Best practice for safe roads around schools

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Abstract

Vulnerable road users have less resilience to falls or collisions, limited mobility and/ or reduced ability to understand the road environment and behave in a safe way when interacting with other, non-vulnerable, road users. Especially for children, there are multiple risk factors that together lead to an increased risk for them in traffic. Traffic environment around schools consists one of the most complex traffic environments regularly encountered by children. Therefore, safe and accessible routes from home to school and vice versa are required. The objective of this paper is twofold. Firstly, it aims to attract attention to best-practice infrastructure engineering strategies near schools in terms of road safety. Secondly, the results of a survey performed in the framework of RADAR project within the Danube area and the RSEG countries are presented. This twofold approach leads to the development of recommendations for enhancing road safety around schools.

Keywords: *schools, road safety, road infrastructure, children, best practice*

Περίληψη

Οι ευάλωτοι χρήστες της οδού είναι λιγότερο ανθεκτικοί σε πτώσεις ή συγκρούσεις, έχουν περιορισμένη κινητικότητα, ή/ και μειωμένη ικανότητα αντίληψης του οδικού περιβάλλοντος και ασφαλούς συμπεριφοράς όταν αλληλεπιδρούν με άλλους, μη ευάλωτους, χρήστες της οδού. Ειδικά για τα παιδιά, υπάρχουν πολλοί παράγοντες που τα οδηγούν σε αυξημένο κίνδυνο στην κυκλοφορία. Το κυκλοφοριακό περιβάλλον γύρω από τα σχολεία αποτελεί ένα από τα πιο περίπλοκα με το οποίο τα παιδιά έρχονται συχνά αντιμέτωπα. Συνεπώς, απαιτούνται ασφαλείς και προσβάσιμες διαδρομές από το σπίτι στο σχολείο και το αντίστροφο. Ο στόχος της παρούσας εργασίας είναι διπλός. Αρχικά, παρουσιάζει διάφορες καλές πρακτικές και επεμβάσεις στην οδική υποδομή κοντά στα σχολεία από άποψη οδικής ασφάλειας. Δεύτερον, παρουσιάζει τα αποτελέσματα μιας έρευνας που πραγματοποιήθηκε στο πλαίσιο του έργου RADAR στις χώρες της περιοχής του Δούναβη και του RSEG. Τέλος, αυτή η διπλή προσέγγιση οδηγεί σε διάφορες προτάσεις για τη βελτίωση της οδικής ασφάλειας γύρω από τα σχολεία.

Λέξεις κλειδιά: *σχολεία, οδική ασφάλεια, οδική υποδομή, παιδιά, καλύτερες πρακτικές*

1. Introduction

The term "vulnerable road user" is applied to those most at risk in traffic, i.e. those unprotected by an outside shield. Pedestrians, pedal cyclists and motorcyclists are often mentioned as vulnerable road users (VRUs) (OECD, 1998; Yannis et al., 2020). VRUs have less resilience to falls or collisions, limited mobility and/ or reduced ability to understand the road environment and behave in a safe way when interacting with other, non vulnerable, road users. Especially for children, there are multiple risk factors that together lead to an increased risk for them in traffic, with either physical or behavioural nature. First, children observe the road environment from a different perspective than adults due to their smaller stature, which makes it more difficult for them to see oncoming traffic (Trifunović et al., 2017). Because of their physical disadvantage, it is also harder for drivers to detect them and at close proximity children may be invisible below the height of the vehicle, especially when standing between parked vehicles (Agran et al., 1994; Ivarsson et al., 2006).

Besides physical disadvantages, major reasons of children's high involvement in road crashes are related to behavioural and cognitive factors (Riaz et al., 2019). It is difficult for children to judge speed accurately and it is not uncommon that, when crossing a road, children may let a slow vehicle pass but instead cross in front of a fast one (Schieber & Thompson, 1996). It is a quite frequent phenomenon for children to cross the road simultaneously with vehicles and not to use pedestrian crossings. Children often may exhibit unexpected behaviour while using the road network without considering the consequences of their actions. Also, they tend to focus only on things that interest them most and are easily distracted. Lastly, children often focus on what they think is the quickest route to reach their destination even if this route may be quite dangerous.

