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Amendment proposals on policies for Powered Two Wheelers (PTW)

Policy Making Guidelines for Vulnerable Road Users for Conditions found in South, Southeast Asian and Other Countries of Transition Economies*, **

Submitted by Institute of Road Traffic Education and University of Birmingham

1. This document provides a comprehensive set of recommendations for developing countries to implement transport and road safety related sustainable development goals 3.6 and 11.2 of the 2030 Agenda.

2. It takes into account the outcomes of the several conferences held in Delhi at IRTE college premises, in 2016 and 2017.

3. It is meant to be complemented by domestic best- practices show –cased as identified by research actions and tutorial exchanges implemented by Institute of Road Traffic Education (IRTE) with the support of National Highway Traffic Safety Administration (NHTSA), FIA Foundation, and other stakeholders, in cooperation with United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) regional commission, in the South and South East-Asia , so to offer replicable references and examples, across the globe.

* The present document was not edited before being sent to the United Nations translation services.

** This document was submitted late due to delayed inputs from other sources.

Executive summary

This paper outlines the fundamental components of road safety for vulnerable road users (VRU) including powered two wheelers (PTW) pedestrians, the elderly, the disabled the very young, schoolchildren transportation and animals for countries of transition economies and rapid motorization growth, such as those of South and South-East Asia (SEA) with the view to offering a policy document associated with the Consolidated Resolution on Road Traffic. Its principles are directional and non-prescriptive.

The paper addresses the need to recognise and therefore improve the safety of vulnerable road users (VRU) through the development of appropriate actions. It has been developed in consultation with the Global Road Safety Forum members on the understanding that any policy and associated implementation strategy can only become practical and applicable if they explicitly recognise the cultural and social contexts of the affected countries and are tailored to the particular context of each country.

The paper has been based on a review of practices in South, Southeast Asia and in consultation with representatives of key stakeholders. It is envisaged that the principles, concepts and options offered hereinafter may be transferred, following adaptation, to countries with similar transport needs found elsewhere, for example in Africa.

Contents

1. Introduction

1.1 Background

The rapid increase in vehicle ownership in the South East Asian Region in recent years has placed considerable pressure on the road network, on drivers, pedestrians and other road users using existing facilities. Traffic accidents are a major concern in the South and South East Asian (SEA) Region. Vulnerable road users (VRU) such as pedestrians, users of non-motorised vehicles and motorcyclists, because of both their large numbers and absence of adequate facilities for them, appear much more frequently among causalities in developing countries than in developed ones. Available data also show that a high proportion of VRUs are involved in fatal accidents. Research in a number of countries indicates that the socio-economic costs of road accidents are normally in the range of 1 to 5 percent of the countries' GDP. There is, therefore, little doubt that the numbers of people killed or injured on the roads in future years will rise substantially and will continue to increase unless effective action is taken urgently to address this growing and serious problem. As far as SEA is concerned, 85% of all road accident deaths concern VRUs. However, this already alarming percentage does not adequately reflect the impact of VRU safety on the societies and economies of the region as important accident information is missing, underreported or erroneous (IRTE, 2017).

Moreover, the use of powered two wheeled (PTW) vehicles is common, popular and growing worldwide. The growth in the use of these vehicles – motorcycles, scooters and mopeds - in both developing and developed countries has been caused by a number of factors. These include urbanization and the increased need for mobility and accessibility, alongside relative vehicle affordability and flexibility. Poor walking and cycling infrastructure, limited public transport services and the expense of cars are also contributing factors. In addition, as income rises, the purchase of a scooter or motorcycle becomes a viable first step towards personalized mobility. With growing modal share, PTWs are increasingly associated with fatal and serious injuries and present a major road safety concern with social, economic and personal implications. The vulnerability of the PTW user is affected by their interaction with fast-moving cars, buses and trucks, the relatively high speed at which they normally move compared to other vulnerable road users, and their lack of both visibility and physical protection.

To gain some perspective on the extent of the PTW road safety issue in South-East Asia, World Health O statistics report that the 11 nations of the region account for the highest proportion of worldwide road deaths at 30.4%. Powered two wheelers account for 34% of these deaths in South East Asia. In addition, it seems likely that the PTW crash rate is will continue to rise as infrastructure expands and traffic grows at rapid rates. There is a need therefore to address the safety of powered two-wheeled vehicles through legal instruments and good practice relevant to the local conditions.

This paper acknowledges that there may be many suggestions made for improving the safety on roads. However, these suggestions can only become practical and applicable intervention strategies if they take account of the cultural and social contexts of the countries concerned; and, if they are 'tailored to the particular context of every country'. Equally significant factors which must be taken into consideration are the background influences on safety, namely road quality, driver behaviour and the general safety culture in different countries.

1.2 Policy transferability and replicability

This policy document is intended to serve as a starting point for further regulatory instruments to be developed at domestic / national level. It is also meant to serve as reference for cohesive

capacity-building actions which are of paramount importance, not only for the Southeast Asia but for other regions of the World as well. Indeed, it is recommended as being highly beneficial for all countries–in particular to follow the appropriate steps for implementing the policy principles outlined hereinafter. It is also vital for countries to remain engaged in policy dialogue at regional level and facilitate inclusive VRU safe mobility actions.

1.3 Definitions

Road users may be defined as **Vulnerable Road Users (VRU) with regard to** '**the amount of protection in** traffic (e.g. pedestrians, cyclists and motorcyclists) **or** by ***the amount of task capability*** (e.g. the disabled, the young and the elderly) (swov.nl, 2017; ec.europa.eu, 2018).

