Integrating Evidence-Based Tools for Safer School Environments: SR4S and Walkability Insights from Naga City, Philippines

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Abstract: Road traffic injuries are a persistent threat to school-aged children in urban areas, where mixed traffic, inadequate pedestrian infrastructure, and poor road design expose them to daily risks. To project its 2028 vision of a "Walkable, Orderly, and Secure City," Naga City adopted two diagnostic tools: the iRAPs Star Rating for Schools (SR4S) and the Clean Air Asia–Asian Development Bank (ADB) Walkability Assessment Tools. SR4S assessments were carried out in three pilot schools—Camarines Sur National High School, Naga Central School, and Universidad de Sta. Isabel—through structured evaluations of different road attributes. Results revealed that two schools received low ratings (1–2 stars), reflecting unsafe conditions such as inadequate crossings and lack of signage. Recommended interventions, including reduced operating speeds, designated crossings, parking restrictions, sidewalk improvements, and crossing supervisors, demonstrated strong potential to raise conditions to 4–5 stars. Complementary walkability surveys across 15 selected locations yielded an average score of 53 out of 100. Residential areas recorded the highest score at 61, followed by institutional/educational areas at 53, commercial areas at 49, and public transport terminal areas at 47. Together, the SR4S and walkability assessments provide pilot evidence for prioritizing targeted, child-centered interventions that support safer, more accessible, and inclusive mobility.

Keywords: Road Safety; Schools; Children; SR4S Assessment; Walkability

1. INTRODUCTION

1.1. Background of the Study

Road traffic injuries continue to be a predominant cause of mortality and severe injury among children globally. The World Health Organization (2023) states that children aged 5 to 14 are among the most susceptible road users, with pedestrian accidents frequently happening near schools. In urban development, elements such as mixed traffic, substandard road design, and insufficient pedestrian infrastructure intensify these hazards, resulting in perilous conditions for children en route to school.

In the Philippines, road safety has been an increasing concern in metropolitan areas where rapid motorization coincides with inadequate pedestrian infrastructure. Naga City, an urban hub in the Bicol Region, aspires to be a "Walkable, Orderly, and Secure City" by 2028. This vision advocates for the incorporation of child safety, non-motorized transportation, and people-centric mobility into its transportation and urban development framework. Nevertheless, systematic methodologies for assessing and mitigating hazards associated with schools are still constrained.

The International Road Assessment Programme's (iRAP) Star Rating for Schools (SR4S) approach offers an evidence-based framework for evaluating risks encountered by children in school zones and for prioritizing life-saving actions. The walkability evaluation tool created by Clean Air Asia and the Asian Development Bank (ADB) provides a systematic method for evaluating accessibility, pedestrian comfort, and land use connectivity. Collectively, these instruments offer a thorough methodology for evaluating safety and walkability conditions in educational settings.

This research utilizes SR4S and the ADB–Clean Air Asia walkability tool in three pilot schools in Naga City to build a baseline of conditions and recommend specific solutions. The results provide substantiation for integrating road safety and walkability into the City's comprehensive transportation and development strategy.

1.2.Objectives

The aims of this study are as follows:

- Evaluate the safety conditions of designated school zones in Naga City employing the iRAP Star Rating for Schools (SR4S) methodology.
- Assess pedestrian accessibility and walkability via the Clean Air Asia–ADB walkability evaluation tool.
- Identify and propose evidence-based strategies to enhance safety ratings and walkability around schools.
- Ensure proposed solutions are consistent with Naga City's 2028 vision of becoming a Walkable, Orderly, and Secure City, consequently enhancing safety, inclusivity, and child-friendly mobility.

2. REVIEW OF RELATED LITERATURE

Road traffic injuries constitute a primary cause of mortality among children worldwide, particularly in metropolitan regions with inadequate pedestrian infrastructure. The World Health Organization (2023) indicates that children aged 5–14 constitute a highly susceptible group of road users, with numerous injuries happening in proximity to schools. Peden et al. (2008) highlight that mixed traffic circumstances, elevated vehicle speeds, and insufficient crossings substantially heighten dangers for school-aged pedestrians.

2.1.Global Frameworks for School Zone Safety

The Star Rating for Schools (SR4S) system, developed by the International Road Assessment Programme (iRAP), provides a standardized framework for assessing and improving road safety near schools. It identifies high-risk areas and guides appropriate measures, including speed reduction, the installation of signs, and improvements to pedestrian infrastructure. SR4S has been implemented in countries such as South Africa, Mexico, and Vietnam, demonstrating its applicability across different urban contexts.

2.2.Walkability and Non-Motorized Transport Planning

Walkability assessments enhance road safety audits by analyzing pedestrian comfort, accessibility, and the integration of land use. Litman (2011) contends that walkable areas enhance safety, health, and social inclusion. The Clean Air Asia - ADB walkability tool offers a systematic framework for evaluating pedestrian infrastructure and connectivity, influencing urban planning initiatives in Metro Manila, Bandung, and Hanoi (Clean Air Asia, 2018).

2.3.Philippine Context and Local Applications

Rapid urbanization and motorization in Philippine cities have often outpaced the development of safe and accessible pedestrian infrastructure, particularly around schools. Kamid et al. (2022) demonstrated the local application of SR4S in Zamboanga and Valenzuela Cities, showing how critical school access points can be assessed and potential interventions modeled using the SR4S web application. Naga City's vision of becoming a "Walkable, Orderly, and Secure City" by 2028 further supports the use of evidence-based road safety and walkability assessments in local transport planning (City of Naga, 2025).

2.4.Evidence-Based Interventions and Policy Integration

Empirical studies demonstrate that targeted interventions, like speed management, dedicated crossings, and sidewalk enhancements, integrated into local transport plans, provide sustainability and institutional backing. In the Philippines, integrating SR4S and walkability evaluations provides a reproducible framework for incorporating child safety into urban mobility systems.

2.5.Study Limitation

The SR4S tool estimates pedestrian–vehicle conflict risk using observed infrastructure and traffic variables. While its methodology has been validated globally (iRAP, 2019), it does not incorporate local crash or near-miss records directly. Consequently, SR4S may overstate or understate risk in areas where historical crash patterns diverge from typical infrastructure–risk relationships. Where available, actual crash data (e.g., police reports, near-miss surveys) can be used to calibrate or validate SR4S outputs. In our study, the limited availability of disaggregated crash data across school zones required us to rely on SR4S as the best available proxy. We recognize this as a limitation and recommend that future research integrate local crash and conflict data—when accessible—to refine star ratings and verify whether predicted high-risk zones correspond with actual incident clusters.