As a result, road traffic injury is currently the leading cause of death for children and young adults aged 5–29 years, signalling a need for a change in the current child health agenda, which has heavily ignored road safety (WHO, 2018).

Schools and the areas around them attract a high number of children on a daily basis. The traffic environment around schools consists one of the most complex traffic environments regularly encountered by children. Therefore, several research studies have been conducted on children's travel to their school and related safety over the years (Pease & Preston, 1967; Ampofo-Boateng & Thomson, 1990; Zeedyk et al., 2001). Children are not always equipped with the appropriate skills to deal with such an environment, resulting in an increased risk of road crash incidents. Consequently, safe and accessible routes from home to school and vice versa are required.

In this backdrop, the objective of this paper is twofold: Firstly, it aims to attract attention to best-practice infrastructure engineering strategies that can potentially be implemented near schools in order to improve road safety. Such interventions concern speed management measures, installation of warning signs, parking management around schools, safe design of pedestrian crosswalks etc. Selected case studies from EU countries and internationally are demonstrated, serving as a best practice identification regarding safe roads around schools. Secondly, the results of a questionnaire survey performed in the framework of RADAR project within the Danube area countries and the RSEG countries regarding road safety around schools are presented. In the last part of the paper, based on this twofold approach, some recommendations for enhancing road safety around schools are proposed.

2. Infrastructure Engineering Strategies

School staff, parents or local residents often observe several road safety problems near school areas. These problems are also commonly identified by site inspections and road safety audits or statistical analyses of data on road crashes and related casualties near schools. Finding solutions and suggesting the appropriate interventions to some problems require expertise in road safety and traffic management, and each situation may have its own unique characteristics. However, there are some more obvious problems near schools such as deficiencies in pedestrian footpaths, missing warning signs, etc., for which common engineering strategies may assist in identifying hazards and suggesting solutions. It should be noted that the implementation of an intervention on the road infrastructure in order to address one problem should be done with caution not to create a different deficiency. Thus, a holistic approach should be followed.

2.1 Speed Management

A fundamental requirement of the road environment near schools should be low traffic speeds. The following measures and interventions could be implemented in order to reduce traffic speeds and keep them at safe levels for all road users.

Installation of special school zone speed limits is a quite common approach. School speed zones are designed to improve road safety for both students and parents as they enter or exit the school. They typically involve the lowering of speed limits near schools with focus on the main entry or exit points and crossings. These speed limits should be set to a maximum of 40km/h and preferably less during school hours. Static warning signs on approach to a school zone and static speed limit signs displaying reduced school zone speed limits and when these limits are applicable should be placed, in order to increase awareness of school zones (Fitzpatrick et al., 2008). The addition of flashing lights to school zone speed limit signage to indicate the operation of the zone has been found to increase awareness of the school zone and lead to a 10km/h mean speed reduction (Turner, 2005). Dynamic road signs indicating variable school zone speed limits and drivers' speed consist another effective treatment for speed management near schools leading to an estimated 10-12 km/h mean speed reduction (Singh, 2011). Speed limit pavement markings can also be applied in the traffic lane to remind drivers of the regulatory speed limit.

Roundabouts are also a useful speed and traffic control treatment at intersections that can improve road safety and traffic flow in several ways. Roundabouts contribute to safer vehicles' u-turn and help parents picking up or setting down children on the school side of road without having to travel long distances or attempt to u-turn near the school. In addition, roundabouts contribute in the reduction of the mean speed of vehicles travelling through the intersection. The results of studies in the literature point out that the number of road crashes is significantly reduced in roundabouts with the highest decrease observed for fatal road crashes. More detailed analyses indicated that there are no significant differences in the effects of roundabout among different countries (Elvik, 2003). Some studies have been carried out aiming to identify the effects of roundabouts on road crashes for different road user groups. These studies showed that pedestrian crashes are reduced to the same extent as other types of crashes. However, the reduction of cyclists' road crashes is smaller (10-20%) compared to the 30-40% reduction of injury road crashes' total number (Lanani, 1975; Minnen, 1993; Jørgensen, 1991; Schoon & Minnen, 1993).