For the purposes of this policy paper, the following groupings of road users have been assessed as vulnerable road users:

(a) PTW (Power Two Wheeled Vehicles)

(b) Cyclists, pedal, non-motorised vehicle riders

(c) Pedestrians

(d) Children

(e) The Elderly

(f) The Disabled

(g) Learner and inexperienced drivers/riders

(h) Road workers

(i) Horse and other animal riders

(j) Man-pulled vehicles

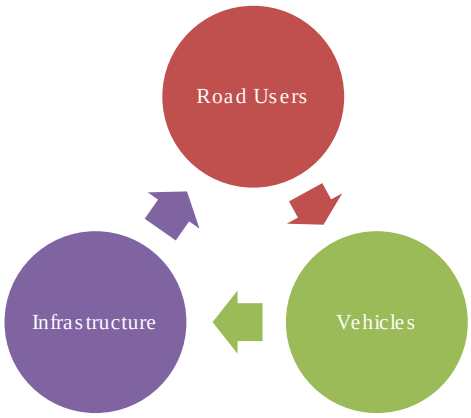
(k) Animals

This document focuses chiefly on Power Two Wheeled Vehicles (PTW) pedestrians, schoolchildren transportation, the elderly, the disabled and to a small extent to animals. It is envisaged that a more comprehensive policy can be developed when the policies suggested hereinafter also cover the remaining groupings of VRUs shown above.

1.4 Key Themes

PTW safety like any other road safety topic should be considered in terms of its three main components (roadsafety.piarc.org, 2018):

1. road users
2. infrastructure
3. vehicles.



Therefore, the recommendations made hereinafter recognize the above holistic relationship as fundamental in achieving good results from any implementation programme. However, the underlying institutional structures, management and financing should also be considered together with the above relationship.

2. Policy issues

2.1 Road safety policy

A well-structured policy is necessary to clarify ownership and responsibility, and targets which are transparent, equitable and reflect accurately road user requirements. Such a policy should consider options, priorities and sustainability (economic, social and environmental). VRU policy should explicitly focus on road safety and recognize it as its primary aim. It should also be part of a holistic vision for road safety and should involve all stakeholders from both the public and private sectors. Policy for VRU should be defined at both Government and Public-Sector Bodies level. Policy instruments should include legislation, regulation and taxation. VRU policy should include vision and mission of all the organizations concerned, objectives communicable to others and detailed standards. VRU safety policy should be sensitive to road user needs and reflect local conditions associated with the environment (security and noise) and societal needs (access and mobility), cultural and religious characteristics. VRU policy should be considered in terms of

- Mobility
- Economic growth and stability
- Prosperity
- The environment (e.g. noise, emissions)

It should ensure healthy lives, make cities and human settlements inclusive, safe and sustainable and strengthen institutions and communities. VRU safety policy as part of a wider road safety policy should facilitate the establishment of appropriate institutional structures (e.g. National Road Safety Council, an executive Road Safety Agency etc).

2.2 Fundamentals

Governments should develop policy reforms to address VRUs and should engage communities in VRU planning and implementation programmes. Transport, road and related policies should be socially inclusive and responsive to the societal and economic needs of

countries of transition economies. They should explicitly recognise the vulnerability of certain categories of road users and address it strategically by means of actions and implementation programmes. They should raise awareness of the existence and needs of these VRUs and the requirement to protect them when they use the road environment. VRU policies should be sustainable in economic, societal and environmental terms. To this end, specific references should be made to the local needs, conditions and context of SEA countries, so that transport planning measures should integrate with public health, environmental, educational equal opportunities, and gender issues.

VRU policies should be based on the Safe System Approach (ECE/TRANS/WP.1/2014/6). It should recognise the fundamental issues that need to be addressed to protect VRUs. Significant knowledge is accumulated worldwide in this regard but it concerns primarily developed nations. Such knowledge should form the basis of any policy in terms of concepts and principles. To this end, it is vital, for some regions of the world, to gather relevant information as far as the following parameters is concerned

1. Insufficient or absence of

   (a) Understanding and recognising of local conditions

   (b) Data of appropriate quality and quantity about road traffic accident numbers and severity which is far from ideal and police data is often the best source of information.

   (c) Legislation which may improve road user behaviour and is a necessity in reducing road traffic crashes, injuries and deaths.

   (d) Strong and sustained enforcement which would enable the public to be made aware of the reasons behind the law and the consequences of noncompliance.

   (e) Post-crash care and trained health care staff

   (f) Clearly defined roles, and responsibilities of, and coordination amongst, the road safety related authorities

2. Technical aspects such as infrastructure and design, traffic composition which forces VRUs to share the road with fast-moving traffic, leading to dangerous situations and lack of road safety audits

3. Developmental issues including rapid motorisation and urbanisation which entails that poor roads are the norm in many of the countries where the risk of road traffic death is highest, and are often built without sufficient planning to take into consideration the safety needs of VRUs and the communities through which these roads pass. This requires sustainable solutions to be identified conforming to international standards.

4. Societal issues such as, low income and low literacy and education of the populations

2.3 Policy and Funding

VRU safety policies should be developed on the understanding that human life is priceless and be associated with a code of ethics. Decisions should consider the economic and financial cost of crashes and therefore be based on the consistent and systematic use of appropriate appraisal models.

Like any other road safety policy, VRU policy should be linked to public health policy. To be implemented, sustained and secure funding from the public and private sectors should be attained. Innovative funding mechanisms may have a role to play within this context, for example, 2nd generation road safety funds (Evdorides et al., 2014), social impact bonds (SIB), as well as mechanisms such as taxation and hypothecation. Collaborations should be

encouraged between the public organizations, the private sector, the industry, the road users and the wider society. Appropriate financial and economic models should be identified to support the development of new funding mechanisms. These models should capture satisfactorily the needs of the road users and the entire society.