3. METHODOLOGY

3.1. Data Collection

This study utilized two complementing instruments to evaluate the safety and walkability of school zones in Naga City: the International Road Assessment Programme's Star Rating for Schools (SR4S) tool and the Asian Development Bank (ADB) - Clean Air Asia Walkability Assessment Tool.

Field assessments were conducted on June 3, 2025 for SR4S Surveys and May 3, 2025, for Walkability Survey. The surveys were undertaken by 20 assessors in total, including students from the Bicol State College of Applied Sciences and Technology (BISCAST) and personnel from City Engineering Office and City Planning & Development Office of Naga City Government. Before the fieldwork, the participants underwent capacity-building activities on the objectives of the study, proper application of the two assessment tools, identification and coding of road attributes, field observation procedures, and recording and validation of survey data. The field activities were conducted under the guidance and supervision of the study team.

The three pilot schools—Camarines Sur National High School–Liboton Annex, Naga Central School I, and Universidad de Sta. Isabel—were purposively selected in coordination with BISCAST and the Naga City Government. The selection considered differences in school-frontage and surrounding land-use conditions, pedestrian activity involving schoolchildren, interaction with motorized traffic, and observed road safety concerns. One critical point was selected for each school, focusing on a location where schoolchildren regularly interacted with traffic, such as a main entrance, pedestrian crossing, loading and unloading area, or nearby intersection.

Assessments were conducted during the morning peak hour, when students were arriving at school. Operating speeds were measured using spot-speed survey. A minimum of 30 sample size free-flowing vehicles were observed at each critical point during off-peak period, and the 85th-percentile operating speed was used for the SR4S assessment. Traffic volume was determined through manual classified count method conducted for 1 hour during peak period. Vehicles were classified into Passenger Cars, Trucks and Motorcycles, and the recorded volume was converted to the category required by the SR4S tool.

The collected SR4S data were entered into the SR4S web application to generate the baseline star ratings. The coded road attributes, baseline assessments, and modeled treatment scenarios were subsequently reviewed by one of the authors, who is an iRAP-accredited SR4S Quality Reviewer. The quality review examined the consistency of the coded attributes with the available field observations and photographs, as well as the corresponding star-rating outputs generated through the SR4S web application.

3.1.1. Star Rating for Schools (SR4S)

The Star Rating for Schools (SR4S) is a data-driven framework created by the International Road Assessment Programme (iRAP) to evaluate the safety of pedestrian routes to, from, and in proximity to schools. It allocates a star rating (1-star indicating the least safe, 5-star denoting the safest) to school zones based on a thorough assessment of the adjacent road infrastructure.



Figure 1. Star Rating for Schools (SR4S) Process (Source: iRAP)

Physical inspections were conducted near schools to assess road conditions, traffic velocities, and pedestrian safety. The places were determined with the assistance of State Universities and Colleges, who conducted the assessments, and the local government unit

office involved in the project. The instrument is employed to evaluate the institution and collect information regarding its pivotal location. Data can be collected through two methods: employing paper forms or utilizing an application on a smartphone or tablet. The iRAP SR4S platform subsequently encodes this data to obtain first star ratings for each region. Schools were assigned a star rating based on their scores and safety level, with 1 star indicating the lowest safety and 5 stars denoting the highest safety. Treatments or interventions are scheduled for locations with low star ratings.

3.1.2 SR4S Scoring

The International Road Assessment Programme (iRAP) developed the Star Rating for Schools (SR4S) instrument, which assigns a star rating derived from a risk assessment of several road attributes. Among these characteristics are:

- Road Infrastructure. This encompasses the condition and availability of sidewalks, pedestrian crossings (zebra crossings, signalized crossings), speed bumps, signage, and road markings.
- Traffic Speed. The study examines the speed limitations in school zones and the actual velocities of vehicles traversing these areas. Generally, reduced speeds correlate with enhanced safety ratings.
- Traffic Volume. The volume of traffic traversing school zones is also considered. The presence of additional vehicles on the road may provide increased risks for pedestrians, particularly children.
- Intersection Safety. The safety of intersections in or adjacent to school zones is assessed, including factors such as the presence of traffic signals, roundabouts, and pedestrian visibility.
- Pedestrian Facilities. This section examines the quantity and quality of pedestrian amenities, including pathways, crosswalks, pedestrian islands, and ramps for individuals with disabilities.
- Safety Barriers. Safety barriers or measures, such as guardrails and bollards, are designed to protect individuals from vehicles.
- Land Use and Accessibility. We also examine land use planning and accessibility, including the proximity of schools to residences, public transportation stations, and safe walking and biking routes.

Each attribute is assigned a risk value, which are subsequently aggregated to yield a total risk score. A star rating from 1 to 5 is assigned based on this score, with 1 star indicating the highest level of hazard and 5 stars indicating the lowest level of danger.



Fig.2. How to score schools with star ratings

The SR4S employs these components to assign star ratings to school zones. Elevated ratings indicate that the regions are more secure for children and pedestrians. These ratings identify areas for improvement and demonstrate methods to enhance traffic safety in proximity to schools.

It is essential to acknowledge that SR4S does not incorporate any actual road crash or conflict data as a criterion for ranking. Nonetheless, it can be utilized in conjunction with

significant crash data repositories, including the Metropolitan Manila Development Authority (MMDA)'s crash Reporting and Analysis System (MMARAS), the PNP Highway Patrol Group, or school incident records to provide a clearer picture of the risks.

3.1.3. Quality Review of SR4S Outputs

The coded road attributes, baseline assessments, and modeled treatment scenarios were reviewed by one of the authors, who is an iRAP-accredited SR4S Quality Reviewer. The quality review examined the consistency of the coded attributes with the available field observations and photographs, as well as the corresponding star-rating outputs generated through the SR4S platform.

3.2.Walkability

The walkability assessment analyzes pedestrian infrastructure in four areas: commercial, residential, educational, and public transport terminals. Locations with elevated pedestrian traffic are determined via initial surveys and discussions with the Local Government Unit (LGU). Thorough route assessments were conducted by mapping logical pedestrian routes in specified areas linking origins to destinations. The field survey utilized a standardized scoring system for nine qualitative factors to facilitate comparisons between cities (Table 1). Thorough route assessments were conducted to provide a cohesive viewpoint linking design and execution to user experience and the built environment.

