatives using the safe community concept can promote the use of helmets among motorcyclists at the population level (Lindqvist, Timpka & Schelp, 2001; Moghisi, Mohammadi & Svanström, 2014a). A safe community can include multi-sectoral groups, including private, governmental, social, educational, and other organizations committed to working on the promotion of helmet use in the form of law enforcement, public education, and accessibility to helmets among motorcyclists at the local level in a safe community initiative (Moghisi et al., 2014a). Similar interventions, including stakeholders in road safety, jointly intensifying education and enforcement on helmet use have been proposed for promoting helmet use among motorcyclists in Africa (Akaateba, Amoh-Gyimah & Yakubu, 2014).



Source: Community activities in Cambodia for helmet use, Satya Boran, 2020.

5.2 Affordable motorcycle helmet price

A higher helmet-wearing rate can be achieved by providing an inexpensive motorcycle helmet. Helmet price is a deterrent for motorcycle riders, especially in low- and middle-income countries. In most ESCAP member countries, there is a great potential to reduce the cost of helmets for the consumer. Research has shown that, on average, factory workers in low-income countries have to work 11 times as long to earn enough money to buy a motorcycle helmet as their counterparts in high-income countries. Providing inexpensive helmets has been successfully introduced in Viet Nam by the non-governmental organization, Asia Injury Prevention Foundation. The Foundation's helmet program distributes tropical motorcycle helmets free to school-age children so that they can ride safely as passengers on their parents' motorbikes.

There is a need for the government to control the helmet price after post the enforcement of legislation. The government should consider the sudden demand for motorcycle helmets after law enforcement and consult with suppliers about pending changes to ensure that the supply of helmets can meet demand. One can see an example of a lack of inadequate planning ahead of law enforcement in Pakistan's Punjab province. A new law on helmets was rigorously enforced soon after the government introduced the law. Owing to an increase in penalties for non-compliance and the introduction of numerous enforcement points, the demand for helmets suddenly shot up. Stocks of locally manufactured helmets quickly sold out, forcing motorcyclists to purchase the imported helmets at a higher price. As a result, industrial helmets jacked up their prices up to twice their regular price, followed by widespread criticism of the government for failing to control helmet prices.