2.4 Policy dissemination

Policy related documents should be made available to the public domain through official dissemination means of governments. Government and other officials working in this field should be made aware of the policy documents.

3. Data issues

3.1 Data management

Data and their management is at the core of needs-based decision-making. Therefore, governments and public organizations dealing with VRU safety data should define and consistently use data relevant to their core responsibilities and needs. Data should enable decision making for at least two functions: (a) strategic planning and (b) implementation, operations and evaluation.

Data for VRU should be collected for (a) accident investigation (see also http://www.unece.org/fileadmin/DAM/trans/doc/2017/wp1/ECE-TRANS-WP1-157e.pdf) and (b) injury causation. Ideally, these two data sets should be fully integrated. This is challenging and therefore as a minimum, governments and public organizations dealing with VRU safety should aim at standardizing and harmonizing data management regimes (roadsafety.piarc.org, accessed 27 June 2018).

Data and their management should be sustainable. The choice of data should be based on their (a) relevance to the core responsibilities, needs and priorities of the organization concerned, (b) appropriateness to current needs and resources, (c) reliability and (d) affordability.

Data analysis should lead to performance indicators for VRU which will quantify, monitor and evaluate the associated road safety policies and plans (ESCAP, 2017; WRI 2016)).

3.2 Evidence based policy

Evidence specific to the VRU collisions should be gathered to develop specific policies tailored to the needs of SE Asia and other countries with similar traffic, economic and social features. As a minimum, data collection and analysis should aim at defining

1. Number of VRUs killed and injured
2. Cost of VRUs fatalities and injuries
3. Location of collisions
4. Time of collisions
5. Categories of VRUs, considering the local conditions

3.3 Standardization of crash data

Crash data should enable an understanding of where incidents are taking place, the nature of these occurrences and the circumstances that surround them. Through such data, patterns, causation, black spots, extenuating factors and other important issues around a crash may be gathered and analysis performed to understand and work towards prevention of a similar occurrence. Reliable and robust data collection for each crash should offer a clear and true picture of the distribution and details of crash incidence on a country's road network. Data should be gathered with consistency and reliability, and database interrogation should be carried out by trained staff who understand the shades of meaning within the multiple aspects of the crash records.

3.4 Crash databases

It is important that individual crash records are comparable to others within a database. This should be achieved through joint institutional working (police, public health, local and national authorities and researchers) to agree the nature and contents of data-gathering instruments that will be used at every crash where there is a fatal, serious or minor injury to at least one person involved. Legislation should be put in place to make completion of such forms mandatory within a time-bound period (say, 24 hours) of the crash. A mechanism for checking the accuracy of the data within each form should be put in place as another mandatory aspect of the data collection process.

With standardization of data collected, there is a need for reliable systems to store and enable interrogation of the information obtained. GIS-based crash databases should be established which enable analysis to take place at several layers of understanding, for example, at a particular geographic location, across a designated section of road network, across a predetermined junction type in a set area. This data should also be searchable via queries which draw together crashes with particular characteristics and those that appear to be outliers among others that share common features. The wealth of analysis available through such databases should not be under-estimated as a key to the development of road safety solutions.

3.5 Traffic data

It is imperative that traffic data of good quality and quantity is gathered and used accordingly to develop traffic and transport models pertinent to SEA countries conditions. Appropriate full-scale field trials should be carried out to enable a scientific understanding of the traffic conditions which atypical of developed countries.

4. Sustainable VRU safety

The concept of sustainable VRU safety should be systematically addressed in policy documents, in terms of:

- economic and financial sustainability
- environmental sustainability
- social sustainability

The economic and financial sustainability should concern improved effectiveness and efficiency through a holistic decision-making environment and engagement of stakeholders, the industry and the road users in the strategic planning for VRU safety. The environmental

sustainability should address the health threatening aspects of VRU safety, its impact in terms of costs and benefits, the use of local knowledge and technology, and the impact of climate on road safety. Social sustainability should be linked to gender biases against the inclusion of the needs of women in road policy and planning, support of cost-effective methods in the implementation of road safety policies for PTWs, and community participation in decision-making.

4.1 Cost-Benefit Analysis

Any option to improve VRU safety should be based on evidence of its efficiency in terms of maximising its benefit to cost ratio. Appropriate transport economic methods such as Cost-Benefit Analysis and Economic Impact Analysis should be used as appropriate together with economic and financial data of good quality.

4.2 Research and Development

To be sustainable, the implementation of VRU policy should be based on local knowledge and expertise developed through appropriate research and development programmes. Research organisations, Universities and the industry should establish collaborative schemes and build international links within and outside the South and Southeast Asian region to examine the real causes behind accidents and to develop country-tailored methodologies, designs and materials conforming with and expanding on the international standards. Governments should support such programmes financially and in kind and encourage collaborations with the private sector and the road industry.

5. Infrastructure

5.1 General

Road infrastructure is at the core of VRU safety (WRI, 2016). Policy-makers should ensure that infrastructure is well-maintained, receives the necessary investment and is VRU friendly.

In particular, powered two wheelers are relatively unstable vehicles and also vulnerable to crashes due to driver error and infrastructure insufficiencies. This two-fold source of risk implies that roads should be designed to take account of PTW needs and also that infrastructure-related safety features should be considered to lower the risks to PTW users through maintenance and improvement programmes. It is important that infrastructure considerations for PTW safety should aim at identifying the causes of accidents and options to address them based on robust engineering principles and prioritized needs of road transport.

5.2 Road design

Safe road design standards should be established for PTW and other VRU users based on predictable road geometry, appropriate visibility, wide and constant radii for curves, together with principles for obstacle free zones. Appropriate and secure parking areas for PTWs should also be part of infrastructure design. In addition, all new designs and maintenance activities should include road safety audits which give due regard to effects on PTWs.