Table 1. Field Walkability Survey Parameters.

#	Parameter	Description
1	Walking Path Modal Conflict	The extent of conflict between pedestrians and other modes on the road, such as bicycles, motorcycles and cars
2	Availability of Walking Paths	The need, availability and condition of walking paths. This parameter is amended from the parameter "Maintenance and Cleanliness" in the Global Walkability Index
3	Availability of Crossings	The availability and length of crossings to describe whether pedestrians tend to jaywalk when there are no crossings or when crossings are too far apart
4	Grade Crossing Safety	The exposure to other modes when crossing roads, time spent waiting and crossing the street and the amount of time given to pedestrians to cross intersections with signals
5	Motorist Behavior	The behavior of motorists towards pedestrians as an indication of the kind of pedestrian environment
6	Amenities	The availability of pedestrian amenities, such as benches, street lights, public toilets, and trees, which greatly enhance the attractiveness and convenience of the pedestrian environment, and in turn, the surrounding area
7	Disability Infrastructure	The availability of, positioning of and maintenance of infrastructure for the disabled
8	Obstructions	The presence of permanent and temporary obstructions on pedestrian pathways. These ultimately affect the effective width of the pedestrian pathway and may cause inconvenience to pedestrians
9	Security from Crime	The general feeling of security from crime on a certain stretch of road

Source: Clean Air Asia - ADB walkability tool

3.3.Data Processing and Analysis

SR4S outputs provided baseline star ratings for child pedestrians at each school zone, highlighting the level of risk exposure. Walkability scores enhanced these findings by

reflecting the overall pedestrian experience, encompassing accessibility and comfort. The outcomes from both instruments were analyzed and integrated to determine priority treatments. Proposed measures were formulated based on the aggregated evidence from the SR4S star ratings and walkability scores, focusing on speed regulation, pedestrian crossings, and enhanced sidewalk infrastructure.

4. RESULTS AND DISCUSSION

4.1.Star Rating for Schools (SR4S) Assessments

This study involved a pilot program at three schools. Camarines Sur National High School - Liboton Annex, Naga Central School, and Universidad de Santa Isabel. Preliminary assessments of the three pilot schools indicate alarming safety concerns. Inadequate road design practices consistently endanger schoolchildren and pedestrians. Public utility vehicles (PUVs) exacerbate the issue due to inadequately constructed or absent pick-up and drop-off zones. This impedes traffic flow and induces confusion, particularly in the lack of marked Right-of-Ways (ROW) for various types of transportation. This lack of segregation creates a high potential for conflict around school zones, increasing the risk of accidents and, unfortunately, past data confirms this risk, with past accidents and fatalities having already occurred.

a. Camarines Sur National High School

Figures 3 presents the location map of Camarines Sur National High School.

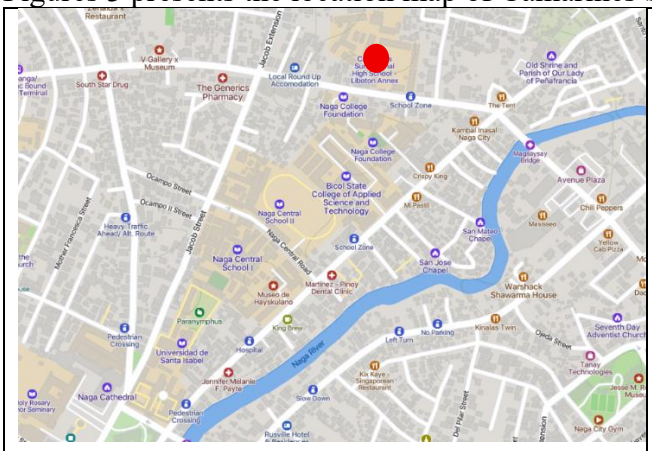


Figure 3. Location map of Camarines Sur National High School - Liboton Annex (Photo credit: Mapcarta)

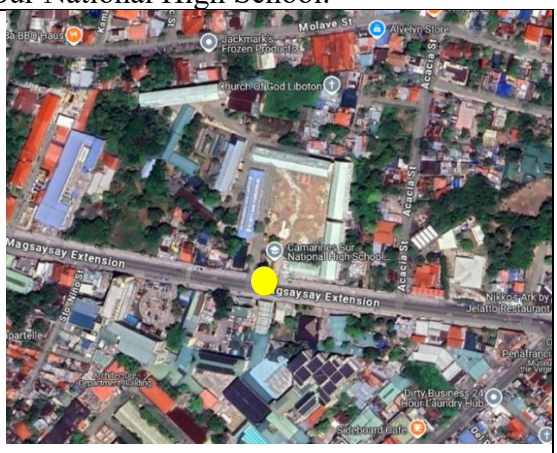


Figure 4. Critical Location Assessed at Camarines Sur National High School – Liboton Annex (Photo credit: Google Maps)

Assessment

Figure 4 shows the critical location identified, which is in front of the school gate, for Camarines Sur National High School - Liboton Annex where the assessments were conducted.

Result

Table 2 presents the quality-reviewed star rating for the identified critical location, generated using iRAP's Star Rating for Schools (SR4S) web application.

Table 2. Quality-Reviewed SR4S Assessment Results for the Critical Location at Camarines Sur National High School–Liboton Annex.

Critical Location Assessed	Results before implementation (assessment)	Decimal Star Rating
M.T. Villanueva Avenue (in front of Camarines Sur National High School – Liboton Annex)	★	1.6

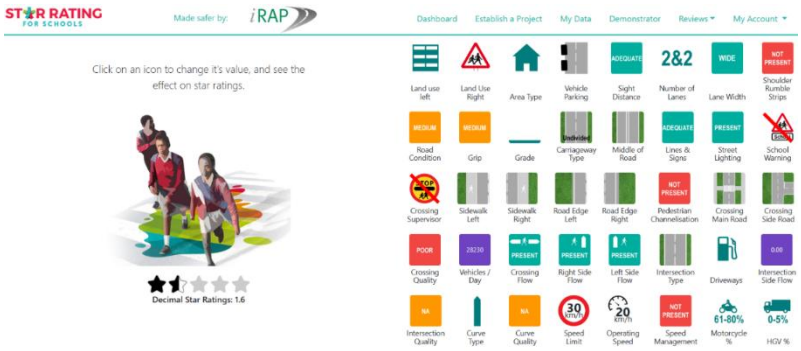


Figure 5. Star Rating of Camarines Sur National High School – Liboton Annex After Quality Reviewed

From the assessments of the assessors, Camarines Sur National High School –Liboton Annex 1 got a Star Rating of 1 with a decimal star rating of 1.6. Table 3 displays the recommended attributes for achieving a higher star rating (at least 3 or higher) and the suggested timing of implementation.