Speed-reducing layouts and devices are also commonly used to impose low speeds and increase pedestrians' safety feeling. Such kind of devices that are used widely near schools are speed humps. Speed humps are artificial elevations on the carriageway that can reduce injury road crashes by about 41% (Elvik et al., 2009).

Median refuge islands are also a treatment that contributes in safer and more convenient street crossing by pedestrians and children. Median refuge island slows traffic as it narrows the road eliminating long and wide straight sections and it also reminds drivers that pedestrians could be crossing the road. Furthermore, it enables pedestrians to split the road crossing into two stages, one for each traffic direction, and it provides a useful intermediate refuge area on the island. This measure acts also as a deterrent against overtaking vehicles which is particularly important in the vicinity of schools. The operating speed reduction of the vehicles due to the existence of median refuge islands on the road has been confirmed by several studies (Fildes et al., 1987; Kolsrud, 1985; Vey & Ferreri, 1968; Yagar & Van Aerde, 1983). It has been estimated that the construction of median refuge islands reduces the number of pedestrian injury crashes by about 18% (Elvik et al., 2009).

Curb extensions can also be used for improved pedestrian safety and traffic calming. They are an extension of the curb line into the roadway and are commonly installed along streets with on-street parking and extend to the travel lane. The pedestrian safety advantages include shorter crossing distance and increased visibility for both the driver and the waiting pedestrian of the approaching motor vehicles. Furthermore, they act as a deterrent for on street parking at the locations where pedestrians normally cross the road.

Rumble strips are a road safety measure aiming to alert inattentive drivers of potential danger and result in speed reduction. Rumble strips involve changes in the surface texture of the road pavement that lead to knocks, vibration and noise within the vehicle. Rumble strips are mostly installed on approaches to junctions, and it is estimated that they reduce the number of injury road crashes at junctions by around 33% (Elvik et al., 2009). A disadvantage of rumble strips is that, especially in residential areas, the noise produced by vehicles passing over them may not be acceptable by nearby residents.

Narrowing traffic lanes is also an infrastructure intervention that could enhance road safety near schools. Especially in residential areas, wide streets may not be necessary because they encourage higher vehicle speeds. The reduction of roadway lane widths also provides additional area for bicyclists and pedestrians and discourages on street parking.

Chicanes (narrowing alternate sides of the road) combined with road signs can also be used in residential streets aiming to reduce vehicles' speed. Chicanes involve curved curb construction alternately on the left and right side of the road, aiming to increase the street curvature and reduce vehicle speed. However, this measure may not be the best choice in front of schools because drivers tend to have to focus on negotiating with these interventions rather than being alert for children. It may be more appropriate to install chicanes on school approach roads.

Raised pedestrian crosswalks are crosswalks in the form of speed humps with a "plateau" that has about the same height as the sidewalk. They extend the sidewalk across the road and bring motor vehicles to the pedestrian level. They also improve accessibility by allowing a pedestrian to cross at nearly a constant grade without the need for a curb ramp and makes the pedestrian more visible to approaching motorists. Their basic aim is to reduce vehicle speeds. The installation of raised crosswalks at locations where there previously was no crosswalk has been

estimated to reduce the number of both pedestrian and vehicles injury road crashes by 65%; if they are installed as an improvement of existing marked crosswalks, the reduction for pedestrian crashes has been estimated at 42% (Elvik et al., 2009).