To improve PTW safety, a number of road design options could be considered. Although safety barriers should be avoided, when used, they should be PTW friendly. Due attention

should be given to a tendency for PTW crash incidence at T and Y junctions. Entry angles of roundabouts should be between 30o and 40o. Speed bumps should be avoided or have a predictable low impact. Motorcycle lanes should be designed with regard to the movement characteristics and speeds of PTWs.

5.3 Traffic engineering

It is important that established traffic engineering principles and methods should be used to record and analyse the traffic conditions which are specific in SE Asia with the view to develop sustainable solutions. Working practices based on empirical knowledge of local conditions should be supported by analytical (i.e. theoretical) concepts and associated approaches. Any option to address the problems encountered should be based on robust evidence (data). Traffic characteristics (e.g. traffic flows, demand, composition) and predictions should be carefully scrutinised to minimise the associated risks.

5.4 Road Maintenance

To ensure that roads can be made safer for VRUs, it is important to treat the road surface condition which may be affected by potholes, thickly painted markings, dirt, clay, water, oil and other sources of risk to the road user. Road maintenance programmes and appropriate standards should address skid resistance, surface texture and choice of materials. Black spots management for PTWs should also be part of maintenance. Roads fitted with signage, roadside features and alignments aimed at drivers of larger vehicles which cause risk to PTW riders should be evaluated and remedied to become safer. Road defects contributing to uneven surfaces, together with faulty drainage and drains should be treated. Night-time retroreflectivity of road markings in rural areas is particularly important.

5.5 Road demand management and regulation

The increasing number of accidents involving VRU on roads should also be addressed through appropriate regulatory options as part of wider demand management strategies which aim to manage the demand for road transport by maximizing the utilisation of the existing infrastructure. Road authorities should aim at providing facilities for VRUs by considering their cost, effectiveness and sustainability.

Box 3 Infrastructure measures specific for PTW

- Motorcycle exclusive lanes
- Advanced stop lines/zones

1) Channelization using painted road markings

- Control of longitudinal and lateral distances
- Speed management (through enforcement and information and use of appropriate speed limits (e.g. 30 km/h).
- Segregated lanes that may include grade separation at intersections and non-exclusive lanes with extra space provided on the outer side of the road
- Separate supplementary sign specifically for PTWs

Box 4 Infrastructure measures for VRUs

- Road shoulders
- Pedestrian refuges
- Wide and flat-topped medians
- Safe crossing points
- Short distances between crossing points
- Footways on urban roads
- Footpaths along rural roads
- Bicycle lanes

6. Implementation

6.1 Integration with other road traffic safety policies

A comprehensive policy should deal with all issues of road safety including matters pertaining

1. Roles and responsibilities of authorities
2. Ownership of roads
3. Road infrastructure
4. Driver licensing
5. Vehicle registration and certification
6. Control and regulation of transport vehicles
7. Motor Vehicle Laws
8. Non-motorised traffic
9. Enforcement

It should also provide references to other policy documents such as those related to the Health, Education and Economy sectors.

Governments, both national and local, should adapt and then adopt the resolutions for VRU using local knowledge and expertise without overlooking any of the fundamental concepts of road traffic safety. They should widen the participation of both the industry and stakeholders in the decision-making processes for VRU and in the implementation programmes. They should clearly define the duties and tasks of those who are responsible for the safety of VRU's. Ministries or Departments of transport (MT) should work closely with the highway, traffic, civic and education departments to achieve safety.

6.2 VRU related Risks

Governments and road safety related authorities should minimise the risks for VRUs by addressing the following:

- Speed

- Alcohol
- Infrastructure design
- Visibility
- Unsafe driving, driver and VRU distractions (e.g. mobile phones), driver fatigue
- Attitudes of VRUs (e.g. the elderly, the disabled, children) and drivers

Decision makers at both political and administrative position should recognise the vulnerability of pedestrian and adopt appropriate policies. Local authorities should also recognise and understand their responsibility of providing a safe and efficient traffic infrastructure as defined and recommended by appropriate standards. They should encourage public consultation in decision making. Dedicated traffic and road safety engineering units should be established in local and highway authorities. Central and local authorities should take research and planning action for efficient management and control of traffic.

6.3 Measures

Road safety authorities should recognise the interaction between VRU and infrastructure and improve the design, construction, maintenance and operations of road networks. Infrastructure should be forgiving and protective to the attitudes, errors and weaknesses of VRUs. Appropriate VRU strategies (ADB, 1996; WHO, 2015) covering both short and long-term actions should be identified (see Box 1).

Box 1 Examples of VRU strategies

1) Short term

a) Focus on known VRU problem areas and consider the critical role of enforcement.

b) On primary roads, non-motorised traffic turns may need to be banned using attractive traffic management options.

c) Road safety audits

d) Traffic calming measures should be introduced in both urban and rural locations

e) Focus on pedestrian environment and needs Awareness campaigns

2) Long term

a) Physical segregation of VRUs from motorised fast moving vehicles

b) VRU consideration should be incorporated into the road planning stage

c) VRUs should receive priority on lower category roads

d) On roads where VRU movements and flows dominate traffic flows, increased funding is needed to provide VRU facilities.

e) Enforcement, education and publicity actions should complement engineering measures in a timely manner and aim at road users' behavioural change.

Box 2 Actions that may raise awareness for VRU's include

1) Media campaigns highlighting the issue in a manner and to the extent where it jolts the polity.

2) Convey the matter of concern being voiced by public to different levels- public forums. NGOs , schools, colleges, local communities.

3) Convince and involve concerned politicians to raise the issues at political forum.