Table 3. Recommended interventions for Camarines Sur National High School – Liboton Annex using the SR4S Demonstrator.

Camarines Sur National High School – Liboton Annex			
Attribute	**Before: 1 star (Decimal Star Rating: 1.6) -Quality Reviewed**	**After intervention: 4 stars (Decimal Star Rating: 4.1) - unreviewed model outputs**	**Suggested Timing of Implementation**
Description of Attributes			
Vehicle Parking	One Side	None	Immediate
School Warning	No School Zone	Signs/Markings	Medium
Crossing Supervisor	No Supervisor	Supervisor	Immediate
Crossing Quality	Poor	Adequate	Medium
Speed Limit	30 kph	20 kph	Medium
Speed Management	Not Present	Present	Medium
Road Condition	Medium	Good	Long Term
Road Grip	Medium	Good	Long Term

Table 4 presents the Star Rating of Camarines Sur National High School – Liboton Annex critical area BEFORE and AFTER improvements using the SR4S demonstrator. The rating improved from 1 star to 4 stars, with a corresponding decimal rating of 4.1.

Table 4. Results before and after hypothetical improvements at the critical points assessed.

Critical Location Assessed	Results before implementation (assessment)	Results after implementation (unreviewed model outputs)
M.T. Villanueva Avenue (in front of Camarines Sur National High School – Liboton Annex)	★	★★★★

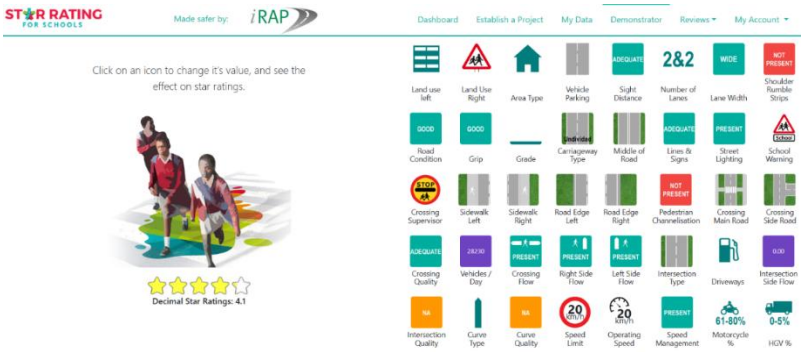


Figure 6: Initial Star Rating of Camarines Sur National High School – Liboton Annex using SR4S Demonstrator after full implementation

The following photos in Figure 7 show the conditions during the initial assessment at Camarines Sur National High School – Liboton Annex.







Figure 7. Photos of Camarines Sur National High School – Liboton Annex during the Assessment

b. Naga Central School I

The location of Naga Central School I is shown in the map in Figures 8.

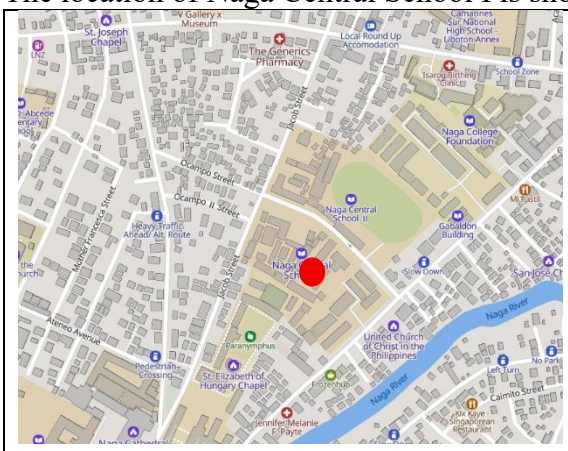


Figure 8. Location of Naga Central School I
(Photo credit: mapcarta.com)

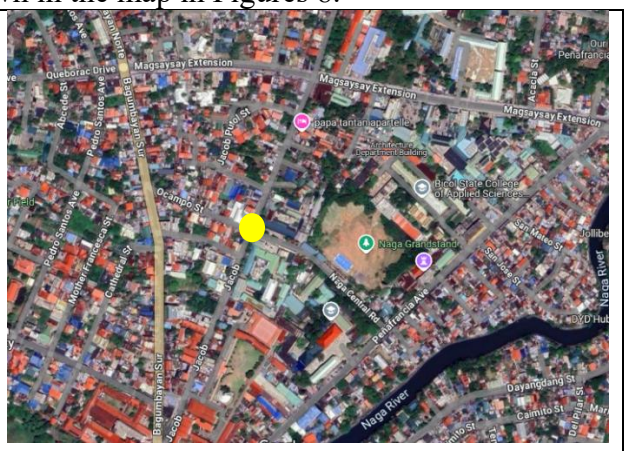


Figure 9. Critical Location Assessed at Naga Central School I
(Photo credit: Google Maps)

Assessment

Figure 9 shows the critical location where the assessments were conducted. The location is in Jacob St. – the Intersection adjacent to the entrance of the school.

Result

The table below presents the quality-reviewed star rating for the identified critical location, generated using iRAP's Star Rating for Schools (SR4S) web application.

Table 5. Quality-Reviewed SR4S Assessment Results for the Critical Location at Naga Central School I.

Critical Location Assessed	Results before implementation (assessment)	Decimal Star Rating
Jacob St. – Ocampo St. Intersection	★★★	3.9



Figure 10. Star Rating of Naga Central School I After Quality Reviewed

From the assessments of the assessors, Naga Central School I got a Star Rating of 3 with a decimal star rating of 3.9. Table 6 show the recommended attributes to obtain a higher star rating and their suggested timing of implementation. Table 7 presents the star rating for each of the data points before and after the improvements using the SR4S demonstrator. From 3 stars, it improves to 5 stars with decimal star ratings of 5.4.

Table 6. Recommended interventions at the main gate using the demonstrator.

