Implementation of Road Safety Interventions for Schools in the Philippines: Experiences and Challenges

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Abstract: Road traffic crashes are the leading global cause of death for children and young adults aged 5-29 years. In the Philippines, pedestrian fatalities among children remain a major concern, exacerbated by inadequate pedestrian infrastructure. To address this issue, the Child Road Traffic Injury Prevention (CRTIP) Program was implemented in Valenzuela, Angeles, Cagayan de Oro, and Zamboanga, aiming to improve school zones and advocate for road safety policies.

Using the iRAP Star Rating for Schools (SR4S) tool, the program assessed 183 schools, revealing that 44 had a 1-star rating, indicating the least safe conditions. Schools with the highest risks were prioritized for engineering interventions, leading to 5-star upgrades post-intervention. Additionally, local governments were trained to continue assessments and policy development. The program's data-driven approach, combined with community engagement, offers a scalable model for improving road safety and protecting schoolchildren across the country.

Keywords: *Road Safety; Schools; Children; SR4S Assessment; Star Rating*

1. INTRODUCTION

1.1 Background of the Study

Road traffic crashes remain a significant global public health and development concern, claiming approximately 1.19 million lives annually. These incidents disproportionately impact vulnerable populations, making road safety a critical priority worldwide.

Notably, road traffic injuries have emerged as the leading cause of death among children and young adults aged 5–29 years. The burden of these fatalities is most severe in low- and middle-income countries, which account for 92% of all road-related deaths despite having only around 60% of the world's vehicles. This disparity underscores the urgent need for targeted interventions and sustainable road safety measures.

Vulnerable road users such as pedestrians, cyclists, and motorcyclists, constitute more than half of all fatalities, highlighting the necessity for infrastructure improvements and policy reforms that prioritize their safety. Beyond the human cost, road traffic crashes impose significant

economic losses, amounting to approximately 3% of a country's gross domestic product, further straining already limited resources in many nations. The Philippines faces a similar challenge, with approximately 1,500 child pedestrian fatalities each year (PSA, 2010-2019).

Global studies have consistently demonstrated that pedestrian infrastructure—such as crosswalks, pedestrian overpasses, and speed-reducing measures—plays a crucial role in reducing child pedestrian fatalities. However, in the Philippines, only 3% of assessed roads have formal sidewalks (iRAP, 2023), underscoring the urgent need for improved infrastructure, particularly in school zones.

Figure 1. Sustainable Development Goals

Figure 2. SDG UN Road Safety Targets

Source: United Nations

This study aims to assess and enhance road safety for schoolchildren in four highly urbanized Philippine cities through the Child Road Traffic Injury Prevention (CRTIP) Program. Utilizing the Star Rating for Schools (SR4S) tool, the study will evaluate existing road conditions and recommend targeted interventions to create safer school environments for children.

1.2 Objectives

The primary objective of this study is to evaluate and improve road safety in the vicinity of schools in the Philippines using the Star Rating for Schools (SR4S) tool and commuting data collected from schoolchildren. The specific objectives are as follows:

- To assess the current road safety conditions around schools in four highly urbanized cities: Valenzuela, Angeles, Cagayan De Oro, and Zamboanga, using the SR4S methodology.

- To identify schools at high risk of road traffic incidents based on their SR4S star ratings and the proximity of their locations to high-speed roads and inadequate pedestrian facilities.

- To recommend targeted engineering interventions such as pedestrian crossings, speed management, based on the SR4S ratings and commuting data, with the goal of improving the safety of school zones.

- To advocate for and support the development of local policies and ordinances that promote road safety near schools, including speed management, infrastructure improvements, and enforcement of pedestrian safety laws.

- To promote the development and implementation of community-driven road safety policies and ordinances at the local government level to ensure sustainable improvements in school zone safety.

1.3 Significance of the Study

This study holds significant importance as it addresses the critical issue of road safety for children. By improving pedestrian infrastructure and promoting road safety awareness, the study aims to reduce the incidence of road traffic injuries and fatalities among schoolchildren. The findings and interventions from this study can serve as a model for other regions in the Philippines and potentially other countries facing similar challenges.

Additionally, local government units (LGUs) encounter various challenges in formulating and implementing effective road safety policies. These challenges include limited funding, infrastructure constraints, enforcement difficulties, and competing urban development priorities. This study seeks to provide both school administrations and LGUs with data-driven insights and practical recommendations to overcome these obstacles. By offering evidence-based strategies and highlighting best practices, the study can support schools and LGUs in developing and sustaining safer school environments, ultimately contributing to a more comprehensive and effective approach to road safety at the local level.

2. REVIEW OF RELATED LITERATURE

Some studies on schoolchildren's commuting patterns in urban and rural parts of the Philippines have identified variations in transportation choices and associated dangers. Kamid et al. (2022) found that children in metropolitan regions, such as Valenzuela City, were more likely to walk to school, but those in rural areas or places with less developed public transportation systems, such as Zamboanga City, relied mostly on motorcycles and tricycles. This reliance on motorized transportation raises the risk of road traffic injuries, especially when safety precautions like helmet use are not regularly followed.

