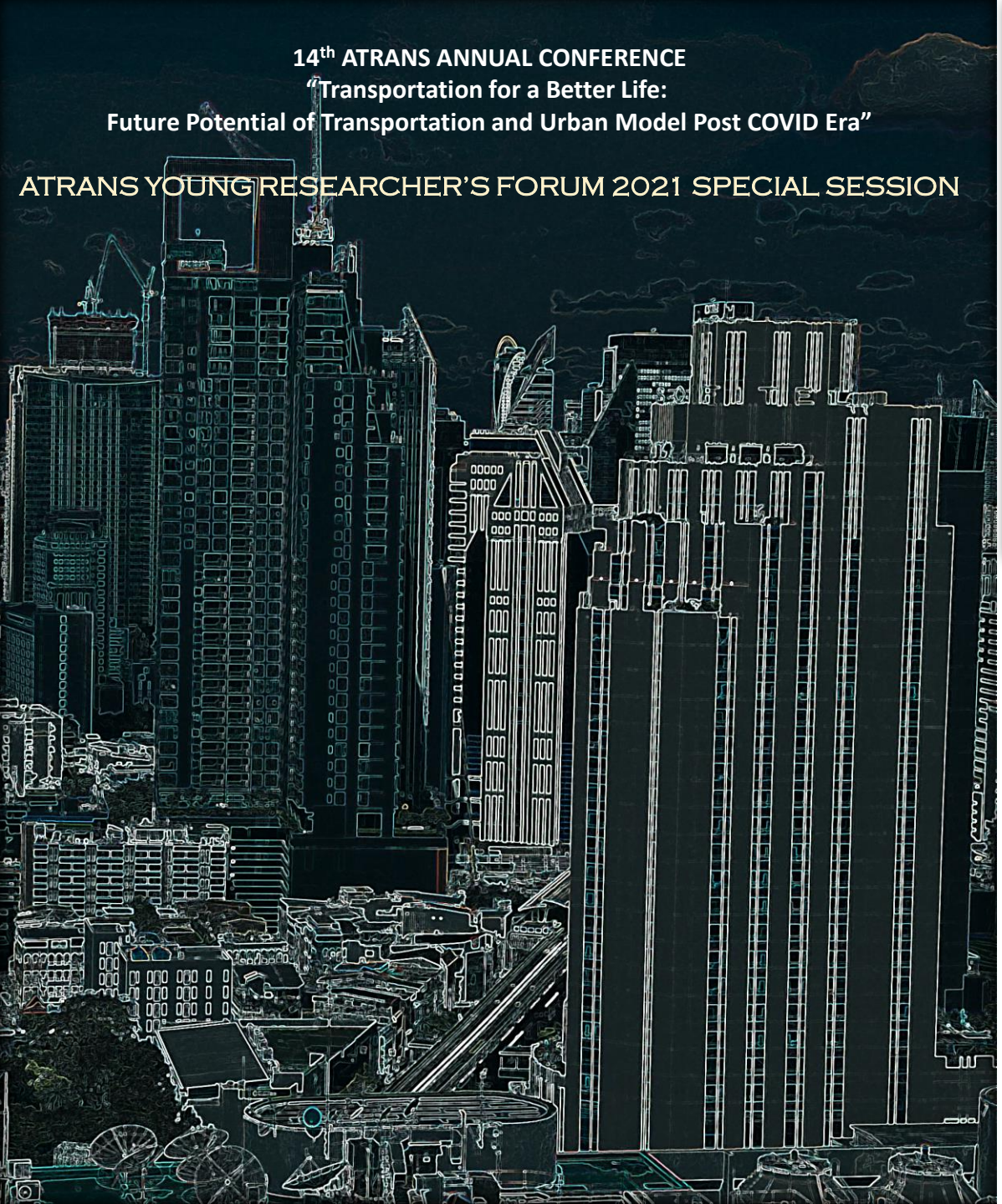

Study on Improvement of Star Rating Approach to Extract Traffic Hazardous Location in Nakhon Ratchasima Province, Thailand

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Background

Accident in Nakhon Ratchasima

- In many developing countries, the development of traffic accident data has not progressed.
- So efforts are being made to evaluate the safety of road facilities using the iRAP Star Rating and to take measures.
- Evaluation of the result of danger by iRAP might mis match the actual danger point from traffic accident data.

