

REPORT OF RESEARCH RESULTS

Road Safety Assessment and iRAP Star Ratings for High-risk Schools in Bangkok

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Summary

Each year, up to 186,300 children lose their lives from road traffic accidents around the world (UN Global Road Safety Week, 2017). Thailand has been among the top countries with highest death rate in road traffic accidents, according to WHO global status report in 2018. Each year more than 2,600 Thai children die on the roads. Moreover, 72,000 young people were injured from road accidents. Children are particularly vulnerable road users, and the safety of children walking along and across roads is the major concern.

In this study, we utilized the concept of Star Rating for Schools methodology from iRAP (International Road Assessment Programme), which is an international charity working to save lives from road accidents. The methodology has been implemented in Thailand on some highway sections through World Bank and Bloomberg Foundation, but it has never been applied particularly in school zones. Thus, in the present research a total of four schools in Bangkok metropolitan region with high risks were selected as case studies, namely, Wat Donmuang School, Wat Sing School, Assumption College (Primary Section), and Wat Sutthiwararam School.

Roads accident data in school's area was collected from secondary sources. Field data collection was conducted at main and access roads nearby selected schools. The collected data covers more than 50 road attributes that are necessary in computing risk scores based on pedestrian perspectives. All methodologies strictly follow the iRAP guidelines, whose results are consistent and can be compared across all streets in any countries.

Results indicate that such a methodology can be applied to Thai schools. In addition, it was found that certain sections of access roads to the schools in the present study still fall into 1 or 2-star roads, while the minimum acceptable criterion according to the World Health Organization (WHO) road safety targets is 3-stars or better. This prompts local road authorities to upgrade such road sections to a higher standard. Proven road safety improvements were also suggested.

Aim of Research

The goal of this research is to raise awareness of road safety around school area by analyzing potential risks in road network around schools and suggesting appropriately treatment options. Pedestrian risk scores are the primary focus of the research. It is also our objective to demonstrate that such an assessment can be applicable for school areas in Thailand and should be further explored in the future.

Method of Research & Progression

The iRAP Star Ratings are based on road inspection data and provide a simple and objective measure of the level of safety, which is 'built-in' to the road. 5-star roads are the lowest risk while 1-star roads are the highest risk. The production of iRAP Star Ratings and Safer Road Investment Plans involve a number of data collection, survey and analysis processes, as illustrated in Figure 1. The iRAP assessments make use of road attribute data for more than 50 variables at 100 meter intervals along a road. The data was compiled through road surveys that collect digital

images of the road using multi-view high-resolution cameras. After the images were collected, they were viewed by coders using specialized software to record the road attributes.