Meanwhile, a study by Regidor et al. (2022) employed the SR4S tool in both Valenzuela and Zamboanga cities, leading to significant improvements in school zone safety through targeted interventions. The study found that schools upgrading their pedestrian infrastructure, such as by adding speed bumps and warning signs, saw a notable increase in star ratings, moving from 1- or 2-star to 4- or 5-star levels. These improvements were directly associated with a reduction in road traffic injuries near the studied schools.

On another note, Gomintong and Regidor's (2022) study focused on pedestrian safety in elementary school zones along highways in Quezon City. Their research highlighted the practical challenges children face due to poorly constructed environments. The Star Rating for Schools tool was used to assess risks and propose improvements for school zones. The paper emphasized the importance of involving local communities in safety assessments and implementing tailored solutions based on actual user experiences.

In their 2023 study, Luitel, Tiwari, Gautam, and Bhattarai applied the Star Rating for Schools (SR4S) technique to evaluate the road safety of four schools in Kathmandu and Nuwakot, Nepal. Initially, the schools got 1–4 stars based on several safety issues such as traffic volume and pedestrian amenities. After introducing safety measures such as zebra crossings, speed restriction signs, and pedestrian warnings, the star ratings increased dramatically, with all schools receiving 3 to 5 stars. This study displays how infrastructure upgrades reduce road safety concerns for young people.

Zayerzadeh and Fallah Zavareh (2019) examined the safety of eight primary schools in Tehran and Mashhad, Iran, using the SR4S approach. The study looked at attributes like traffic volume, road width, and pedestrian facilities. After adopting safety interventions such as speed bumps, road signs, and pedestrian crossings, the schools' star ratings improved significantly, with some rising from one to three or four stars. The authors emphasize the need of both infrastructure changes and education in enhancing road safety near school zones.

The materials reviewed above revealed the significance of infrastructure upgrades and community involvement in improving road safety for students. This paper builds on this by looking into how local governments (LGUs) in Valenzuela, Angeles, Cagayan De Oro, and Zamboanga conducted the Child Road Traffic Injury Prevention (CRTIP) Program, which used the SR4S tool to address school safety concerns.

2.1 Scope and Limitations

The SR4S tool is designed to estimate pedestrian-vehicle conflict risk based on observed infrastructure and traffic variables. Though this approach has been validated globally (iRAP, 2022), it does not directly ingest local crash or near-miss records. As a result, SR4S may overestimate or underestimate risk in locations where historical crash patterns deviate substantially from typical infrastructure-risk relationships. Where available, actual crash data (e.g., police-reported accidents, near-miss surveys) can be used to calibrate or validate SR4S predictions. In our study, limited availability of disaggregated crash data for every school zone meant we relied on SR4S as a best-available proxy. We acknowledge this as a limitation and recommend future research to integrate local crash/conflict data—when accessible—to fine-tune star ratings and confirm whether predicted high-risk zones align with real incident clusters.

3. METHODOLOGY

The Star Rating for Schools (SR4S) tool, developed by the International Road Assessment Programme (iRAP), is an evidence-based approach to assess road safety risks around schools. The SR4S tool evaluates the risk of child pedestrian fatalities or injuries by analyzing various road attributes, including traffic speeds, pedestrian facilities, road width, and crossing availability. The SR4S process is shown in Figure 3. This provides a guide for steps to be undertaken towards safer school zones that involves stakeholders such as the school and its students.

Source: iRAP

Figure 3. Star Rating for Schools (SR4S) Process

3.1 Data Collection and Processing

Physical assessments were conducted around schools to evaluate road infrastructure, traffic speeds, and pedestrian safety conditions. Locations were determined in consultation with the school authorities as well as the local government unit office involved in the study. Data concerning road and traffic characteristics are collected and encoded using the tools developed by iRAP. Either a conventional approach using paper forms or one using an app installed on a smart phone or tablet can be employed for data collection. These data are then encoded to the iRAP SR4S platform to obtain initial star ratings for each location. Schools were assigned a star rating based on their scores and corresponding safety level, with 1-star being the least safe and 5-star the safest. Treatments or interventions are formulated for locations with low star ratings

3.2 SR4S Scoring

The Star Rating for Schools (SR4S) tool developed by the International Road Assessment Programme (iRAP) computes a star rating based on a quantified risk score derived from various roadway attributes. These attributes include the following:

- Road Infrastructure. This includes factors such as the presence and condition of sidewalks, pedestrian crossings (zebra crossings, signalized crossings), speed humps, signage, and road markings.

- Traffic Speed. The assessment considers the speed limits in school zones and the actual speeds of vehicles traveling through these areas. Lower speeds are generally associated with higher safety ratings.

- Traffic Volume. The volume of traffic passing through school zones is also considered. Higher volumes of traffic may pose greater risks to pedestrians, especially children.

- Intersection Safety. The safety of intersections within or near school zones is evaluated, including the presence of traffic lights, roundabouts, and the visibility of pedestrians.

- Pedestrian Facilities. This component assesses the availability and quality of pedestrian facilities such as footpaths, crosswalks, pedestrian islands, and ramps for people with disabilities.