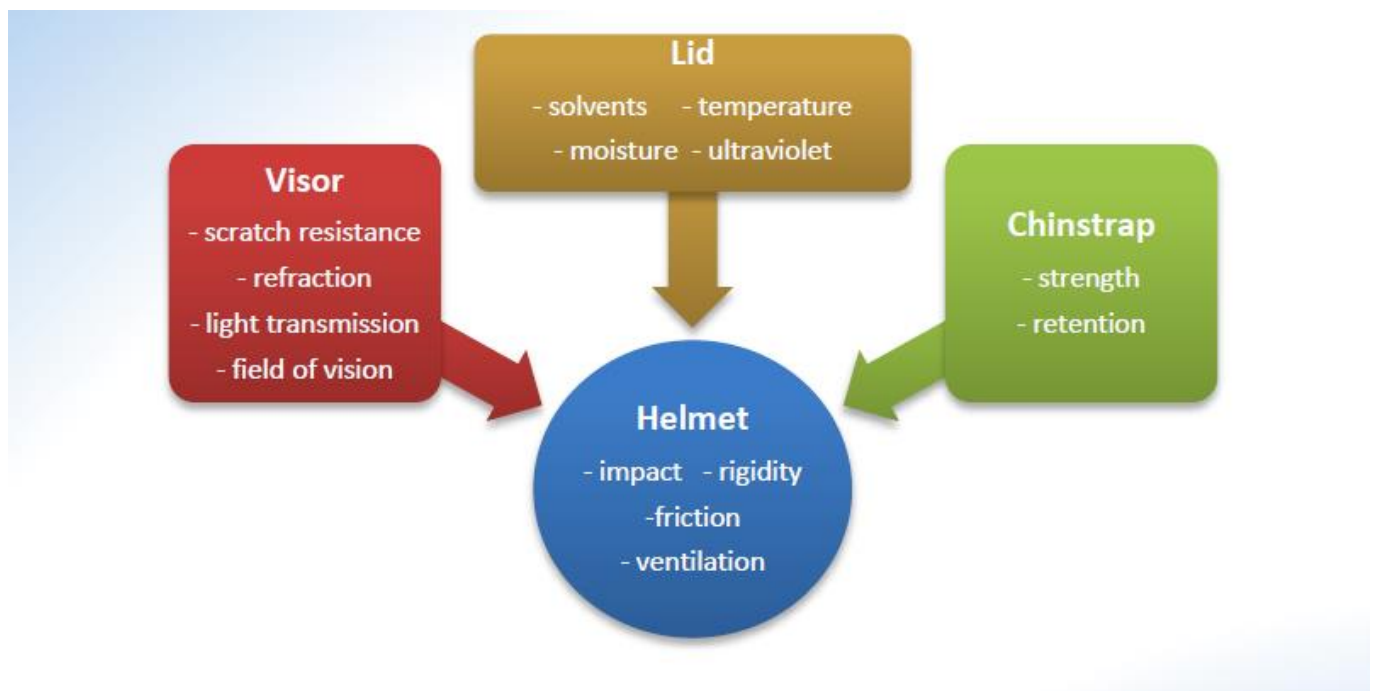
5.3 Good quality motorcycle helmet

The quality of a motorcycle helmet plays a vital role in reducing the risk and severity of injuries. A standard good quality motorcycle helmet can reduce the risk of death by 40% and the risk of serious injury by over 70%. There is a need to set national standards for motorcycle helmets. Helmet standards broadly define helmet characteristics and provide a basic indicator to drivers of motorized vehicles of the safety helmet allowed under the law. While UNECE regulation 22 defines a high-quality international helmet standard (see Figure 3), some low- and middle – income countries develop their individual national helmet standards or don't have the national helmet standards at all because of their easy accessibility and affordability. However, the quality of motorcycle helmets meeting these standards varies significantly. The government should make sure that their national standards ensure good helmet quality.

A good quality helmet needs to be designed to meet the previously described functions and standard requirements. It must also suit the local weather and traffic conditions. Following are some characteristics of a good quality motorcycle helmet:

- Standards often set the minimum coverage of a helmet. Half-head helmets offer minimal coverage. Full-face helmets should ensure that the wearer's peripheral vision and hearing are not compromised.
- To ensure that a helmet can absorb the shock of a crash, the crushable liner should be between 1.5 cm and 3.0 cm in thickness.
- Materials used in the manufacture of a helmet should neither degrade with time or exposure to weather nor be toxic, causing allergic reactions. Currently, the plastic materials commonly used are Expanded Poly-Styrene (EPS), Acrylonitrile Butadiene Styrene (ABS), Poly Carbon (PC), and Poly Propylene (PP). While the material of the helmet shell generally contains PC, PVC, ABS, or fiber glass, the crushable liner inside the shell is often made of EPS – a material that can absorb shock and impact and is relatively inexpensive. However, helmets with EPS liners should be discarded after a crash, and in any case, users should replace such helmets after 3–5 years of use

Figure 7. Requirements and tests for helmets in UNECE regulation 22



Source: https://www.unece.org/fileadmin/DAM/trans/publications/WP29/Leaflet_Helmets.pdf

5.4 Law enforcement and awareness

An opportunity worth exploring is improving the awareness of the existing helmet law for passengers and ensuring that the helmet laws are strictly enforced.

A survey from Piyapong Jiwattanakupaisarn et al. reveals that the awareness of helmet law enforcement can influence the use of motorcycle helmets. The prevalence of helmet use was greater among those frequently observing the police checkpoints for wearing helmets and those perceiving the high risk of being caught for Non-helmet use. However, the use of helmets appeared to be lower among drivers who perceived the checkpoints to take place at the same times and locations, which were likely predicted.