4) If required, take the option of going in for public interest litigation.

It is important to research and identify sustainable solutions associated with the patterns of VRU flows within areas of specific interest such as schools, bus and train stations, trade centres, local markets and rural communities. In addition, each fatal or serious injury accident should undergo a road safety audit to answer why such accidents happen and what steps should be taken to minimise, if not ensure that they will not happen again. Such actions will ensure that the optimum solutions which are tailored to the needs and conditions of SEA countries are identified and therefore will contribute to the development of new knowledge and know-how.

6.4 Technology

Governments, road safety authorities, industry and stakeholders should encourage the development and use of appropriate technology in vehicles and infrastructure to protect VRU. Technology may concern:

1. Clothing
2. Electronic devices
3. Protective gear using locally sourced materials

Both low cost and high cost solutions should be identified, tested and subsequently used consistently. Local Universities and other research and development centres should be heavily involved in this process to produce viable solutions with regard to the issues likely to be found in the transport sector of SE Asian countries.

6.5 Enforcement

Enforcement is of paramount importance to the success of any short and long-term safety programme. It is vital that enforcement is improved significantly through appropriate measures. Traffic police has a major role to play in this regard and they should train their personnel in issues pertaining to engineering, education and driver training. However, all law enforcement authorities should aim at performing better and appropriate performance management approaches should be introduced accordingly aiming at improving road safety.

7. Power Two Wheeled Vehicles

A comprehensive policy for PTW safety should consider:

1. Infrastructure Considerations
2. Road Users
    (a) Rider Training
    (b) Licences (Full driving, provisional/probationary) and permits
    (c) Insurance
    (d) Safety apparel
    (e) Helmet use regulations
3. Public Health Approach to PTWs' Safety
4. Post-Crash Management
5. Vehicle Standards

PTW policy should raise awareness of PTWs as a legitimate transport mode. It should recognise the benefits of PTW use in South and Southeast Asian countries and link them with region's specific growth needs and transport issues. The role PTW can play in both urban and rural transport should be also recognised together with their vulnerability and their specific safety needs.

These may be further elaborated as follows

7.1 Behavioural issues

Influencing behaviour is key to public policy. Behavioural aspects of PTW safety should be seen from two perspectives: the rider's and the other road users'. Often the focus is on rider behaviour, although other road users' behaviour is also directly relevant to safety outcomes for PTWs. It is important that PTW policy should address the need that all road users should develop holistic skills and knowledge that influence their behaviour in the road environment. It is particularly necessary to ensure that riders are made aware of their vulnerability as PTW users and the need to act and respond to threatening stimuli effectively and efficiently to maintain and promote their (and other users') safety.

7.1.1 Rider

Rider error is found to be the major cause of PTW crashes. Individual PTW rider behaviour is influenced by the behaviour of other riders which can lead to risky habits becoming common, cultural practice within a country or a particular city. It is therefore necessary to address problems such as bus lane intrusion, conglomeration of two wheelers ahead of the junction stop line, overloading of the vehicle with goods or passengers and indulgence in distracting activities such as mobile phone usage while riding through road safety campaigns, consistent enforcement, and other measures. Evidence shows that improving the conspicuity of PTW drivers contributes to the improvement of their safety but it is attitudes to safety apparel and use of headlights that should be the focus of interventions that promote PTW visibility. However, due regard should be given to the need to work around the issues arising from certain approaches being financially difficult to introduce such as ABS systems to PTW and safety apparel for riders such as jackets and helmets.

7.1.2 Professional services

Professional services (e.g. taxi services, carriers who deliver goods) using two wheeled vehicles should be regulated or licenced, and the drivers' skills and character should be of good standing.

7.1.3 Other road users

Legal instruments should encourage behaviour change among other road users towards PTWs, albeit recognizing that such change will be difficult. They should also recognize that other users, such as pedestrians and cyclists, can arguably be more vulnerable in an encounter with a PTW. General road safety awareness mixed with a sensitivity to one's own mortality would help these users to adopt self-protective behaviours in challenging road environments. However, it is important that there is overt realism with regard to any suggested countermeasures. There may be cultural, social, religious and other influencers of behaviour that may require further training with regard to modifying behaviour towards PTWs. It is difficult to encourage behavioural change on a large scale. Smaller actions and interventions

to influence some change may be a solution as evidenced by the work of the UK's Behavioural Insights Team (www.behaviouralinsights.co.uk).

Drivers of larger motorised vehicles should be regularly targeted by safety information campaigns which highlight (a) the recognised inconspicuity of PTWs, particularly at junctions, (b) lane discipline and (c) the important role PTW users play to the economic and social development at community and country level.

7.2 Vehicle issues

PTWs or any modifications should meet minimum safety standards, and this becomes increasingly important as they age. It is necessary to ensure that there are regulations in place aimed at maximising safety for riders and passengers. At the same time, there should be complementary legislative policies and practices introduced to promote adherence to regulations (IMMA, 2010).

7.2.1 Safety standards and regulations

Policy instruments and safety regulations should be employed to reflect local nuances. These standards and regulations should build on international best practice, consider local circumstances and then be tailored to best address social, economic, environmental and behavioural effects on PTW safety. Standards should be legally enforceable.

7.2.2 Improving PTW design

There should be collaborative work between manufacturers, practitioners, policy-makers and the research community to enable PTW design to evolve to reflect the latest advances which help to design out safety risk. Innovative designs that address the mobility issues of South and Southeast Asian countries should be encouraged on the condition that they conform to safety standards. Such designs should cover the transportation of both people and goods.

7.3 Mitigations of PTW-related death and injury

Powered two-wheeler related death and injury can be linked to multi-faceted causes such as behaviour, design and perceived risk. However, central to the consideration of ways to prevent crashes and improve outcomes are the use of safety apparel and medical care post-crash.