- Safety Barriers. The presence of safety barriers or measures such as guardrails and bollards, which are considered to protect pedestrians from vehicular traffic.

- Land Use and Accessibility. Factors related to land use planning and accessibility, such as the proximity of schools to residential areas, public transport stops, and safe routes for walking and cycling, are also evaluated.

Each attribute is assigned a risk value, which is aggregated to calculate a composite risk score. Based on this score, a star rating from 1 to 5 is assigned, with 1-star indicating the highest risk and 5-star the lowest.

Figure 4. Star Rating for Schools scoring

The SR4S uses these components to assign star ratings to school zones, with higher ratings indicating safer environments for students and pedestrians. These ratings help identify areas for improvement and guide interventions to enhance road safety around schools.

It is important to note that SR4S does not include real crash or conflict data. However, it can be used in conjunction with historical crash data from agencies such as the Metropolitan Manila Development Authority (MMDA) – Crash Reporting and Analysis System (MMARAS), PNP Highway Patrol Group or school incident logs for a more holistic risk assessment.

3.3 Training of Trainers Approach

The Training of Trainers model was central to the success of the CRTIP Program. Through this model planning, engineering and other staff of local government units (LGUs), schoolteachers and staff of selected elementary and high schools, and college students were trained in the use of the SR4S tool to assess road safety around schools. This approach empowered local stakeholders to take ownership of the safety assessments and enabled the expansion of the program to more schools, even beyond the initial target cities.

The impact of this model has been measured through its scalability, with local task forces formed to continue road safety assessments and maintain engagement with the community. This community-driven model has helped ensure that road safety remains a local priority, leading to sustained policy advocacy and ongoing assessments.

4. RESULTS AND DISCUSSION

4.1 Experiences of Local Government Units (LGUs)

The Child Road Traffic Injury Prevention (CRTIP) Program has had varying levels of success and challenges across the four cities—Valenzuela, Angeles, Cagayan De Oro, and Zamboanga—largely influenced by the experiences and capabilities of local government units (LGUs) in implementing road safety interventions. Each city faced distinct challenges and opportunities in addressing road safety for schoolchildren.

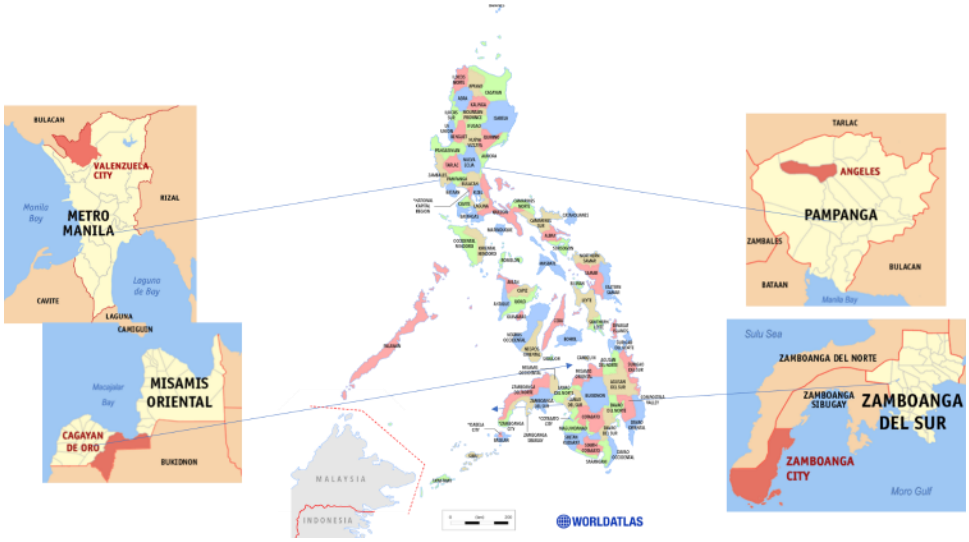


Figure 5. Pilot Cities for the Child Road Traffic Injury Prevention Program

4.1.1 Valenzuela City

Valenzuela City, located in the National Capital Region (NCR), demonstrated one of the most proactive approaches to road safety improvement. The LGU benefited from a well-established urban infrastructure and relatively better access to resources compared to the other cities. Valenzuela had an efficient school zone management system, with most schools located in residential areas, and most access roads under the jurisdiction of the city instead of the DPWH. This, allowed the LGU to address road safety issue more quickly, focusing on upgrading pedestrian facilities like crosswalks and road signs in the vicinity of the schools.

The Valenzuela LGU embraced the training of trainers approach, where school personnel and traffic enforcers were trained to conduct SR4S assessments. This decentralized approach allowed for greater involvement of the local community in data collection, resulting in faster and more accurate identification of high-risk zones. Several schools in Valenzuela achieved 5-star SR4S ratings after implementing speed management measures and improving pedestrian crossings. Additionally, Valenzuela's LGU was instrumental in drafting local road safety ordinances, including a city-wide speed limit around schools during peak hours, which is expected to significantly reduce road traffic incidents near educational institutions.

However, Valenzuela still faced challenges, particularly in managing traffic congestion in densely populated areas. As more students walk to school, further infrastructure improvements, including the expansion of sidewalks and designated pedestrian pathways, are needed.