Raised intersections involve raising the roadway surface at the central area of an intersection, formulating a type of "plateau" across the intersection, with a ramp on each approach. The plateau is at curb level and can be enhanced with distinctive surfacing such as pavement colouring, brickwork or other pavements. Raised intersection impose a safe, slow-speed crossing of vehicles along with public space at minor intersections. Similarly to speed humps and other vertical speed control elements, raised intersections impose slow speeds and encourage motorists to yield to pedestrians at the crosswalk.

Finally, there is a variety of treatments that involve restrictions of access to roads that can contribute to traffic calming, such as partial and full road closures to motorized vehicles. However, these have a significant effect on permeability of traffic flow with through traffic being diverted to other roads. They should only be considered as part of an area-wide review of traffic safety and access and the safety implications on schools should be considered in that context. It should be noted that full closure is usually a last choice.

2.2 Warning Signs

School advance warning signs and school crosswalk signs are important elements for road safety near schools. School advance warning signs should generally be used in advance of the first school crosswalk sign encountered by each direction of traffic. School crosswalk signs shall not be used at crossings other than those next to schools and those on established school pedestrian routes. Warnings to alert drivers to modify their behaviour as they approach a school could include school crossings, pedestrian crossings, presence of school, presence of pedestrians near school, people with disabilities etc.

2.3 Parking Management

Inconsiderate on-street parking is increasingly causing problems around schools that put the safety of children and others at risk. Cars' parking on inappropriate locations may create visibility problems for pedestrians of all ages who are crossing the road to and from schools. A lot of parking infringements are observed around schools due to the increased short term parking demand related to dropping off or picking up school children.

For lengths of roads that are intended for pick-up and set down areas only, "no parking" signs should be used. These signs are appropriate to use on a length of road immediately in front of a school. They allow children to be dropped off or picked up in the minimum amount of time. However, in the after-school period, parents often arrive earlier than school finishing time so pick-up sections are usually inadequate to serve their needs. For this reason, parking areas that cater for parking of vehicles are necessary. The requirement of parking at schools is highly associated with the number of students attending a school. Access to public transport, vehicle ownership and population density are some other important factors that are related to parking demand in an area.

Regarding on-road parking, embayed parking is preferred along school frontages. It enables curb nodes to protrude at intervals along a road, reducing pavement widths for through traffic and providing places where pedestrians can see past parked vehicles and be seen by drivers. Bus parking could be off-road. However, the bus turning circle requirements can be forbidding

and it may not be feasible to cater for buses other than in indented parking areas on the road. Regarding public transport to and from schools, the most preferable choice is for public buses to drop off and pick up children on the side of the school entrance but not right in front of the entrance.

2.4 Road Crossing

Crossing roads can be quite difficult especially for children. Marking a pedestrian crossing does not always ensure enough safety for pedestrians because drivers do not always observe the duty to yield for pedestrians crossing the road on marked pedestrian crossings (Varhelyi, 1998). In order to improve the pedestrians' safety, the crossing point could be signalised. Traffic control signals are usually installed at intersections with high volumes of conflicting traffic. The signals may also include pedestrian lights (i.e. green means "walk" and red means "don't walk") incorporated with signals. However, it is not very easy for young children to understand the operation of traffic control signals. Therefore, they may not be the best solution to improving safety for young children who want to cross the road.

Keeping pedestrian crosswalks brightly painted and well maintained helps alert drivers to look for pedestrians crossing the street, improving pedestrian safety and visibility. Crosswalks that are painted with a zebra or ladder stripe are more effective than two parallel lines because they are more visible to all road users. Some pedestrian crossings have zig zag lines marked on the road before the crossing. Zig zag line on the road in many countries means that the driver is approaching a crossing which the driver may not be able to see because of a curve, crest or dip in the road.

2.5 Bicycle Safety

The number of bicycle users vary from one school to another and from country to country. It is important to enhance the safety of children who choose to go to their school by bicycle. One general guideline for bicycle safety is the creation of wide bicycle paths around schools which ensure the safe co-existence of cyclists and pedestrians. Moreover, the entrances to bicycle parking areas on schools should be separate from the entrances of other motor vehicles (e.g. cars, buses etc.) and pedestrians. Generally, the potential conflicts between bicycles and motor vehicles should be avoided.