Purpose

▹ Clarify the problems of the evaluation items of iRAP Star Rating.

Steps:

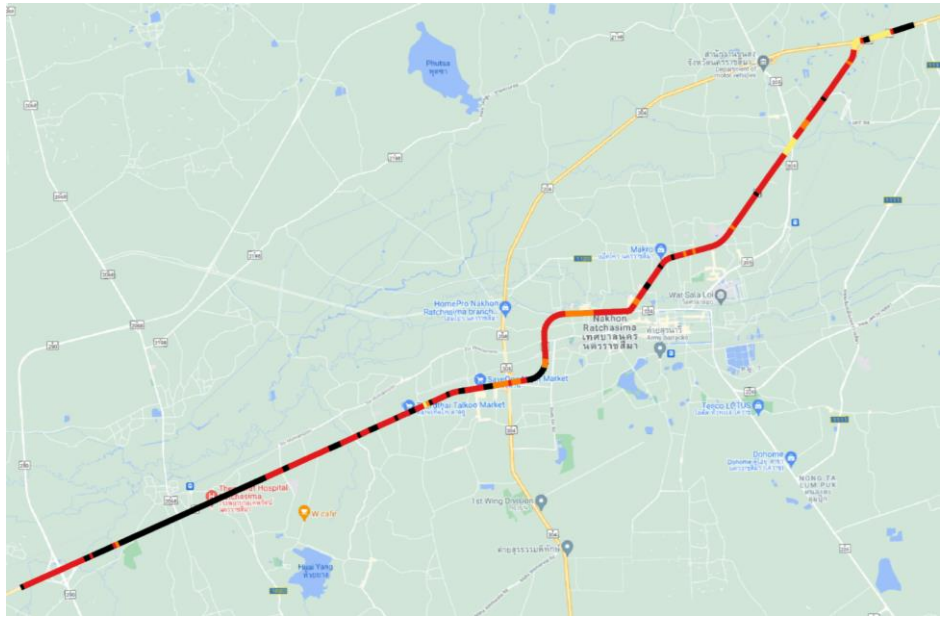
▹ To compare with actual road traffic accident data and results of iRAP Star Rating.

▹ To propose important points of iRAP Star Rating.

iRAP Star Rating

iRAP Star Ratings		Star Rating Score
★★★★★	Safest	0 to < 2.5
★★★★		2.5 to < 5.0
★★★		5.0 to < 12.5
★★		12.5 to < 22.5
★	Least safe	22.5 +
	Not rated	

iRAP Star Rating



Star Rating Score「SRS」

▹ The number of stars is determined from the Star Rating Score (SRS), which is the result of evaluating road facilities (road geometry, road attachments, road surface conditions).

▹ The higher the Star Rating score, the smaller the number of ★, and it is evaluated as dangerous.

Literature Review

1) Mazharul Hoque (2010)

- Hoque et al. conducted a verification in Bangladesh.
- They found that the type and danger of a particular accident are related to the road design.

2) Douglas W. Harwood (2010)

Harwood et al. compared SRS and crash rates on roads in Iowa and Washington State in the U.S., and clarified the relationship between SRS and crash rates.

3) Kamiya (2014)

- Kamiya et al. evaluated the SRS for roads in Japan and compared it with the accident data.
- As a result, there was no correlation between the risk level based on the SRS and the road traffic accident data.

<Positioning of this research>

- If there is no correlation, it is necessary to understand the cause of the no correlation and improve the Star Rating Approach.
- In this paper, the evaluation index for SRS was added as an approach improvement.