7.3.1 Helmets and other safety apparel standards

Protective gear for two wheeled vehicle riders (drivers and pillions) must cover helmets, as a minimum. Other protective gear should include gloves and boots together with jackets and trousers using appropriate materials available locally.

Helmet standards should be compulsory.

The widespread differences worldwide in regulations, standards and other policy components should be reconciled through standardization and harmonization actions. These should also consider the local traditions and religious views. Subsequently it is important that individual nations develop plans to adopt the standards and regulations needed.

7.3.2 Medical care at crash site

The importance of prompt and effective care for people injured in PTW crashes is paramount. Expeditious medical intervention and transfer to suitable care facility is central to beginning recovery and lessening the likelihood that a seriously injured person will become a fatal victim.

7.3.3 Health care provision and follow up

To obtain deeper insight into the patient's journey from crash to recovery, each trauma receiving centre should maintain a PTW dedicated register of details pertaining to injuries and outcomes. This register should be standardised across all such health care sites. In addition, information thus obtained should be transferred to a central database for interrogation to obtain patterns, features and further understanding of medical factors which may contribute to public health policy development.

7.4 Training considerations

Sound road user training is fundamental to providing a basis for development of skills that promote safety for all. It is important to note that it is through practice that skills are developed and honed. Therefore, a sufficient period of training should be required prior to license testing.

It should be recognized that training and testing is just one element of a driver and rider licensing system and appropriate enforcement is needed to ensure that the standards are firmly applied.

The training and testing standards should cover the following

- The vehicles that can be driven
- Who can drive them
- When and where they can be driven
- The processes to achieve all of the above

Whilst it should be acknowledged that different approaches may be followed, good practice suggests a training and testing system should include the following key components:

- Realistic grouping of vehicles
- Administrative arrangements for the system (validity, renewal, retesting, staging etc)
- Minimum age for entitlement
- A competence framework covering the attitudes, knowledge, skills and understanding that a safe and responsible driver and rider needs
- Based on the competence framework a set of standards for:
  - the characteristics of a safe and responsible driver and rider
  - the content of training
  - the trainers who deliver it
- Operating procedures and standards covering the content, location and duration of driving tests and for the recruitment, training, qualification, supervision, monitoring and development of driving examiners

- What happens after the test – penalties, post-test or remedial development, restrictions

The driving/riding test should, as a minimum, contain:

- A theory test based on the Highway Code and educational materials using a large validated item bank that is not in the public domain.
- An off-road test of control and safety for motorcycle riders that should include safety checks, emergency braking, braking accurately under control, negotiating bends, figure of eight, slalom etc
- An on-road test incorporating a realistic range of road and traffic conditions and lasting a minimum of 25 minutes. The content should be specified.

Resource materials should be developed to include:

- A Traffic or Highway Code for all road user groups (covering the regulations and best practice for using the roads)
- Educational (books, DVDs, Apps, on-line content) to support those learning to drive and to act as reference material for qualified licence holders
- Sample theory test questions (but not the live questions and not the answers)

In countries where standards do not exist, research should ideally be undertaken to develop an evidence based set of standards (competences) covering:

- The attitudes, knowledge, skills and understanding that a safe and responsible driver/rider needs
- Training delivery
- The trainers
- The examiners
- The driving/riding test

Consideration should be given to introducing hazard perception training and testing

Learner motorcycle riders should have to wear suitable protective clothing (in addition to a helmet), a high visibility vest, display a sign on the machine to indicate that they are learners and be accompanied by a qualified motorcycle trainer who is in radio contact at all times. No more than 2 trainees should be allowed with the same trainer.

In addition, the industry and the insurance companies should offer support and incentives for rider training. In addition, as the quality of instruction is central to the training's effectiveness, instructor competence should be regulated as part of training provision.

7.4.1 Rider

In the context of PTWs, pre-license training should include technical riding skills such as manoeuvres and appropriate actions in response to varied traffic situations, as well as the importance of using protective clothing and equipment. At the same time, training should also include emphasis on attitudes to safety, defensive riding and hazard perception.

There should also be additional training made readily available post-licensing focused on unravelling any actions that have become habits which could be detrimental to safety and updating risk awareness and defensive riding.

7.4.2 Other road users

All other road users are responsible for their own and other users' safety. During their pre-license training, non-PTW users should be made aware of the vulnerability of PTW users, develop understanding of where and when crashes with PTWs are most likely to occur and acquire robust risk awareness and hazard perception skills.

8. Pedestrian Safety

Governments should recognise the importance of pedestrian in modern transport and provide a road infrastructure for the safe and convenient movement of pedestrians. They should develop guidelines and rules to provide adequate road space for pedestrians and encourage the implementation of tried and tested technologies, especially those which are simple and inexpensive. Research is needed for the application into developing different types of footways suited for different conditions in terms of local terrain and climate conditions (Baluja 2018; IRTE 2009; IRTE, 2010).

Box 5: Strategies to improve pedestrians safety

- Relocation of road space by considering VRUs and other traffic flows
- Introduction of wider sidewalks where possible
- Introduction of pedestrian pathway schemes

8.1 Construction, Maintenance and Financing

The design of footpaths should be appropriate for the road class and depending upon aesthetics, history, culture, type and density of activities. Also, the design and positioning of traffic control devices such as signals, signs and road markings including pedestrian crossings must conform to appropriate guidelines and standards. To ensure longevity, authorities should ensure that material used in pedestrian footways are not substandard and conform to stipulated standards suitable for the specific use and area where the pathway is being constructed. Walkways and footpaths should not be congested or have obstructions including poorly designed or chosen street furniture. As noise and atmospheric pollution harm the pedestrian directly, planning of footways away from the carriageways and plantation of trees along pedestrian walkways need to be considered. Routine maintenance (e.g. cleanliness) of footways and footpaths should involve public participation wherever possible. During road works and road repair activities, effective and proper signs and signals must be installed for protecting, warning and guiding all road users. Also, funds could be allocated to residential associations, market and industrial bodies potentially out of their tax structures to take over the responsibility of routine maintenance.