4.1.2 Angeles City

Angeles City, a highly urbanized city in the Province of Pampanga located to the north of Metro Manila, faced different challenges due to the city's rapid urban expansion. With schools often located in areas where new developments and highways intersect, the LGU had to manage a more complex traffic environment. The SR4S assessments revealed that several schools were located near high-speed roads or in mixed-use zones with significant heavy vehicle (i.e., trucks and buses) traffic, posing a higher risk to students.

The LGU in Angeles City responded by focusing on enforcing speed limits and improving

pedestrian crossings around these schools. Despite some success, the city's limited pedestrian infrastructure, particularly in newly developed areas, limited more sustainable results for active transportations and this required significant investment. Many of the 1- and 2-star rated schools were located along highways where crossing guards and speed bumps were installed to mitigate risks. These interventions helped reduce the immediate dangers, but long-term urban planning and investment in dedicated pedestrian infrastructure are still needed.

The LGU also found the trainor's training of trainer's model valuable, as it empowered local communities to participate in road safety initiatives. However, the success of interventions was hampered by budget constraints and the need for continuous funding for road improvements.

4.1.3 Cagayan De Oro

Cagayan De Oro, a city in Northern Mindanao in the southern part of the country, faced significant logistical and infrastructural challenges in improving road safety around schools. Many schools in the city are located near steep terrains and narrow roads, where pedestrian facilities are often lacking. The LGU in Cagayan De Oro has historically struggled with maintaining existing infrastructure, much less upgrading it to meet modern safety standards.

The SR4S assessments in Cagayan De Oro highlighted the need for comprehensive road safety interventions, including the construction of new pedestrian pathways, the installation of warning signs, and the implementation of speed restrictions near schools. However, the city's limited financial resources delayed the implementation of many recommended interventions.

Despite these challenges, Cagayan De Oro's LGU demonstrated strong community engagement through the SR4S program. By involving local teachers, traffic enforcers, and parents in road safety assessments, the city built a collaborative network that helped raise awareness about the risks schoolchildren face on their daily commutes. While financial limitations persist, this community-driven approach has laid the groundwork for long-term improvements in road safety.

4.1.4 Zamboanga City

Zamboanga City also presented unique challenges due to the schools' its geographical location and proximity to national highways. Many schools in Zamboanga are located along these highways, where vehicles travel at high speeds and pedestrian facilities are minimal. The SR4S assessments revealed that schools in Zamboanga received some of the lowest star ratings, with several schools receiving 1- and 2-star ratings due to poor infrastructure and high vehicle speeds.

Zamboanga's LGU faced the daunting task of addressing inadequate pedestrian facilities in areas where national highways pass through residential zones. The LGU's initial focus was on installing pedestrian fences and speed bumps, especially near schools with high traffic volumes. Additionally, crossing supervisors were deployed to high-risk areas during peak school hours. These interventions have improved safety, but the underlying infrastructure remains inadequate, and long-term solutions such as pedestrian overpasses or designated crossings need to be considered.

The LGU also faced challenges in engaging the local community in road safety efforts. Unlike the other cities, Zamboanga's population is more spread out, and the lack of resources to

regularly enforce traffic rules further exacerbated the problem. Despite these difficulties, the SR4S training provided to local stakeholders has begun to foster a culture of road safety awareness, particularly among school administrators.

4.2 SR4S Ratings

Of the 146 schools surveyed, the following star ratings shown in Figure 12 were obtained. It highlights the distribution of SR4S star ratings across the four cities.

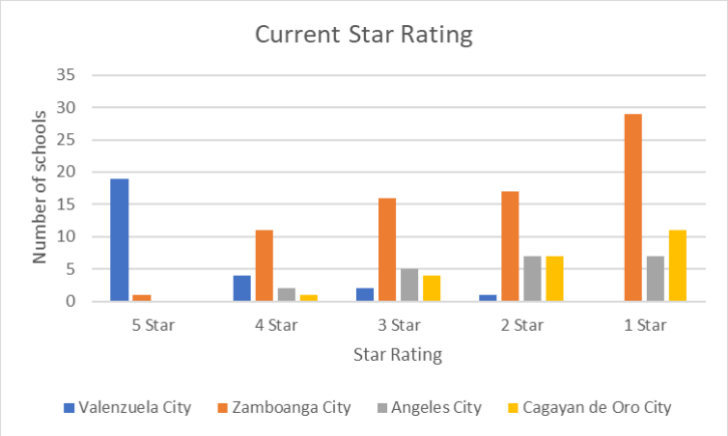


Figure 6. Current Star Rating of schools per City

Valenzuela City stands out with the highest number of 5-star ratings. This is because most of the schools are located inside the residential subdivisions with roads that are not generally used by through traffic.

Zamboanga City has a broader spread across the star ratings, showing the highest counts in the lower star categories. It leads in the 1-star and 2-star categories, which may indicate higher risks. Most of the schools are located along national highways along which average speeds are generally high.

Most roads in Angeles City fall into the 3-star and 2-star categories, with a mix of schools located along national and local roads.