3. Case Studies

3.1 Star Rating for Schools

Star Rating for Schools is the first evidence-based tool for measuring, managing and communicating the risk children are exposed to on a journey to their school. It supports quick interventions that could save lives and prevent road crashes with serious injuries from day one. Star Rating for Schools identifies the road features and traffic conditions that affect the pedestrian safety on a journey to their school. It measures safety before and after road improvements. It provides an evidence-based rating of road safety. More specifically a Star Rating can be calculated at spot locations, where 1-star is the least safe while 5-star is the safest. It combines a central web application and a data collection Android app that harness the power of the iRAP Star Rating for Pedestrians (Star Rating for Schools, 2020).

Figure 1: *Example of upgrades in Lusaka (Zambia) led from 1 to 5 stars school entrance (Source: Star Rating for Schools, 2020)*

3.2 Credible speed limit in Zone 30, Slovenia

In town Krško in Slovenia, there was a need for new road design near the primary School. This need occurred because it was planned to re-design all the section of the road within the town borders with similar features as the road design near the School where the 30 km/h was already implemented. Therefore, if the rest road network would look similar to the road network near the School, the credibility of road design in zone 30 km/h near school would be lost. The aim of this case was to implement a new road design that would lead to lower driving speeds, more careful driving and increased road safety mainly for children walking or cycling to their School. After comparison of "before and after" implementation of colourful road design, it was observed that driving trajectories were not affected by the colourful circles and these were not a hazard for drivers. Moreover, speed measurements showed that drivers tended to slow down and reduce speed, and it was concluded that this project was successful since credible speed limits and VRU's enhanced safety were achieved (PIARC, 2019).

Figure 2: *Example of interventions (Source: PIARC, 2019)*

3.3 Road Safety in Rural School Areas, Chile

One of the most important road safety application policies of the Road Direction of Chile was the enhancement of road safety in the rural school environment. The main objective was to ensure calm traffic areas for schools' environments and create a school safety zone for students, teachers and parents, especially during the hours of entrance and exit of students. In addition, particular emphasis was placed on achieving operating speeds that comply with the national regulations. The most common engineering measures used for traffic calming are described below. Lane narrowing on the horizontal curve was an effective way to increase road safety. Moreover, speed humps and speed cushion found to be relatively low cost measures that force drivers to reduce traffic speeds. Transverse lines were also influential on driver behaviour (PIARC, 2019; Public Works Ministry of Chile, 2016). The results indicated that drivers were able to reduce their speed less than or equal to 50km/h in front of the school, when speed humps were installed.

Figure 3: *Speed hump (left), Transverse lines on both lanes (right) (Source: PIARC, 2019)*

4. Survey in RADAR and RSEG countries

In order to collect information about rules and data concerning road safety around schools, a questionnaire was designed and dispatched to Danube area countries and RSEG countries within the framework of RADAR project. The questionnaire comprises of the following five survey topics:

1. Collection of road accidents data related to casualties near schools.
2. Specific guidelines for road infrastructure safety around schools.
3. Special infrastructure measures “traditionally” used.
4. Specific speed limits set by Road Traffic Code near schools.
5. Best practices for road safety infrastructure measures near schools.

Responses were collected from seven (7) countries: Austria, Bulgaria, Croatia, Czech Republic, Greece, Republic of Moldova and Slovenia. In the following sub-sections of the paper, the responses of the questionnaire survey are presented and discussed. Results are reported “by topic”, and for each topic of the questionnaire aggregated results are provided.

4.1 Collection of road accidents data related to casualties near schools

According to the responses provided in the survey in six (6) out of seven (7) countries, data related to casualties near schools are not collected (Figure 4). Only Austria responded positively, stating that, although there is no specific variable or value in the road accident

database that would specify whether a crash has occurred near school, there is a checkmark in the field "way to or from school". The Austrian police is responsible for collecting such data.