8.2 Safety of occupational pedestrians

Safety of occupational pedestrians working for road construction and maintenance should be recognised. For example, Traffic enforcement staff should be trained to protect themselves while working on road. Bright and reflective clothing should be provided for enforcement staff. Also, barricades should have high visibility hazard warning lights.

8.3 Vehicle design and pedestrian protection

Severity of injuries to pedestrians involved in road accident could be reduced if vehicle features, particularly the frontal design of bumpers, are re-engineered. Research should be encouraged to identify improvement possibilities for vehicles likely to be found in South-East Asia and other similar regions, in collaboration with the automobile industry, Universities and research centres.

8.4 Educate and create awareness to the general public

Pedestrians should be made aware of the dangers they confront as these will help to make them defensive road users. Awareness may therefore address the following:

(a) Poor visibility during darkness and extreme weather conditions.

(b) Carelessness and taking unnecessary risks.

(c) Walking under the influence of drugs and alcohol.

(d) Traffic rules

(e) The perplexed rural citizen confronting the strangeness of the urban environment.

(f) The negligence of the other road users.

Road safety awareness programmes should be organised by transport authorities through strong collaboration with other departments, organisations and professionals is necessary to include Education, Health, Vehicle Licensing and Traffic Police officers

Road safety education should address Schools, Non-Motorised drivers, riders of cycle rickshaws, animal pulled vehicles and handcart pullers, Local communities and villages situated on highways.

Such awareness activities require funding and sponsorship through print and visual media, radio programmes together with corporate support should be encouraged.

8.5 Define rights and responsibilities of pedestrians

Legislation should be introduced to recognise that the pedestrian in an important traffic unit and to define the rights and duties of pedestrians as road users with regard to the road classification system declared in road legislation.

Pedestrians who engage themselves in pulling, pushing, drawing vehicle for the purpose of any job including pullers of handcraft, food vendors on carts, rickshaw and other such people on the road where movement is regularly involved (except for their own walking) should have a licence to do so. Furthermore, this licence should only be issued after the person has attended a class on basic road rules and laws.

8.6 Enforcement against violations

Violation of all specified standards and rules is common is SEA countries and there is a need to address it effectively and efficiently. However, its underlying causes concern wider societal issues and should be addressed comprehensively. Enforcement is the obvious means to address road violations and therefore traffic police and transport units should coordinate effectively. Enforcement should address road traffic rules violations such as:-

Over speeding.

1. Rash and negligent driving.
2. Driving under the influence of alcohol and drugs
3. Violating traffic signs and signals.
4. Driving of bus without care to alighting or boarding passengers.
5. Footboard travelling.
6. Allowing bus passengers to alight or board at non-scheduled stops such as intersections, on stops signals etc.
7. Allowing passengers to board and alight on a running bus.
8. Driving on pedestrianised areas.
9. Parking on footways.
10. Driving under the permissible age limit.
11. Poor design and poorly maintained vehicles.
12. Major encroachments on pedestrians' facilities should be considered as an offence.
13. All rights of pedestrians.

9. The Elderly, the very young and the disabled

- The elderly: Any approach for the elderly should be sensitive to both their needs and concerns. The latter may include marginalisation, patronisation and lack of respect.
- The disabled: Governments should recognise that a sizeable percentage of road users are disabled and ensure that the disabled, including the visually impaired, should be provided with a degree of support as road users. They should collaborate with all stakeholders in the areas of road and traffic engineering, vehicle design, training and bringing awareness to address the needs of the elderly.
- The very young: Welfare associations, parent and teacher associations, NGOs and village welfare organisations should be involved in decision making and in consequent actions. In addition, unaccompanied young children making their way to school and back are a very high-risk category. In addition, morning walkers, residents association and retired people form groups could assist children crossing roads and at bus stops. Their involvement in VRU safety plan shall be formally recognised and supported.

10. School children transportation

Transportation of children to and from School for educational activities should be addressed with regard to the areas described in the following sections. An associated code of practice should also be developed and adopted by all who are associated with Schoolchildren transport to help improve the standards of safety.

10.1 Driver Training

The drivers' credentials should be regularly scrutinised to ensure that they are properly qualified. It should become mandatory for all drivers who drive school buses to undergo

professional training, which should include some understanding of the behaviour of the children. Proper medical examination must form a part of the procedures before a clearance is given to those who will drive school buses. The same requirements are necessary for drivers of other vehicles which carry school children such as taxis, vans, and auto rickshaws.

10.2 Training of supervisors:

Supervision is required at all stages-during the bus journey and especially during the boarding and alighting stage. Supervisors may include the bus driver, teachers, older students and parents. Parents in particular should be encouraged to participate in supervision. Parents should also be made aware of the safety risks associated with the transportation of their children with their own vehicles as well as all other public and private transport vehicles. Training to all should be imparted on a regular basis. Incentives to supervisors should be offered: for example a free pass system could be introduced to all supervisors. School children should be given the opportunity to participate in reviews of their transport to and from school although their views should be considered with care. Every child using public or contract transport should also be advised of their powers to protect themselves including how to fill a complaint form and to report negligence of driver and defective vehicles.