Naga Central School I			
Attribute	**Before: 3 stars (Decimal Star Rating: 3.9) -Quality Reviewed**	**After intervention: 5 stars (Decimal Star Rating: 5.4) -unreviewed model outputs**	**Suggested Timing of Implementation**
	Description of Attributes		
Vehicle Parking	One side	None	Immediate
Sight Distance	Poor	Adequate	Immediate
Road Edge Left	None	0 to 1m wide	Immediate
Speed Limit	30 kph	20 kph	Medium
Speed Management	Not Present	Present	Medium

Table 7: Baseline and Modeled Treatment Scenario Results for the Assessed Critical Location (Unreviewed SR4S Demonstrator Outputs)

Critical Location Assessed	Results before implementation (initial assessment)	Results after implementation (unreviewed model outputs)
Jacob St. – Ocampo St. Intersection	★★★	★★★★★



Figure 11. Initial Star Rating of Naga Central I using SR4S Demonstrator after full implementation

The photos in Figure 12 show the conditions during the initial assessment at Naga Central I – Jacob St. and Ocampo St.



Figure 12. Photos of Naga Central I during the Assessment

c. Universidad de Sta. Isabel (USI)

The location of the Universidad de Sta. Isabel is shown in the map in Figure 13.

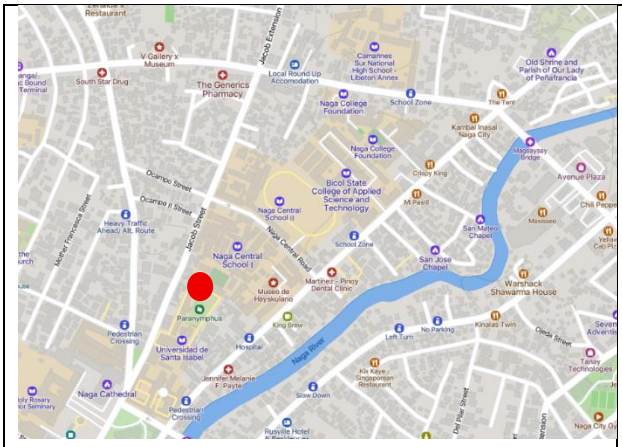


Figure 13. Location of Universidad de Sta. Isabel (Photo credit: mapcarta.com)

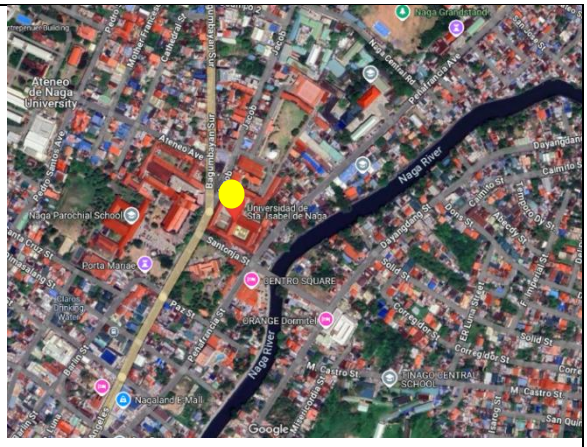


Figure 14. Critical Location Assessed at Universidad de Sta. Isabel (Photo credit: Google Maps)

Assessment

Figure 14 shows the critical point where the assessments were conducted. The location is in Jacob St. – the intersection adjacent to the entrance of the school.

Result

Table 8 below presents the quality-reviewed star rating for the identified critical location, generated using iRAP's Star Rating for Schools (SR4S) web application.

Table 8: Quality-Reviewed SR4S Assessment Results for the Critical Location at Universidad de Sta. Isabel.

Critical Location Assessed	Results before implementation (assessment)	Decimal Star Rating
Peñafrancia Avenue > Back entrance of school	★★	2.4

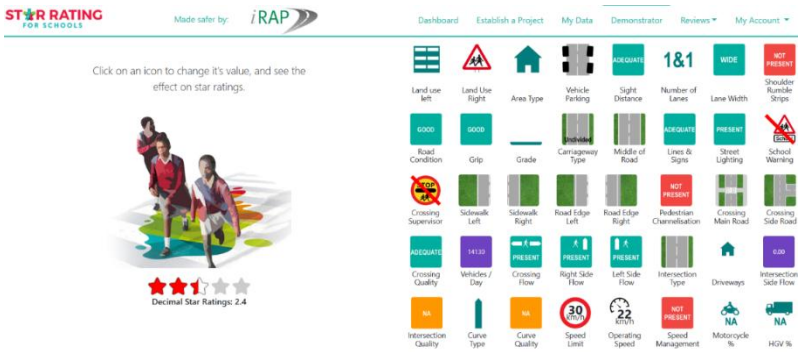


Figure 15. Star Rating of Universidad de Sta. Isabel After Quality Reviewed

From the assessments of the assessors, Universidad de Sta. Isabel got a Star Rating of 2 with a decimal star rating of 2.4. Table 9 show the recommended attributes to obtain a higher star rating and their suggested timing of implementation.

Table 9: Recommended interventions at Peñafrancia Avenue - Back entrance of school using the demonstrator.

Universidad de Sta. Isabel			
Attribute	**Before: 2 stars (Decimal Star Rating: 2.4) -Quality Reviewed**	**After intervention: 5 stars (Decimal Star Rating: 5.4) - unreviewed model outputs**	**Suggested Timing of Implementation**
	Description of Attributes		
Vehicle Parking	Both sides	None	Immediate
School Warning Sign	No School Warning Sign	Signs / Markings	Medium
Crossing Supervisor	No Supervisor	Supervisor	Immediate
Sidewalk Left	No Sidewalk	0 to 1m Away	Long Term
Sidewalk Right	No Sidewalk	0 to 1m Away	Long Term
Speed Limit	30 kph	20 kph	Medium
Speed Management	Not Present	Present	Medium

Table 10 presents the star rating for each of the data points before and after the improvements using the SR4S demonstrator. From 3 stars, it improves to 5 stars with decimal star ratings of 5.4.

Table 10: Results before and after hypothetical improvements at the critical points assessed.

Critical Location Assessed	Results before implementation (initial assessment)	Results after implementation **(unreviewed model outputs)**
Peñafrancia Avenue - Back entrance	★★	★★★★★



Figure 16. Initial Star Rating of Universidad de Sta. Isabel using SR4S Demonstrator after full implementation

The following photos show the conditions during the initial assessment at Universidad de Sta. Isabel - Peñafrancia Avenue - Back entrance of school.