Cagayan de Oro has notable representation in the 2-star and 1-star categories, similar to Zamboanga City. This may also be due to schools being located along national roads.

The star rating distribution provides a snapshot of the road safety situation across these cities, with Valenzuela City performing the best in terms of road safety standards. The other cities, especially Zamboanga and Cagayan de Oro, may need focused interventions to improve their road conditions and reduce the risk of traffic-related incidents

5. ROAD SAFETY INTERVENTIONS

Based on the SR4S findings, specific engineering interventions need to be prioritized. Schools with 1- and 2-star ratings will be targeted for engineering interventions such as speed management programs, enhanced pedestrian safety measures such as repainting of pedestrian

crossings, building more sidewalks and traffic calming devices.

During the phase 1 of the project, four schools underwent modifications, resulting in their star ratings being upgraded to 5-stars post-intervention. The CRTIP program also facilitated the drafting of several Road Safety Ordinances in collaboration with local government units. These ordinances focused on speed management, road infrastructure improvements, and enhanced school zone safety, with potential for implementation across the country.

5.1. Examples of Improved School Safety through Infrastructure Changes

Phase 1 and 2 of the Child Road Traffic Injury Prevention (CRTIP) Program has led to notable improvements in school zone safety through targeted infrastructure changes. The use of the Star Rating for Schools (SR4S) tool provided an evidence-based approach to assessing and prioritizing interventions. Schools underwent critical modifications such as the installation of lines and signs, pedestrian crossings, and pedestrian fences. These interventions successfully upgraded the star ratings of several schools to 5-stars, indicating a significantly safer environment for schoolchildren.

Figures 7 to 10 Star Rating and risk score was based on the SR4S old model. Pasolo Elementary School, although already rated 5-Stars, further improved its Risk Score from 0.68 to 0.56 following the implementation of a new pedestrian crossing and speed management systems.

Marulas Central School saw a similar improvement, where a combination of infrastructure modifications, including the installation of warning signs and road markings, led to an increased safety rating.

Source: Imagine Law

Figure 7. Pasolo Elementary School before and after intervention

Source: Imagine Law

Figure 8. Marulas Elementary School before and after intervention

Similar to the improvements made at Pasolo Elementary School and Marulas Central School, the engineering interventions around Parada Elementary School have greatly contributed to the safety of students. The emphasis on clear signage, pedestrian crossings, and physical barriers ensures that both students and drivers are aware of safety measures, leading to more structured and safer interactions between pedestrians and traffic.

Source: Imagine Law

Figure 9. Parada Elementary School beforeand after intervention

Source: Imagine Law

Figure 10. Putik Elementary School before and after intervention

The improvements made around Putik Elementary School in Zamboanga City have significantly enhanced the safety of the students. The installation of marked pedestrian crossings, safety signage, and pedestrian channelization are effective interventions in reducing the risk of road crashers and ensuring a secure passage for children. These changes demonstrate the effectiveness of targeted infrastructure modifications in school zones to prioritize student safety and promote safer commuting practices.

Figures 11 to 18 was based on the recent updated SR4S model.

Source: Angeles City

Figure 11. Pulung Cacutud Elementary School before and after intervention

Source: Angeles City

Figure 12. Gueco Balibago School before and after intervention

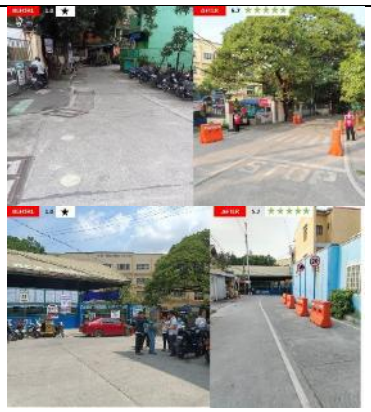
At Pulung Cacutud Elementary School (Figure 11), the before-and-after comparison highlights critical interventions that improved pedestrian safety. The zebra crossing was reinforced with clearer road markings and pedestrian signage, making it more visible to both students and drivers. Additionally, the installation of a STOP sign and pedestrian crossing sign serves as a traffic-calming measure to alert motorists of the school zone. These interventions have increased the school's SR4S star rating from 1.0 to 4.1, reflecting a major improvement in road safety conditions.

Meanwhile, at Gueco Balibago School (Figure 12), the SR4S-based enhancements focused on increasing pedestrian safety and speed management. Prior to the intervention, the area had faded or missing road markings, putting students at risk. The improvements included the installation of bold zebra crossings, pedestrian signages, and speed-calming measures, ensuring that vehicles slow down when approaching the school zone. The star rating significantly improved from 2.2 to 5.2, indicating a much safer environment for schoolchildren.

Tacondo Elementary School in Angeles City have significantly enhanced road safety for students by addressing key risks in the school zone. As shown in Figure 13, the before-and-after comparison highlights critical improvements in pedestrian safety and school zone visibility. Previously, the area had limited pedestrian infrastructure, faded markings, and a lack of protective barriers, leading to a low SR4S star rating of 2.5. The interventions included the installation of clear pedestrian crossings, a STOP sign, school zone signage, and a dedicated pedestrian walkway with railings, ensuring a safer environment for students moving around the school premises. These enhancements resulted in a major star rating increase from 2.5 to 5.4, signifying a substantial reduction in road risks.