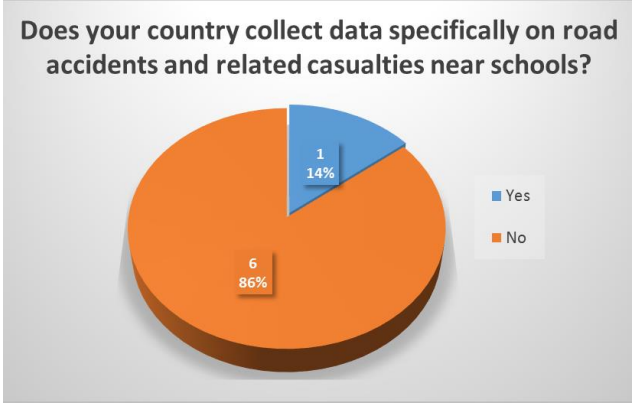

Figure 4: *Responses concerning the collection of casualties' data near schools*

4.2 Specific guidelines for road infrastructure safety around schools

Regarding the existence of specific guidelines for road infrastructure safety around schools (Figure 5), three (3) countries responded negatively: Bulgaria, Croatia and Moldova. In Austria, the guidelines related to road infrastructure safety around schools are part of the Austrian Design Guidelines for Road and Rail RVS issued by the FSV (Austrian Research Association for Roads, Railways and Transport - www.fsv.at). In Czech Republic, guidelines are issued by a Non-profit organization called "Prague Mothers". There are manuals available for both "Walking to School" and "Safe Routes to School", together with many other publications advising vulnerable road users on various topics. In Greece, specific guidelines for road infrastructure safety around schools are included in a relevant law (FEK 2302/B/2013). In Slovenia, the associated guidelines are issued by the Slovenian Infrastructure Agency.

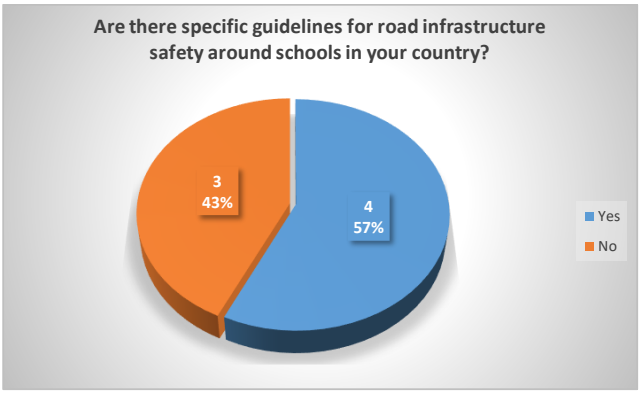

Figure 5: *Existence of relevant guidelines for road infrastructure safety*

4.3 Special infrastructure measures "traditionally" used

Within the questionnaire survey, detailed information regarding the implementation of special infrastructure measures was collected in the aforementioned countries. Based on the answers, it occurs that most of the infrastructure measures aim to reduce speed near school zones.

In all countries, except for Austria, speed humps are used near school areas. In most countries (Austria, Bulgaria, Czech Republic, Greece and Moldova), speed limit signs are placed.

Furthermore, in many countries such as Austria, Bulgaria and Croatia crossing aids are used such as zebra crossings and pavement markings. Other common protective infrastructure measures are refuge islands (Austria and Czech Republic) and chicanes (Austria and Slovenia). In Croatia and Moldova, speed cameras are also used. It is worth to be mentioned that in Austria, during morning hours, streets around schools are sometimes closed, in order to reduce traffic.