Figure 17. Photos of Universidad de Sta. Isabel during the Assessment

4.2.Walkability Assessment

A walkability assessment was conducted along 15 purposively selected routes representing commercial, institutional/educational, residential, and public transport terminal areas in Naga City. The routes covered major roads and pedestrian corridors within and around the Central Business District. They were selected to capture variations in land use, pedestrian activity, road function, and conditions relevant to school-zone safety and urban accessibility.

Trained enumerators conducted direct field observations during typical weekdays. Each route was walked and divided into observable sections. The following nine indicators from the Asian Walkability Index were assessed: walking-path modal conflict, availability of walking paths, availability of crossings, grade-crossing safety, motorists' behavior, pedestrian amenities, infrastructure for persons with disabilities, pedestrian obstructions, and security from crime.

Each indicator was rated from 1, representing poor conditions, to 10, representing excellent conditions. The ratings were multiplied by the corresponding weights prescribed by the assessment tool and aggregated to produce a route-level score out of 100. Route scores were then grouped by area type to calculate the comparative walkability scores for residential, institutional/educational, commercial, and public transport terminal areas.

Table 11: Locations of the Walkability Survey.

No.	Locations/Survey Route	Area Type
1	Diversion Road (Yashano Mall to Deux Machina Agrosolutions)	PT Terminal
2	Diversion (Deux Machina Agro to Naga City Ferry Terminal)	PT Terminal
3	J. Hernandez to General Luna	Commercial
4	Magsaysay Avenue (Intersection to South Star Drugs)	Commercial
5	Magsaysay Avenue (Petron Magsaysay to Rotonda)	Commercial
6	Magsaysay Avenue (Southstar Drug to Petron)	Institutional/Educational
7	Padian Street - Peñafrancia Street - Arana Street - Elias Angeles Street	Residential
8	Panganiban Drive (NIA to Jollibee)	Commercial
9	Panganiban Drive (Rotonda to Naga Irrigation Administration)	Institutional/Educational
10	Penafrancia Ave (Cam High Crossing to Centro Square Crossing)	Commercial
11	Peñafrancia Avenue (San Francisco Church to Centro Square)	Institutional/Educational
12	Peñafrancia Avenue-Naga-Central-Crossing-Liboton-Crossing	Residential
13	Plaza Rizal to Jollibee Panganiban	PT Terminal
14	Rotunda to Yashano Mall	PT Terminal

The map in Figure 18 shows the designated walkability survey area in Naga City, highlighting key neighborhoods such as Diversion Road, Magsaysay Avenue, Panganiban Drive and Peñafrancia Avenue. Major roads and landmarks within the boundary illustrate the scope of pedestrian infrastructure assessed.

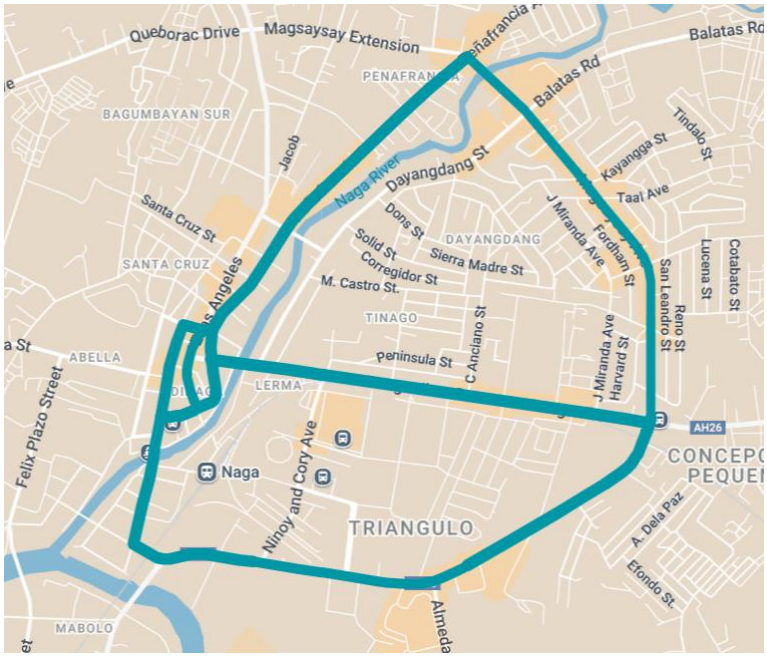


Figure 18: Map showing the assessed area

4.3.Walkability Assessment Results

The comparative walkability assessment across four urban area types in Naga City—Residential, Institutional/Educational, Public Transport Terminal, and Commercial—revealed notable variations in pedestrian infrastructure and safety.

Residential areas recorded the highest overall walkability score of 61, indicating relatively better walking conditions among the assessed area types. Institutional/educational areas followed with a score of 53, reflecting moderate walkability but indicating opportunities to improve pedestrian amenities, accessibility, and facilities for persons with disabilities.

Commercial areas and public transport terminal areas recorded lower scores of 49 and 47, respectively. These results indicate greater concerns related to pedestrian–vehicle conflicts, crossing safety, motorist behavior, walkway obstructions, and the continuity and accessibility of pedestrian facilities in high-activity areas.

The average score across the four assessed area types was 53 out of 100, indicating moderate but inadequate overall walkability. The findings support the prioritization of targeted improvements, particularly in commercial and public transport terminal areas where pedestrian activity and interaction with motorized traffic are generally high.

These findings provide a data-driven foundation for prioritizing improvements in urban mobility, particularly in areas serving vulnerable road users and high foot traffic.

Table 12. Walkability Scores of Naga City (Scores - out of a maximum possible 100).