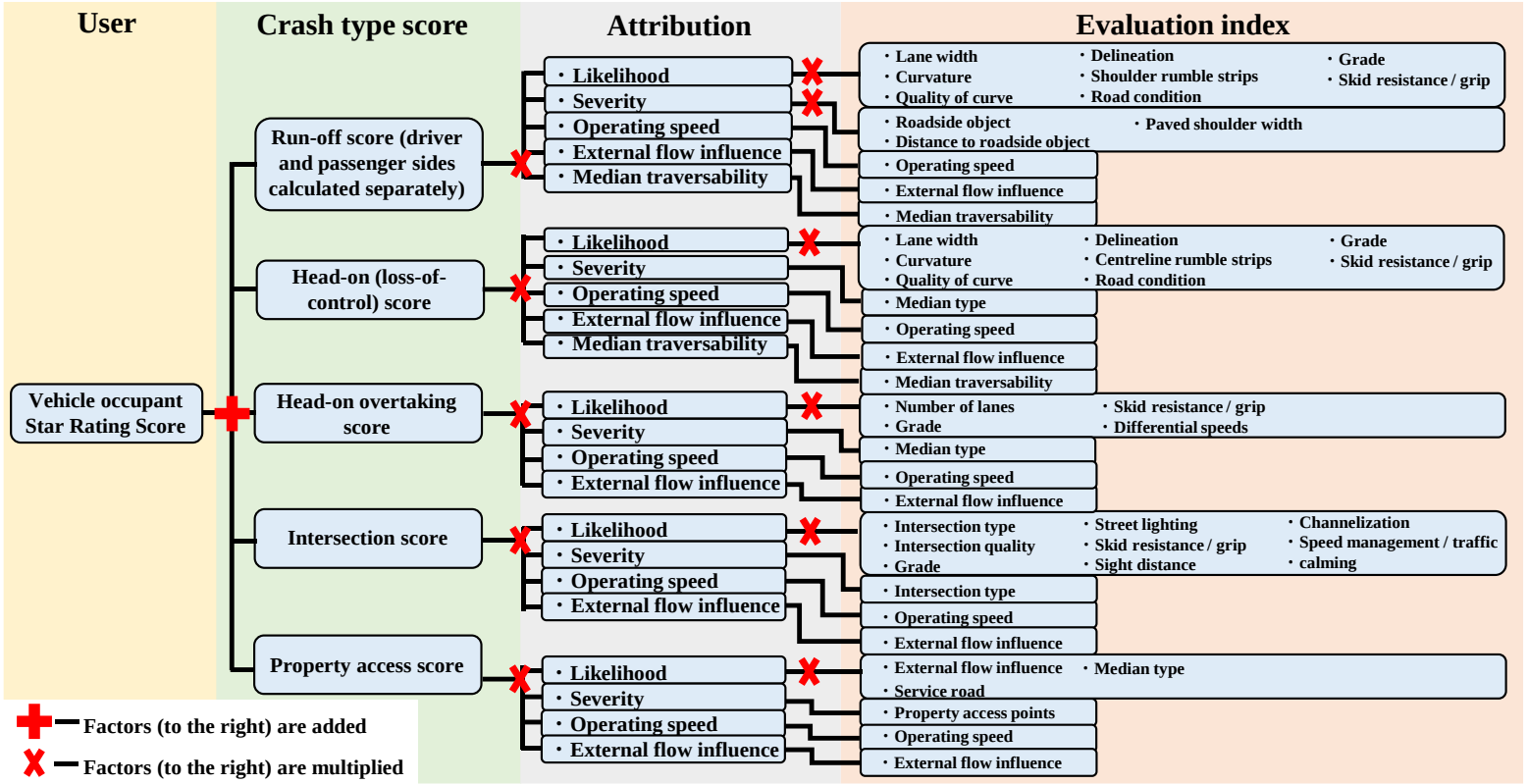
Flow of Evaluation Method

① The iRAP Star Rating will be applied on National Highway No. 2 passing through Korat City, Nakhon Ratchasima Province, Thailand.

② By comparing SRS with the points where traffic accidents and Hiyari Hatto occurred, and the details of the events that occurred, the problems of the evaluation items of iRAP Star Rating can be understood.

③ Consider and propose improvements to iRAP Star Rating based on problems.