Source: Angeles City

Figure 13. Tacondo Elementary School before and after intervention



Source: Valenzuela City

Figure 14. Vicente Trinidad National High School before and after intervention

As shown in Figure 14, the before-and-after comparison highlights key enhancements in school zone safety. Before the intervention, the area had no clear pedestrian pathways, missing or faded traffic signage, and minimal traffic-calming measures, which posed significant risks to students and other road users. The SR4S safety measures included the installation of speed limit signs (20 km/h) to regulate vehicle speeds, the strategic placement of orange safety barriers to restrict unauthorized vehicle movement and create a safer pedestrian space, and the marking of STOP signs and zebra crossings to enhance visibility and prioritize pedestrian right-of-way.

These interventions led to an increase in the SR4S star rating from 1.0 to 5.7, reflecting an improvement in overall road safety for students and pedestrians. The modifications at Vicente Trinidad National High School demonstrate the importance of structured safety interventions in school zones. By implementing speed reduction measures, enhancing pedestrian visibility, and reinforcing school zone awareness, these changes play a crucial role in enhancing student safety and promoting a secure school commuting environment.

Source: Valenzuela City

Figure 15. Lawang Bato National High School before and after intervention

Source: Cagayan De Oro City

Figure 16. Bulua Central School before and after intervention

As shown in the before-and-after comparison in figure 15, Lawang Bato National High School's surroundings initially lacked clear pedestrian pathways, proper signage, and traffic-calming measures, contributing to a low SR4S star rating of 2.6. The interventions included the installation of school zone signage, a speed limit sign (20 km/h) to control vehicle speeds, and barriers separating pedestrian walkways from the roadway to ensure a safer passage for students. These improvements have resulted in a remarkable increase in the SR4S star rating from 2.6 to 4.6, reflecting a significant enhancement in pedestrian safety and driver awareness.

Bulua Central School in Figure 16, with an initial SR4S star rating of 2.8, the school zone was considered high-risk for pedestrian safety. The implemented interventions included putting a traffic supervisor, the widening of pedestrian walkways, ensuring a safer space for students to walk, and the installation of traffic-calming measures, which help reduce vehicle speeds near the school entrance. Additionally, barriers and proper pavement markings were placed to separate pedestrian areas from the main roadway, minimizing the risk of road crashes.

South City Central (Figure 17) lacks proper traffic management and pedestrian infrastructure. With an initial SR4S star rating of 1.4, the area had unregulated crossings, obstructed pathways, and unsafe loading and unloading zones, exposing students to road hazards. To address these issues, key interventions were implemented, including the installation of designated pedestrian crossings, clear traffic signage, and properly marked loading and unloading areas to improve traffic flow and minimize conflicts between pedestrians and vehicles.

The school zone along Bulua National Highschool (Figure 18) initially posed serious risks to students crossing a multi-lane road with only a pedestrian crossing and minimal safety infrastructure. With an initial SR4S star rating of 1.0, the area lacked essential pedestrian safety measures, exposing students to speeding vehicles. Loading and unloading areas were properly designated, preventing vehicles from obstructing pedestrian pathways and ensuring safer drop-off and pick-up zones. Clear no-parking and traffic regulation signage were also installed to manage vehicle flow efficiently. The strict use of the pedestrian footbridge was enforced to eliminate unsafe road crossings, ensuring that students and pedestrians follow a safer, designated path. These improvements significantly enhanced road safety, leading to an increased SR4S star rating of 5.0 and creating a more secure environment for all road users.

Source: Cagayan De Oro City

Figure 17. South City Central School before and after intervention

Source: Cagayan De Oro City

Figure 18. Bulua National Highschool before and after intervention

These improvements demonstrate the effectiveness of data-driven interventions in reducing the risk of road traffic incidents around schools. These engineering measures demonstrate the effectiveness of targeted infrastructure modifications in making school zones safer. By improving pedestrian visibility, slowing down traffic, and reinforcing school zone awareness, these interventions play a crucial role in preventing road crashes and promoting safer commuting habits for students.

The countermeasures recommended and implemented—such as speed limit signs, marked pedestrian crossings, fences, STOP signs, improved sidewalks, and enhanced sight distance—were directly tied to the specific risk elements found in the SR4S assessment. For example:

- Low star ratings due to high vehicle speeds led to the installation of speed calming devices and signage.
- Unprotected crossings or faded markings prompted the installation of new zebra crossings and line markings with better visibility.
- Lack of pedestrian fencing and channelization was addressed to manage student movement and prevent unsafe midblock crossings.
- Narrow, obstructed, or damaged sidewalks were improved to ensure safe and continuous pedestrian pathways.
- Poor sight distance at crossings and intersections was resolved through the strategic placement of signage, clearing of visual obstructions, and proper layout of pedestrian infrastructure.

The improvements shown in Figures 7 to 18 reflect both the pre- and post-intervention SR4S star ratings as quantifiable evidence of increased safety. The selection of countermeasures was thus guided by a combination of SR4S diagnostic outputs, engineering judgement, and stakeholder consensus.