Criteria	Residential	Institutional / Educational	Public Transport Terminal	Commercial	Average
1. Walking path modal conflict	63	51	52	52	54
2. Availability of walking paths	66	51	55	56	57
3. Availability of crossings	62	66	35	47	52
4. Grade crossing safety	63	59	40	41	51
5. Motorist behavior	73	64	57	46	60
6. Amenities	61	46	41	46	48
7. Disability infrastructure	43	23	34	47	37
8. Obstructions	49	49	50	44	48
9. Security from crime	74	70	60	63	67
Walkability Score	**61**	**53**	**47**	**49**	**53**

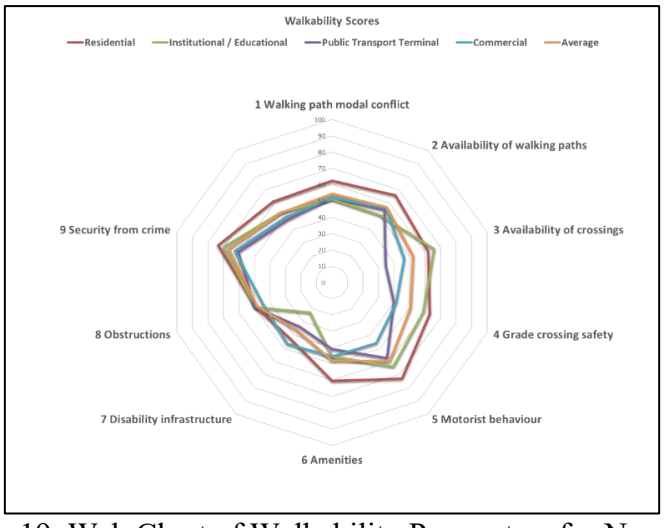


Figure 19. Web Chart of Walkability Parameters for Naga City

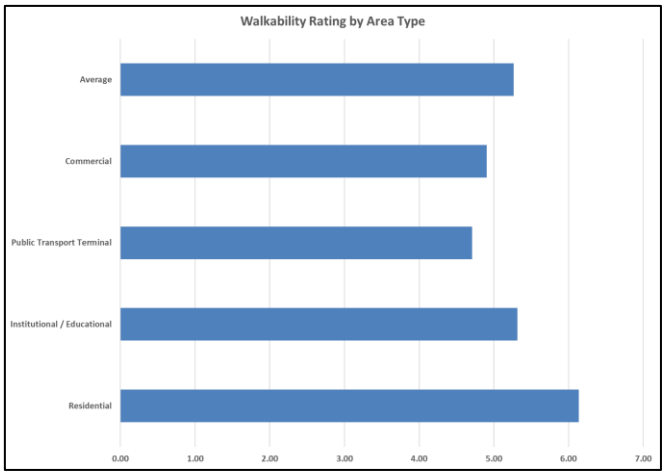


Fig. 20. Overall Walkability Ratings for Naga City

The walkability assessment highlights significant variation across urban zones and cities. Among the four zone types—Commercial, Public Transport Terminal, Educational, and Residential—Residential areas recorded the highest average score of 61, reflecting better infrastructure and pedestrian amenities. This was followed by institutional/educational areas at 53 and commercial areas at 49. Public transport terminal areas received the lowest score of 47, indicating greater gaps in pedestrian safety, accessibility, facility continuity, and inclusive design.

These outcomes are compared to other Philippine cities that have been evaluated before for walkability. Among these cities, Metro Manila had the highest overall score with 60.62. This was followed by Davao City (59.68) in Mindanao Island, Cebu City (59.05) in Central Philippines, Tacloban City (56.66) in the Eastern Visayas region and Olongapo City (56.32) in Luzon Island. Naga City's scores are lower than all these cities. The breakdown of scores for the cities and the comparison with Naga City are shown in Figure 21.

Walkability scores out of a possible 100

Criteria	Residential	Educational	PT Terminal	Commercial	Average
1. Walking path modal conflict	63	51	52	52	54
2. Availability of walking paths	66	51	55	56	57
3. Availability of crossings	62	66	35	47	52
4. Grade crossing safety	63	59	40	41	51
5. Motorist behavior	73	64	57	46	60
6. Amenities	61	46	41	46	48
7. Disability infrastructure	43	23	34	47	37
8. Obstructions	49	49	50	44	48
9. Security from crime	74	70	60	63	67
Walkability Score	**61**	**53**	**47**	**49**	**53**

For comparison:

City	Residential	Educational	PT Terminal	Commercial	WALKABILITY SCORE (Average)
Tacloban City	**63.60**	**50.97**	**55.14**	**56.93**	**56.66**
Olongapo City	55.47	55.69	54.94	59.17	56.32
Metro Manila	- no data -	53.89	49.44	78.52	60.62
Davao City	51.11	58.89	59.63	69.07	59.68
Cebu City	46.53	64.44	57.04	68.18	59.05

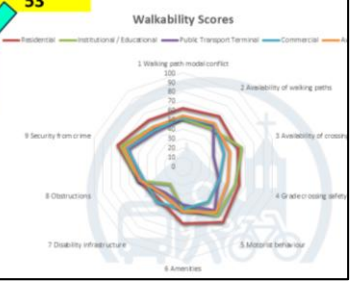


Figure 21. Comparative Walkability Scores Across Urban Zones and Cities

These findings suggest that while Naga's central commercial corridors offer decent walkability, there's a lot of room for improvements in residential, educational and transport terminal areas to achieve more inclusive and safer pedestrian mobility across the city.

4.4.Integration of the Assessment Tools

The SR4S and walkability results were integrated through a common priority-setting process rather than by combining their scores. The three pilot school critical locations were prioritized, while lower walkability scores identified broader deficiencies affecting pedestrian safety, accessibility, and comfort. Recurring concerns identified by both tools—such as excessive vehicle speeds, unsafe crossings, sidewalk gaps, pedestrian obstructions, parking and loading activities, and inadequate facilities for persons with disabilities—were consolidated into a common list of priority interventions. This approach linked school-specific safety treatments with improvements needed along the surrounding pedestrian network.

Table 13 presents the SR4S and walkability findings in a common comparative framework. The SR4S results identify risks at specific school critical points, while the walkability assessment describes broader pedestrian conditions across selected area types. Although the two tools use different scoring systems and their scores are not directly comparable, their findings were integrated by identifying recurring safety concerns and corresponding priority interventions.