Method of calculating of iRAP Star Rating approach

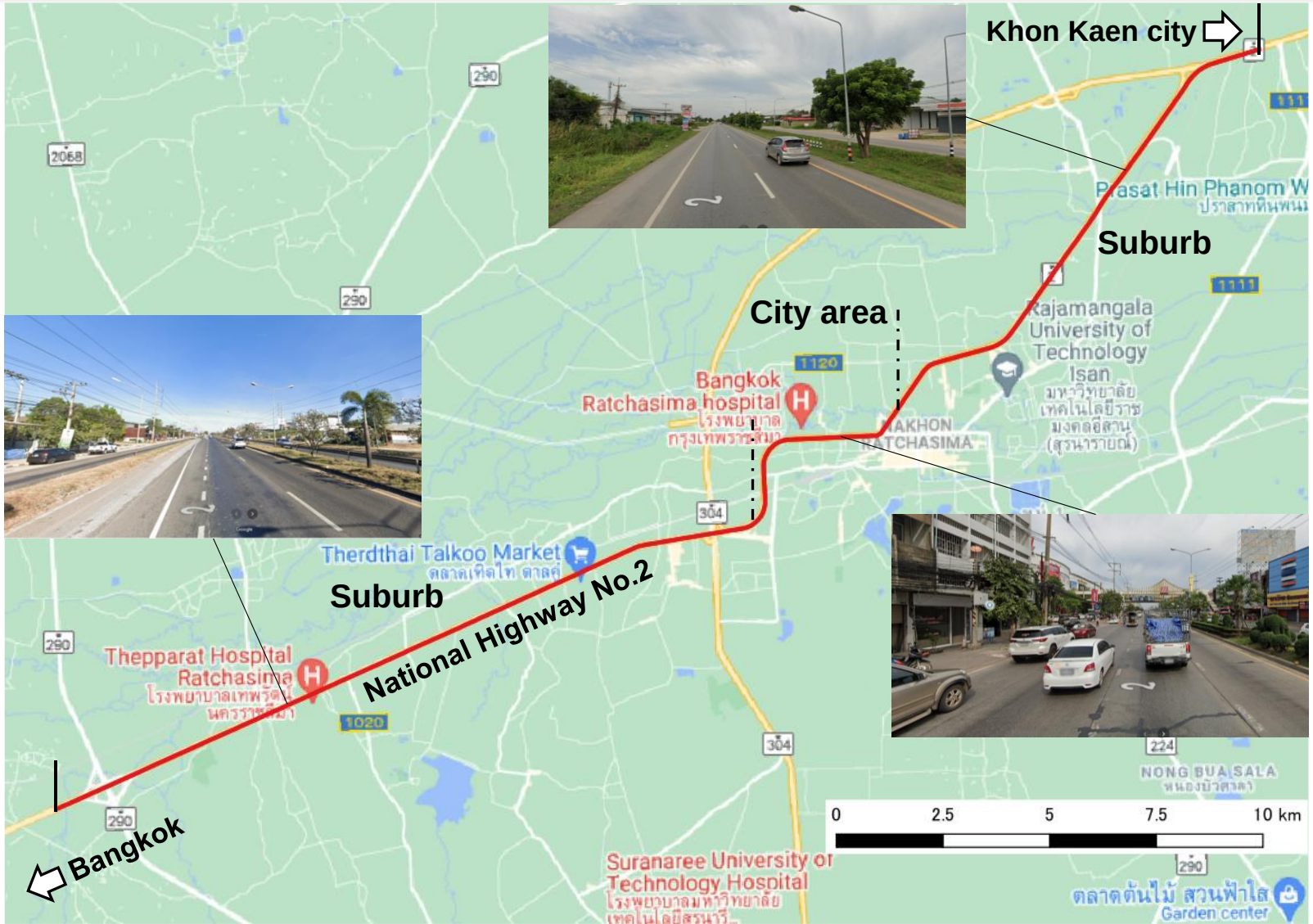


<Data used for calculates of Star Rating approach>

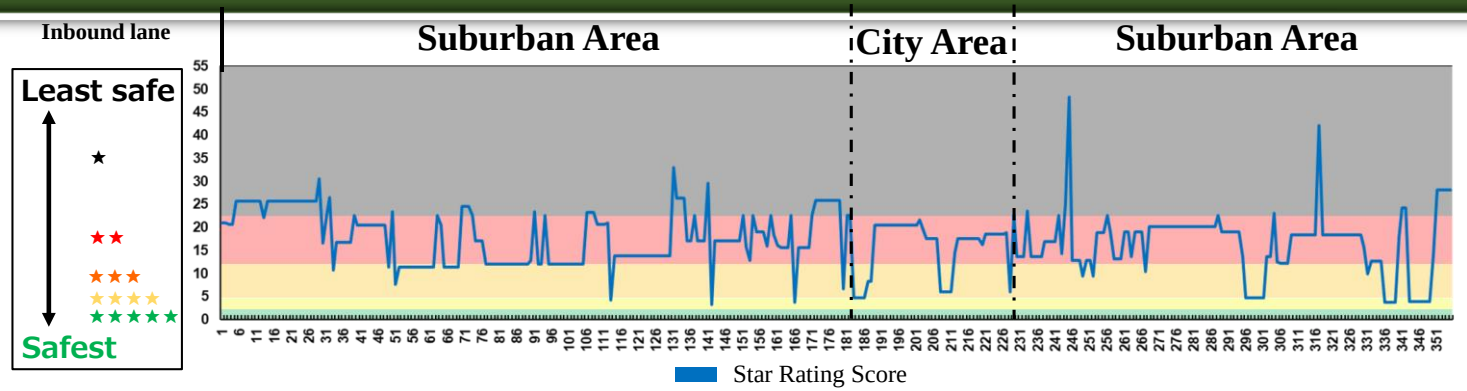
▹ The traffic volume used for the traffic flow is the daily traffic volume (AADT) collected in the target section in 2017 for the urban area and the suburbs on the Bangkok side, and in 2019 for the suburbs on the Khon Kaen city side.