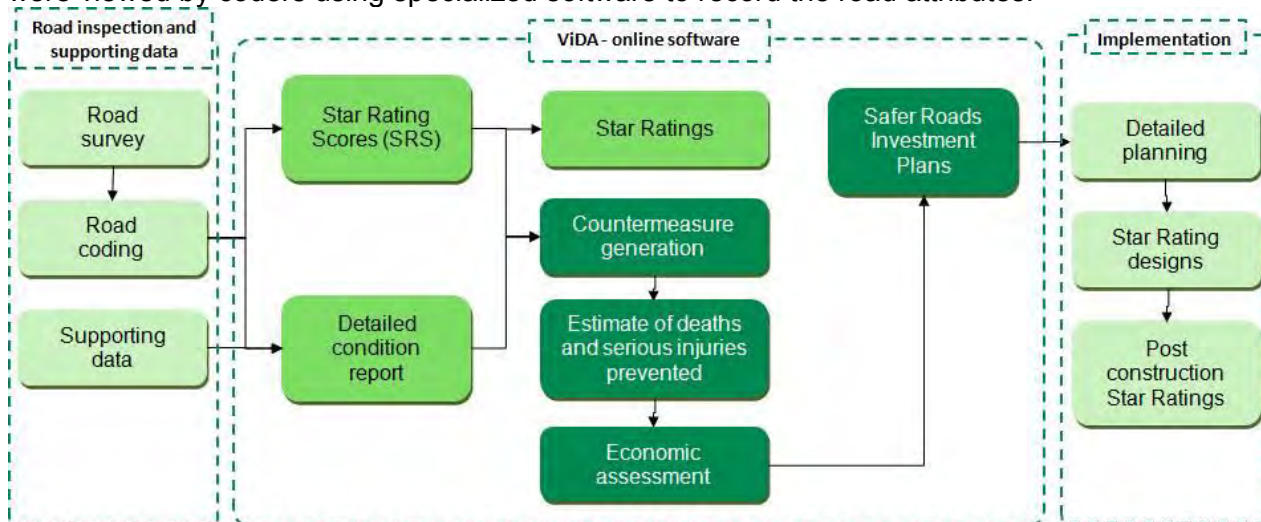


Figure 1 iRAP Assessment Process

In this study, four schools in Bangkok metropolitan region with high risks were selected as case studies, namely, Wat Donmuang School, Wat Sing School, Assumption College (Primary Section), and Wat Sutthiwararam School. Figure 2 shows the location of the schools, while Table 1 presents related information, including historical crash records within 400-meter buffer radius from the center of the school. It should be noted that different school could have different public transportation modes available. For instance, Wat Donmuang School can be accessed by pick-up trucks (locally known as song-taews), buses, vans, local trains, and motorcycle taxis. On the other hand, Assumption College (Primary section) and Wat Sutthiwararam School can be accessed by song-taews, buses, motorcycle taxis, and mass transit (BTS sky train).

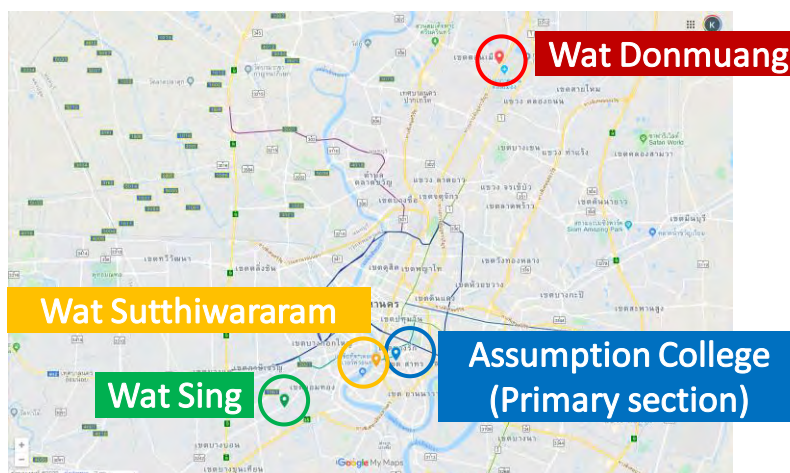


Figure 2 Location of Selected Schools

Table 1 Information on Selected Schools

School Name	Primary/ High School	Number of Students	Past crash recorded (Buffer 400 m, year 2018)		Main access road
			# Crashes	# Fatalities	
Wat Donmuang	Primary	1,612	42	4	Vibhavadi Rangsit
Wat Sing	High	3,302	109	3	Eakachai
Assumption College (Primary Section)	Primary	2,689	17	0	South Sathorn
Wat Sutthiwararam	High	2,899	28	0	Charoen Krung

Note: Crash statistics from Road Accident Victims Protection Company Limited.

Results of Research

An in-depth field survey was conducted for all selected schools. A total of 11.8 kilometres of 39 road sections in four corridors were assessed utilizing the data collected during the road video survey. The Star Ratings are based on Star Rating Scores (SRS). The iRAP models are used to calculate an SRS at 100 meter intervals for pedestrians, based on relative risk factors for each of the road attributes. The scores are developed by combining relative risk factors using a multiplicative model. More information on the risk factors used within the model can be found within the Methodology Documents at www.irap.org. In principle, the star rating bands for pedestrians can be shown in Table 2 below.

Table 2 Star Rating Bands for Pedestrians

Star Rating	Pedestrian Star Rating Score		
	Along	Crossing	Total
5	0 to < 0.2	0 to < 4.8	0 to < 5
4	0.2 to < 1	4.8 to < 14	5 to < 15
3	1 to < 7.5	14 to < 32.5	15 to < 40
2	7.5 to < 15	32.5 to < 75	40 to < 90
1	15 +	75 +	90 +

Table 3 presents the findings in terms of star ratings and associated Star Rating Scores (SRS) for the four corridors in this study. The star rating results for all road sections surveyed demonstrate that there is a potential to improve the safety of road infrastructure for pedestrians. Although most of the surveyed roads are rated 3 stars or better, part of the network is yet rated as high-risk for pedestrians. Table 4 summarizes the distribution of star ratings for all four schools.