Table 1. Star Rating before and after intervention

Location	Results before implementation	Results after implementation
VALENZUELA CITY		
Pasolo Elementary School	★★★★★	★★★★★
Marulas Central School	★★★★	★★★★★
Parada Elementary School	★★★	★★★★★
Vicente Trinidad National High School	★	★★★★★

Location	Results before implementation	Results after implementation
Lawang Bato National High School	★★	★★★★
Valenzuela National High School	★	-
CAGAYAN DE ORO CITY		
Bulua Elementary School	★★	★★★★★
South City Central School	★	★★★★★
Bulua National Highschool	★	★★★★★
Agusan National Highschool	★	-
ANGELES CITY		
Pulung Cacutud Elementary School	★	★★★★
Gueco Balibago Elementary School	★★	★★★★★
Tacondo Elementary School	★★	★★★★★
ZAMBOANGA CITY		
Putik Elementary School	★★★★	★★★★★
Southcom Elementary School	★★★★	-
Immaculate Concepcion Archdiocesan De Calarian	★	-
Southcom National High School	★★★	-
Culianan Learning Center	★★	-
Maria Clara Lorenzo Lobregat High School	★	-
Divisoria Elementary School	★	-
Mampang Elementary School	★	-
Recodo Elementary School	★★	-
San Jose Gusu Elementary School	★★★	-
Southern City Colleges West	★	-
Sangali Elementary School	★★	-
Sta. Barbara Elementary School	★★★	-
Don Gems Elementary School	★★★★	-
Sta Maria Central School	★	-
Talon-Talon Central School	★★	-
Zamboanga City High School Main	★★	-
Tetuan Central School	★★★	-
Sta. Catalina Viuda De Jalon Memorial School	★★	-
Zamboanga Central School Sped Center	★★★	-

Table 1 shows the results before and after the engineering interventions. Some schools were still in the process of procuring materials and waiting for the delivery of items such as signages and road markings.

For the City of Zamboanga, even though the engineering plans were made and some of the engineering interventions were implemented, unfortunately, there was no available time to conduct the post-assessments after the research project ended.

The following interventions were commonly implemented to help schools achieve improved safety ratings after the engineering implementation:

- Pavement marking pedestrian crosswalk on the main road

- Improvement of sidewalks
- Speed limit signs
- School Zone warning signs
- Pavement marking of STOP line before crosswalk
- "You are Entering a School Zone" signs "Slow Down School Zone 20kph" signs
- Painting of school wall along Safe School Zone

The primary objective of this study was to assess the road safety conditions around schools and improve safety through targeted interventions. The use of the SR4S methodology successfully identified high-risk schools, and targeted interventions were implemented. For example, in Valenzuela City, interventions such as pedestrian crossings and speed management measures resulted in a shift from 3-star to 5-star ratings for several schools, meeting the objective of improving safety in school zones. Additionally, commuting data from previous studies revealed patterns in students' behavior that influenced the design of these interventions, further fulfilling the objective of aligning interventions with commuting risks.

5.2 Intercity Agreements and Sharing of Best Practices

An important component of the CRTIP program was the creation of intercity agreements between pilot cities like Valenzuela and Zamboanga, and expansion cities such as Angeles and Cagayan De Oro. These agreements allowed for the exchange of best practices, strategies, and technologies related to road safety. For example, Valenzuela shared its success in implementing speed limit enforcement and the use of crossing supervisors, which were subsequently adopted in Zamboanga. The sisterhood agreement on road safety fostered collaboration between cities, promoting mutual support in developing and implementing road safety strategies across different regions.

This intercity cooperation facilitated the replication of successful interventions and promoted a culture of shared learning, making it easier to scale up the CRTIP program across the Philippines.

5.3 Sustainability and Challenges

While the CRTIP program has seen early success, ensuring its sustainability requires continuous commitment from local government units (LGUs). One major challenge is the integration of road safety interventions into local budgets and procurement plans. Cities like Valenzuela and Angeles have made road safety a budget priority, ensuring that interventions such as infrastructure maintenance and crossing guard programs are included in their annual procurement plans. However, in cities like Zamboanga, where resources are more constrained, securing long-term funding remains a significant challenge.

Additionally, policy enforcement remains uneven across regions. While some cities have been proactive in drafting and implementing local road safety ordinances, others face barriers related to enforcement capacity and resource limitations. Sustaining the improvements made through CRTIP will depend heavily on continued financial support and community engagement.

5.4 Importance of Task Forces and Local Leadership

A key success factor in the CRTIP program has been the formation of task forces dedicated to road safety. Cities like Valenzuela and Angeles benefited from strong leadership, where mayors

and local executives championed road safety initiatives. In Valenzuela, the Task Force Safe Kids was instrumental in securing executive and legislative buy-in for road safety policies, leading to the establishment of a city-wide speed limit around schools during peak hours.

The role of local leadership in ensuring the success of the CRTIP program cannot be understated. The formation of inter-agency task forces that bring together representatives from transportation, education, and health sectors has proven to be an effective governance model. These task forces help ensure that road safety remains a priority across different levels of government and that the program is implemented in a coordinated manner.