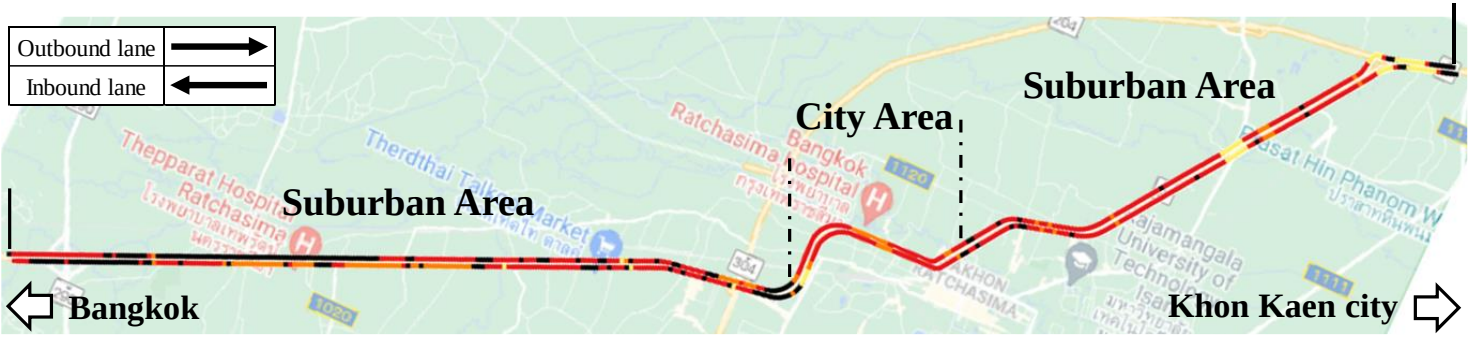
▹ Since the traveling speed could not be collected locally, it is assumed that the vehicle is accelerating to the speed limit by 10km / h (the vehicle speed is 70km / h when the traveling speed is 60km / h).