Table 13. Comparative Assessment of SR4S and Walkability Findings

Assessment component	Location or area type	Baseline result	Interpretation	Common issues identified	Priority interventions
SR4S	Camarines Sur National High School–Liboton Annex	1 star (1.6)	Highest modeled risk among the three school locations	High vehicle speeds, inadequate crossings, limited school-zone facilities, and frontage conflicts	Speed management, designated and supervised crossings, school-zone signs and markings, and parking controls
SR4S	Naga Central School I	3 stars (3.9)	Moderate modeled risk, but further improvement is needed	Crossing safety, speed management, pedestrian visibility, and roadside activity	Improve crossings, maintain low operating speeds, enhance signs and markings, and manage curbside activities
SR4S	Universidad de Sta. Isabel	2 stars (2.4)	High modeled risk requiring priority intervention	Inadequate crossing provision, vehicle parking, loading and unloading activities, and pedestrian exposure	Provide safe crossings, remove parking near the entrance, designate loading areas, and improve pedestrian facilities
Walkability	Residential areas	61/100	Highest score among the	Gaps in pedestrian-	Improve sidewalk

Assessment component	Location or area type	Baseline result	Interpretation	Common issues identified	Priority interventions
			assessed area types, but deficiencies remain	facility continuity, accessibility, and amenities	continuity, accessibility, lighting, and pedestrian amenities
Walkability	Institutional/educational areas	53/100	Moderate walkability; directly relevant to school travel	Crossing deficiencies, inadequate amenities, and limited facilities for persons with disabilities	Provide accessible sidewalks, safer crossings, traffic calming, and school-zone treatments
Walkability	Commercial areas	49/100	Lower walkability in high-activity corridors	Pedestrian obstructions, motor-vehicle conflicts, unsafe crossings, and curbside activity	Clear pedestrian paths, improve crossings, regulate parking and loading, and manage vehicle speeds
Walkability	Public transport terminal areas	47/100	Lowest walkability score and highest area-level priority	Heavy pedestrian–vehicle interaction, obstructions, inadequate crossings, and discontinuous facilities	Separate pedestrian and vehicle movements, improve terminal access, provide crossings, and remove walkway obstructions

The comparison shows that the two assessment tools produced complementary findings. SR4S identified location-specific risks faced by schoolchildren, particularly at the 1-star and 2-star school locations. The walkability assessment showed that similar concerns extend to the broader pedestrian environment, particularly in commercial and public transport terminal areas. Both assessments consistently identified the need for speed management, safer crossings, continuous and accessible sidewalks, removal of pedestrian obstructions, and better management of parking and loading activities. These recurring concerns formed the basis of the common priority list.

5. CONCLUSIONS

This pilot study applied iRAP's Star Rating for Schools (SR4S) alongside the ADB–Clean Air Asia Walkability tool to diagnose school-zone risks and pedestrian conditions in Naga City. The combined evidence pinpoints systemic exposure to speeding, inadequate crossings, sidewalk gaps, and curbside conflicts, and shows strong, modelled upgrade potential with low- to medium-cost countermeasures. Together, the results establish a defensible baseline and a child-first prioritization framework aligned with the city's walkability and safety goals.

- The quality-reviewed SR4S baseline assessments rated Camarines Sur National High School–Liboton Annex at 1 star (1.6), Naga Central School I at 3 stars (3.9), and Universidad de Sta. Isabel at 2 stars (2.4). At these critical points, the assessments identified recurring concerns involving operating speed, crossing provision, school-zone signs and markings, sidewalk continuity, and parking or loading activities near school entrances. SR4S Demonstrator runs indicated that combinations of speed management, designated or supervised crossings, parking controls, school-zone signs and markings, and sidewalk improvements could produce modeled ratings of 4 to 5 stars. These ratings represent hypothetical treatment scenarios and not observed post-implementation conditions.
- The modeled treatment scenarios indicate the potential to improve the assessed school locations to 4–5 stars through measures such as reducing speeds to 20 km/h, providing supervised or designated crossings, restricting parking near school frontages, installing appropriate school-zone signs and markings, and improving sidewalk provision. These interventions should be validated through detailed engineering assessment and post-implementation evaluation.
- Across the 15 selected walkability routes, the average score was 53 out of 100. Residential areas recorded the highest area-type score at 61, followed by institutional and educational areas at 53, commercial areas at 49, and public transport terminal areas at 47. The lower scores in commercial and terminal areas indicate that these assessed routes require greater attention to pedestrian–vehicle conflicts, crossing safety, walkway obstructions, and the continuity and accessibility of pedestrian facilities.
- Although SR4S and the walkability assessment use different scoring systems, their findings converged on a common set of priorities: speed management, safer crossings, continuous and accessible sidewalks, removal of pedestrian obstructions, and improved management of parking and loading activities. This combined approach can help Naga City identify priority locations and develop phased interventions consistent with its goal of becoming a “Walkable, Orderly, and Secure City”.

6. RECOMMENDATIONS

Building on the conclusions, the results point to clear, evidence-based opportunities for action. Since SR4S and the ADB–Clean Air Asia Walkability tool revealed systemic risks, speeding, poor crossings, sidewalk gaps, and curbside conflicts, paired with strong upgrade potential, Naga City can move from diagnosis to implementation through a phased and child-first program. These recommendations support the city’s 2028 vision of a “Walkable, Orderly, and Secure City.”

1) School-Zone Safety

- Institutionalize the use of SR4S for all schools, starting with those rated 1–2 stars.
- Implement speed management at 20 km/h, especially near school gates, with raised tables, conspicuous signs/markings, and time-of-day enforcement.
- Provide safe crossings through supervised/designated crosswalks, daylighting (no parking near gates), and high-visibility markings.
- Remove on-street parking at frontages and establish formal loading bays away from crossing points.
- Address sidewalk gaps and obstructions to ensure continuous, accessible paths for children.

2) Active Transport and Walkability

- Adopt and routinely apply SR4S and walkability apps to monitor and guide improvements.
  - SR4S for school zones.
  - Expanded walkability surveys across neighborhoods, terminals, and commercial corridors.
- Implement priority interventions in school zones to upgrade them from 1–3 stars to 4–5 stars.
- Identify and designate streets for pedestrianization, including no-car Sundays, to promote safe, inclusive walking environments and extend benefits beyond school frontages.

3) Policy Measures

- Institutionalize an annual "assess → engineering interventions → post-assessment" cycle for both schools and walkability sites, linking results to investment programs.
- Establish a "Safe School Zones" budget line for quick-build and permanent treatments, tapping local funds and external support.
- Integrate these interventions into the city's transport and capital investment plans, ensuring alignment with Naga's 2028 goals.
- Build local capacity by training LGU staff, school personnel, and community groups on SR4S and walkability audits, while co-designing solutions with School officials, PTAs, barangays, and transport operators.

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