Another way to improve public awareness is an awareness campaign. Research has shown that awareness campaign has a positive influence on helmet-wearing rate. A study conducted by NIMHANS showed that the helmet use rate has increased from less than 5% in 2005 to 60% in 2008 in Bengaluru due to several education programs and media campaigns delivering information about helmet law for the public to wear helmets.

6. Recommendations

Based on this analysis of motorcycle helmet use in ESCAP member countries and identification of best practices, we recommend a few motorcycle helmet interventions. The recommendations are grouped into four major categories:

6.1 Legislation and enforcement

1. The motorcycle helmet laws need to specify a minimum age that children can ride a motorcycle as passengers and require that all children legally allowed as motorcycle passengers must be wearing a helmet.
2. Member countries need to specify the helmet quality standard. Besides the high quality international helmet standard (UNECE regulation 22), ESCAP member countries may consider developing a regional standard. Member countries can develop their own national helmet standards that can be more appropriate to the specific circumstance, more affordable, and more readily available. But member countries should ensure that the standard meets minimum quality criteria and include the testing of helmets at crash-testing facilities. The national helmet standard should cover all riders, including children and adults.
3. We recommend that member countries have strict enforcement of helmet law, which requires widespread government support. This is especially important in low-and middle-income countries where the police resources are limited and lack community education campaigns. One way to increase the level of enforcement is police surveillance – police stepping up operations to check on the wearing of motorcycle helmets.

6.2 Education and awareness campaign

4. We recommend that member countries include education programs in their road safety strategies. The road user behavior can be positively influenced when motorcycle riders are made aware of the reasons for a national helmet law and the consequences of non-compliance. Education programs should target specific skills, such as training on proper buckling of the helmet and choosing a correct fit.
5. We also recommend that member countries include public awareness campaigns in their road safety strategies. Campaigns can be attractive tools for reducing road traffic crashes given their more expansive reach and lower cost of education, coupled with mass media.

6.3 Data collection

6. Member countries must improve their data collection system to know precise levels of motorcycle rider fatalities. This will enable the governments to assess a country's situation and set realistic targets and priorities for the program.
7. Member countries must also develop a national information system with high-quality data, such as helmet-wearing rate and head injuries among motorcyclists in each area. The information system can provide baseline indicators that can be used to monitor and evaluate a program, and provide evidence for arguments on why helmet use is essential and why it should be supported. It will also help identify the problem of lack of helmet use among motorcyclists and assist in depicting the scale of the problem.