Study area

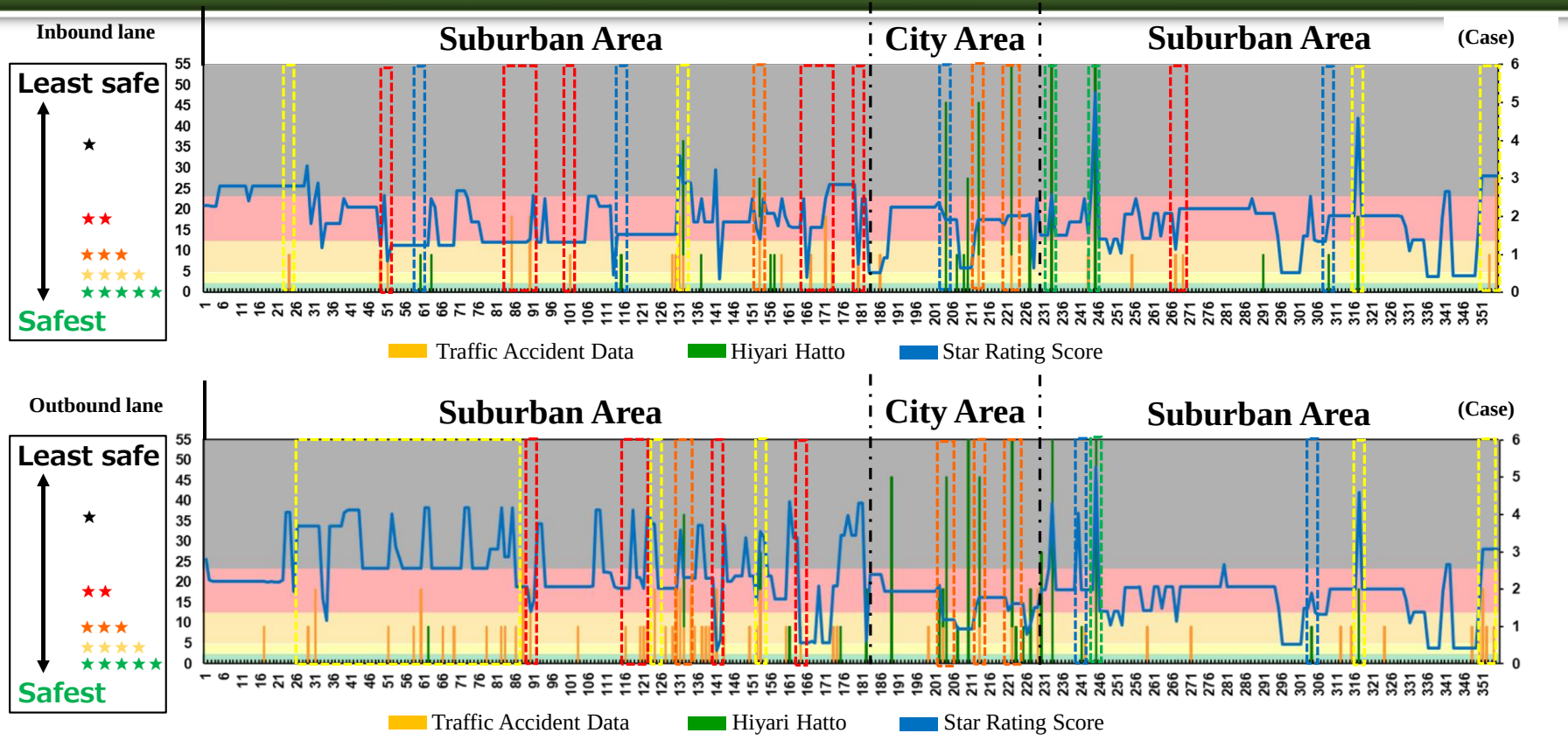

Khon Kaen city
Suburb
City area
Suburb
National Highway No.2
Bangkok
Bangkok Ratchasima hospital
Therdthai Talkoo Market
Thepparat Hospital Ratchasima
Rajamangala University of Technology Isan
Suranaree University of Technology Hospital
NONG BUA SALA
0 2.5 5 7.5 10 km

Result of SRS





Relationship between SRS and Hiyari Hatto Data and Traffic Accident Data



Least safe	★	a Star Rating Score : High	Traffic Accident : Occurred	Consistency
	★★	b Star Rating Score : High	Hiyari Hatto : Occurred	
Safest	★★★	c Star Rating Score : Low	Traffic Accident , Hiyari Hatto : Occurred	Not Consistency
	★★★★	d Star Rating Score : Low	Traffic Accident : Occurred	
	★★★★★	e Star Rating Score : Low	Hiyari Hatto : Occurred	

Problem of iRAP Star Rating

SRS (Star Rating score)	★★★★ [3.27]
Hiyari Hatto (Case)	0
Traffic accident (Case)	2

Although there have been Hiyari Hatto and traffic accidents, they are evaluated as "safe" by SRS.

SRS (Star Rating score)	★★ [15.77]
Hiyari Hatto (Case)	1
Traffic accident (Case)	3

It is evaluated as "dangerous".