6. CONCLUSION

The application of the Star Rating for Schools (SR4S) tool, combined with commuting data, has proven effective in identifying and addressing road safety risks near schools in the Philippines. The Child Road Traffic Injury Prevention (CRTIP) Program has not only highlighted critical risk areas but also provided a scalable model for improving school zone safety through community engagement and data-driven interventions.

The success of the program is evident in the improvement of school safety through targeted infrastructure changes. Schools that were previously rated as unsafe due to a lack of pedestrian facilities saw substantial upgrades in their SR4S star ratings after interventions such as the installation of speed management measures and improving pedestrian crossings and traffic signs. This demonstrates the effectiveness of engineering solutions in enhancing child pedestrian safety.

Additionally, the creation of intercity agreements has fostered collaboration among local government units (LGUs) in sharing best practices, strategies, and technologies related to road safety. This cooperation has been critical in scaling the program across different regions, allowing cities to replicate successful interventions and support each other in developing road safety policies.

Ensuring the long-term sustainability of these interventions will require LGUs to include road safety measures in their annual procurement plans and budgets. While some cities have successfully done this, others face challenges related to resource constraints and the enforcement of road safety policies. Continued financial support and policy enforcement will be crucial to maintaining the improvements made through the CRTIP program.

There are ongoing engineering interventions in the following cities. The local government units, through their Annual Incentive Budget (AIP), have allotted funds for interventions at selected schools, particularly those with ratings of 3 stars and below.

Table 2. Number of schools with ongoing interventions

City	Number of schools assessed	Number of schools with ongoing interventions
Valenzuela City	46	1
Angeles City	21	0
Cagayan de Oro City	23	1
Zamboanga City	74	20

Figure 20 shows the examples of proposed engineering intervention of the schools.

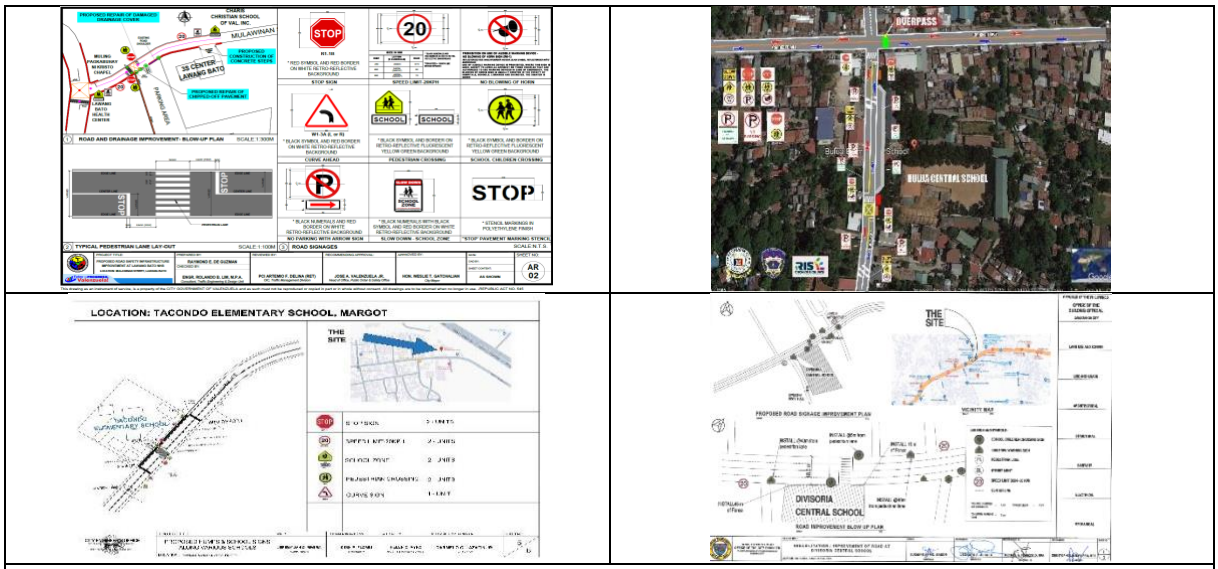


Figure 19. Engineering drawing and typical layout design of the proposed intervention

Source: Valenzuela City, Cagayan de Oro, Angeles City, Zamboanga City

7. RECOMMENDATIONS

The following recommendations are made in relation to the findings of this project:

1) Local governments should prioritize road safety in their annual budgets to ensure that infrastructure improvements, such as pedestrian crossings and speed bumps, are maintained and expanded.
2) Expand intercity collaborations to foster shared learning and the replication of successful interventions in more cities across the Philippines.
3) Strengthen community engagement efforts, particularly in rural areas, by launching educational campaigns that raise awareness about road safety among schoolchildren and their families.
4) Replicate local task forces, such as Valenzuela's Task Force Safe Kids, in other regions to ensure the ongoing commitment of local leadership to road safety initiatives.

The CRTIP program, with its focus on community-driven solutions, data-driven interventions, and policy advocacy, demonstrates a strong model for improving child road safety in the Philippines. Continued expansion of the program, coupled with further policy development, will be essential to ensuring safer commutes for Filipino schoolchildren across the country.

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