10.3 Vehicle Features

Transport authorities should be particularly diligent in the certification of school transport vehicles. Regular checks especially during early morning hours should be made to check damaged vehicles, tyres, missing wheel nuts, overloading, excessive emissions and driver credentials. For all vehicles including any modified vehicles the road and vehicle licencing authorities should develop regulations associated with a minimum set of safety standards for all vehicles used for School transport purposes and enforce them firmly. They should also enforce a speed limit for vehicles used in school transport; for example, a limit of no more than 50 km/h is stipulated for buses moving in urban areas.

A number of vehicle specific standards including that for the maximum seating capacity should be met. Trip timings should be realistically planned by all corporations, schools and should be tested and reviewed regularly.

Box 6 Example of vehicle specific recommendations (for India)

1) Buses: Windscreen should be clean and kept free of add-ons (e.g. stickers, decoration etc.)
2) Auto rickshaws:

Auto rickshaw manufacturers should be called upon to devise certain special add-ons in seating to carry school children. Such carrying capacity could then be allowed in the Motor Vehicle Regulations.

3) Rickshaws:

a) The use of rickshaws for school transport must also be regulated by Law.
b) Rickshaw pullers should be trained as they are mostly uneducated and not aware of road rules and signage and therefore they ignore all safety norms.
c) Rickshaws must remain in specific localities and not be allowed to run on arterial roads.

10.4 Roads and their Environment:

Schools in consultation with Traffic and Municipal Authorities should identify parking areas. Parking of School buses for boarding and alighting must be provided and comply with associated standards. School patrol should be encouraged.

10.5 Transport Services

An appropriate set of standards should be developed and met for transport service contractors and vehicles to ensure that

- all vehicles are in good condition, their emission meet the associated standards and they are clean and thoroughly roadworthy according to published vehicle standards.
- the insurance cover indemnifies the passengers and clients
- only fully trained drivers are employed
- the vehicle papers are in order
- all vehicles are equipped with a fire extinguisher and a first aid kit.

Box 7 Example of vehicle specific minimum expectations for schoolchildren transportation (from India)

Safer School bus Design

2) If possible the bus chasis should be lowered for easy climbing up and down even by the younger children. If it is not possible, then at least one more step should be added for this purpose.
3) The bus should have wide and functioning doors. If possible, it should have only one entry/exit door near the driver's side for easy control and emergency exits.
4) It should have a speed limiter to restrict its maximum speed to an appropriate speed, e.g. 50 km/h.
5) The exterior should be painted in a suitable colour to improve conspicuity.
6) The bus should have an adequate number of reflectors on its exterior.
7) It should, as a minimum, have four way flash lights, two in front and two at the back at eye level (e.g. 2 meter height). These should be activated whenever the bus stops on its route stops. This will give warning to other vehicle users and make them more careful.
8) The seating layout and the seat design should be based on economic and safety considerations. The use of seat belts should be encouraged or preferably be mandatory.
9) The bus should have a coloured signage board on all sides indicating that it is a school bus.

Safer Auto-Rickshaw Design

1) To enhance the seating capacity the body should be broadened on sides. Additional foldable seats could also be added.
2) It should not carry more children than it can comfortably accommodate.
3) Through better design, proper storage system should be provided for keeping school bags.
4) The exterior should be painted in an appropriate colour to make it more conspicuous. If this is not possible for dual purpose (public as well as school children) autorickshaws, then at least a coloured signage board should be fixed on rear side indicating that it carries school children.
5) It should have an adequate number of reflectors on all sides as mentioned in safer bus design.
6) Research indicates that rear facing seats may be safer than front facing seats in case of frontal impacts. Therefore this principal may be used for making exclusive autorickshaws for carrying school children.

Safer Cycle Rickshaw Design

1) Its exterior should be painted in a conspicuous colour
2) Signboards on all possible sides should be fixed indicating that it carries school children.
3) An adequate number of reflectors on all sides should be fixed.
4) The design should be modified to improve seating and storage capacity.
5) The braking system of good standing should be installed.

Safer Bicycles

1) The parents should choose appropriate bicycle for their children. The height of the bicycle should be such that the child's feet should easily touch the ground in normal sitting position. For this, the seat height should be adjusted if required.

2) For better conspicuity, the bicycle should have an appropriate colour (e.g. yellow or orange) visible during the day as well as at night.
3) It should have white reflector at front, red at the back and yellow on the sides.
4) The parents should check that the bicycle has a bell in working order.

Notwithstanding standard rules and regulations for the safe transportation of school children to and from school, any vehicle used for such purposes should be examined in terms of its suitability with regard to the following criteria:

(a) Economic Viability of school transport Vs Value of life.

(b) Convenience of service vs licenced vehicle driver's responsibilities.

(c) Non-availability of public transport

(d) Lack of competition between transport operators in terms of their safety records

Parents, schools and their association should be made aware of the above and of the opportunities available to them both direct and indirect, to influence decisions and actions aimed at improving school children transport safety. Action plans for the provision of safe school children transport should be developed in consultation with and involvement of schools, parents association, Automobile Association, the traffic Police and NGO's. Lines of responsibilities for School Authorities, bus operators, drivers and any other party involved in school children transportation should be clearly defined. Vehicle and drivers licensing authorities should be made aware of their responsibilities.

11. Animals

Infrastructure related solutions should be provided to enable the safe movement of animals away from the road environment. Such solutions should seek to influence wildlife behaviour, physically separate animals from the roadway, influence driver behaviour, reduce animal population size and modify road design and planning. Appropriate solutions may include reduced vehicle speed, increased median width, vegetation removal, warning signs, alternative alignment or road removal, fencing, underpasses and overpasses, boulders in the right of way, escape ramps, and temporary road closures. Country specific research is required to identify solutions based on appropriate technology, local knowledge and experience.

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