Table 3 Star Rating and SRS for Schools







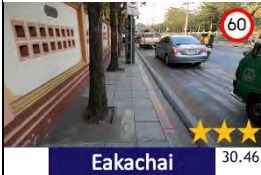
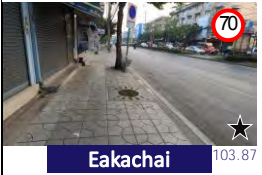








Site	Front road		Main access road	
Wat Donmuang School				
	Cherdvudthagard 4.28	Cherdvudthagard 9.98	Vibhavadi Rangsit 15.34	Vibhavadi Rangsit 42.75
Wat Sing School				
	Eakachai 43 6.68	Eakachai 43 13.74	Eakachai 30.46	Eakachai 103.87
Assumption College (Primary Section)				
	Sathorn 11 1.82	Sathorn 11 1.82	South Sathorn 35.91	South Sathorn 35.91
Wat Sutthiwaram School				
	Charoen Krung 10.67	Charoen Krung 134.50	Charoen Krung 247.66	Charoen Krung 278.04

Table 4 Summary of Star Ratings

Site	1 Star	2 Stars	3 Stars	4 Stars	5 Stars	Total (m)
Wat Donmuang School	3.9 %	4.0 %	78.5 %	13.6 %	0.0 %	2,600
Wat Sing School	6.3 %	1.6 %	35.5 %	42.1 %	14.5 %	2,600
Assumption College (Primary Section)	0.0 %	13.8 %	82.5 %	0.0 %	3.7 %	3,800
Wat Sutthiwararam School	35.4 %	15.1 %	37.7 %	11.7 %	0.0 %	2,800

The following key issues can be derived from the present findings:

- Traffic in front of the school is found to be at low speed, which is relatively safer for students than the traffic on main roads around the school
- Lack of safety facilities such as safe sidewalks (no obstacles) along main roads
- Lack of a safe pedestrian crossing (where driver can see and can stop the car safely when students cross the road)
- Lack of information for drivers to perform proper speed maneuver and be aware of students crossing the roads

Future Areas to Take Note of, and Going Forward

The Crash Reduction Factor (CRF), the percentage crash reduction that might be expected after implementing a given countermeasure at a specific site, could be considered in selecting appropriate road safety improvements and countermeasures. Some of the proven countermeasures include pedestrian fencing (25-40 % CRF), pedestrian footpath (40-60% CRF), speed management (25-40% CRF), signalized pedestrian crossing (25-40% CRF), and traffic calming (25-40% CRF). Examples of applications to the schools in this study are shown in Figure 3 below.

In order to maximize the benefits from road safety projects, it is recommended that public participation is encouraged. Community engagement and cooperation between project partners, road authority and schools is regarded as providing a useful two-way flow of information that will not only educate and inform local road users and communities on how they are expected to use the road network, but can also provide designers and decision makers with an understanding of the needs and requirements of affected groups.

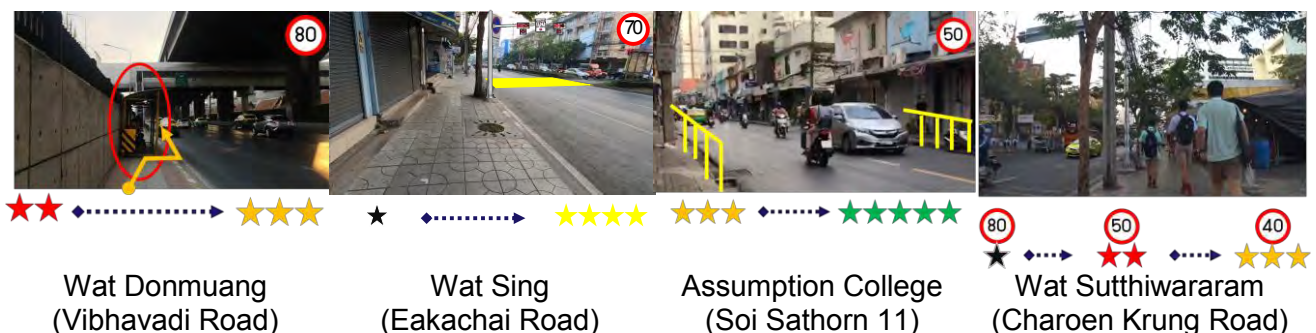


Figure 3 Examples of Proven Road Safety Improvements

Means of Official Announcement of Research Results

Research results from the present study is planned to be submitted for presentation at related national conferences such as the National Convention on Civil Engineering or relevant international conferences. Further discussion is being planned for related agencies to expand the study to other schools.