4.4 Specific speed limits set by Road Traffic Code near schools

According to the questionnaire survey, in none of the seven (7) responded countries there is a specific speed limit set near schools by the Road Traffic Code. In most of the countries, a speed limit of 30km/h is generally used near schools (Austria, Bulgaria, Moldova). In Croatia, 40km/h is "traditionally" used near schools. In Greece, the speed limit can be even 20km/h. In Slovenia, 50km/h is used in general, but in some cases it may be set to 10km/h on less busy roads. Czech Republic did not specify a commonly used speed limit near schools.

4.5 Best practices for road safety infrastructure measures near schools

Concerning the existence of best practices for road safety infrastructure measures near schools, most of the seven (7) countries replied positively.

In Austria, a research project named "Inspection and improvement of road safety in the school environment", was financed by the Austrian Transport Ministry in 2015 to provide the basis for the guideline mentioned in question 2. In Bulgaria and Croatia, it is considered that the "traditionally" used infrastructure measures, mentioned in question 3 recommend best practices. Furthermore in Croatia, the Faculty of Transport and Traffic Sciences has recently performed a research related to Safety of children in elementary school zones. In this research several countermeasures were proposed on the observed road sections near schools, including the realignment of road infrastructure elements and placement of various physical barriers in order to narrow traffic lanes, placing the speed bumps on the road, reconstruction of existing intersections or construction of mini-roundabouts at entrances/exits of school zones, placing speed cameras, reorganization of traffic flows, improving the quality of horizontal and vertical traffic signalization, banning the motorized traffic on critical road segments, introducing the school zone patrols etc. In Czech Republic there are some technical conditions for general traffic calming in urbanized areas, movement of vulnerable road users or principles for designing urban through-roads. Finally, in the Slovenian response, the case study already presented in the sub-section 3.2 of the paper was reported as a best practice.

5. Conclusions

Children are vulnerable road users that are exposed to increased crash injury risk due to the concurring effects of multiple risk factors. The traffic environment around schools attracts a high number of students daily and is quite complex for them. The analysis of the survey responses indicates that the majority of the RADAR countries do not collect data specifically on road crashes near schools and there are no specific guidelines for road infrastructure safety around them. However, there are some measures "traditionally" used near schools aiming to enhance road safety.

Road safety education is essential in today's world as road traffic is becoming more and more complex. There are many educational institutions organising road safety education programs and campaigns for improving students' road safety. However, in addition to the provision of

road safety education to students, a safe and friendly road environment around schools is also essential.

Within this paper, several infrastructure engineering interventions that can potentially be implemented near schools in order to increase the safety level of road users and especially of children have been identified and discussed. Many interventions concern speed management and aim to ensure low speeds around schools. Moreover, other commonly used countermeasures concern the installation of warning signs, parking management around schools, safe design of pedestrian crosswalks etc.

Each case of road safety improvement around schools is unique and needs to be carefully considered by road safety and traffic management experts. As a first step, hazardous locations near schools and the causes of road safety problems should be identified. Undoubtedly, systematic collection of data on road crashes near schools and related casualties would contribute positively to the identification of the hazardous locations. Afterwards, intervention priorities should be defined and then the selected interventions should be implemented. Finally, studies based on "before and after" comparisons should be conducted in order to evaluate the road safety effect of implemented interventions.

Although road safety near schools is critical for children and young adolescents, the absence of special consideration is evident in the results of the questionnaire survey on RADAR and RSEG countries. In all but one of the responses no data on road accidents and related casualties near schools are collected, in more than half of the countries there are no specific guidelines for road infrastructure safety around schools, and in none of the responding countries does the Road Traffic Code suggest specific maximum speed limits around schools.

The collection and analysis of road safety data and key performance indicators on the road network around schools is an essential step to support and enhance road safety decision making and cost effective interventions. The assessment of international case studies on road infrastructure countermeasures around schools, as included in this paper, can also assist in comparing intervention alternatives and help to highlight road safety best practices for safer roads around schools. Lastly, as further research and extension of the present work, it would be interesting to define various criteria based on which each school unit in cooperation with the Local Authorities could select the most appropriate road safety interventions.

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