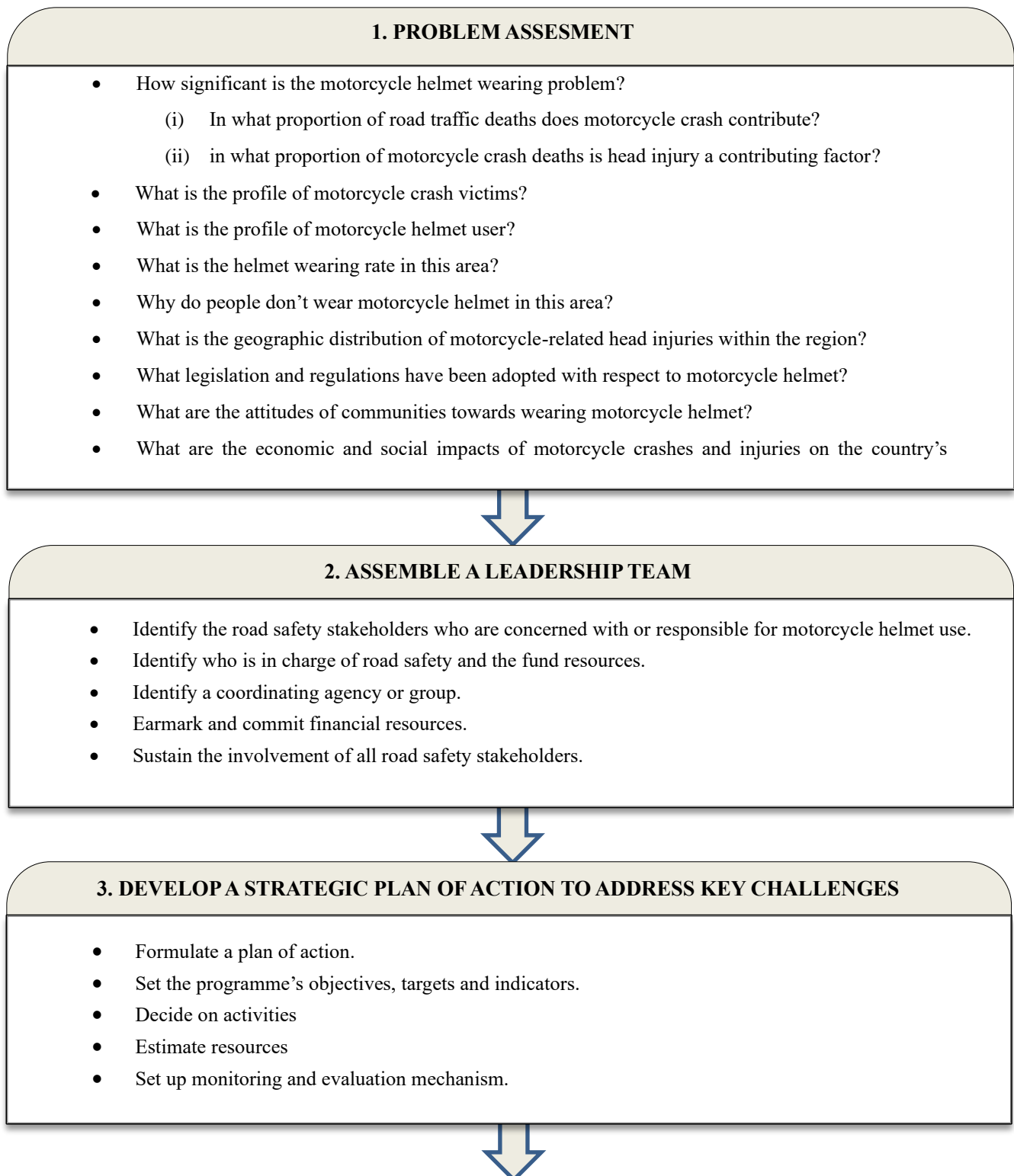
6.4 Detection system

8. Countries should use efficient tracking and detection systems for law enforcement of helmet-wearing to increase helmet law enforcement. Automation for observing the usefulness of helmets without significant human resistance is highly desirable for reliable and robust monitoring of these violations. It significantly reduces the amount of improper helmet use.

6.5 Implementation framework

The following implementation framework should be treated as flexible guidelines. Each country should implement a combination of strategies appropriate to its local conditions and capacities. For this purpose, the following framework as shown in Table 3 may be utilized.

Table 3. Stepwise illustration of the implementation framework



4. IMPLEMENT THE STRATEGIC PLAN OF ACTION

- Public information and education.
- Monitor progress against the plan and against performance indicators.
- Introduce and implement legislation.
- Adopt helmet standards
- Change knowledge and attitude on helmet use
- Educate young people



5. EVALUATION OF COUNTERMEASURES IMPLEMENTED

- Assess changes in baseline measurements collected during problem assessment:
 - (i) Has there been a reduction in motorcycle crash death?
 - (ii) Has the reduction in motorcycle crash death been related to motorcycle helmet use?
 - (iii) Has there been progress with regard to other aspects, such as the attitudes of communities to helmet use?
 - (iv) Has there been an increase in helmet wearing rate?
- Identify lessons learned.
- Conduct an economic evaluation of a program.
- Disseminate evaluation results to gain further report.
- Using evaluation results to feed back into new planning cycle.

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