Problem area of iRAP Star Rating approach

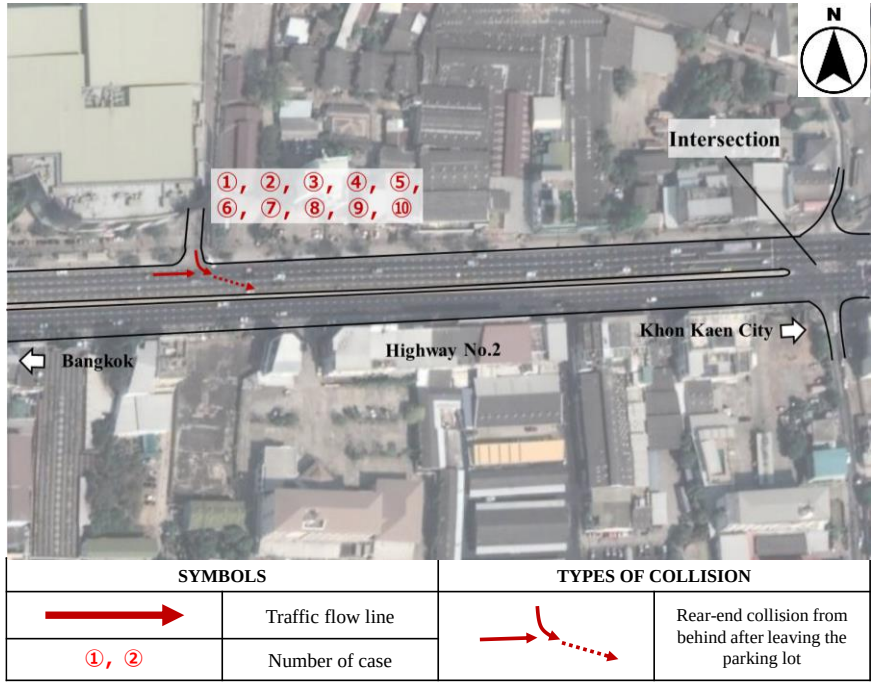
Inbound lane				
Aria	Road type	SRS	Hiyari Hatto (case)	Accident (case)
48-49	Arterial roads	★★★	0	1
50-51	Arterial roads	★★★	0	1
59-60	Arterial roads	★★★	1	0
84-85	Arterial roads	★★★	0	2
100-101	Arterial roads	★★★	0	1
179-180	Curve	★★★	0	1
209-210	Arterial roads	★★★	3	0
266-267	Arterial roads	★★★	1	0

Outbound lane				
Aria	Road type	SRS	Hiyari Hatto (case)	Accident (case)
140-141	U-turn-lane	★★★★	0	2
163-164	Arterial roads	★★★	0	1
203-204	Intersection U-turn-lane	★★★	5	0
209-210	Parking lot entrance	★★★	12	0
226-227	U-turn-lane	★★★	2	0
347-348	Arterial roads	★★★★	0	1

▹ The most many Hiyari Hatto and Trafic accident cases were Parking entrance and U-turn lanes.

Dangerous Factors in Parking Entrance

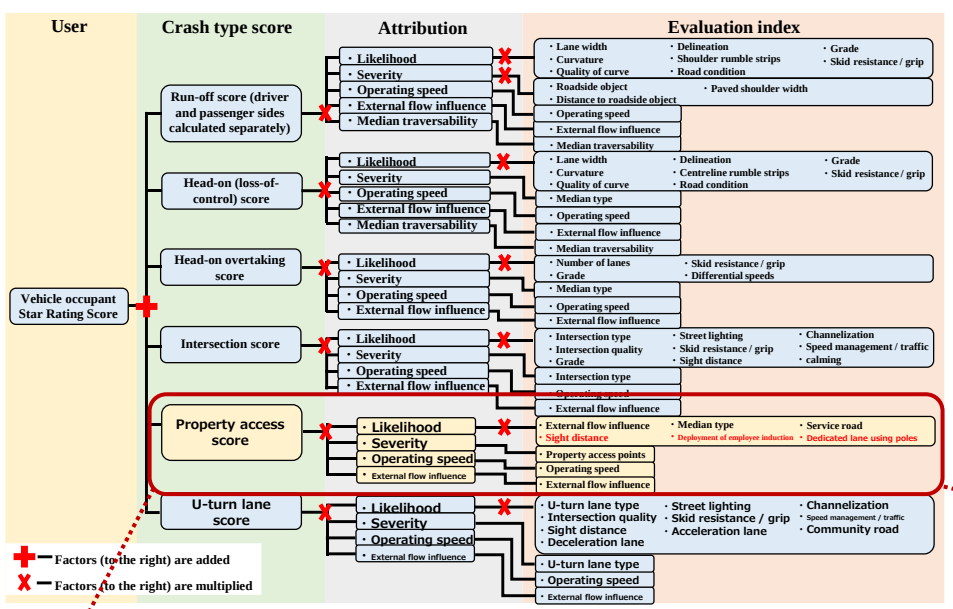
<Parking Entrance (Area 209-210)>

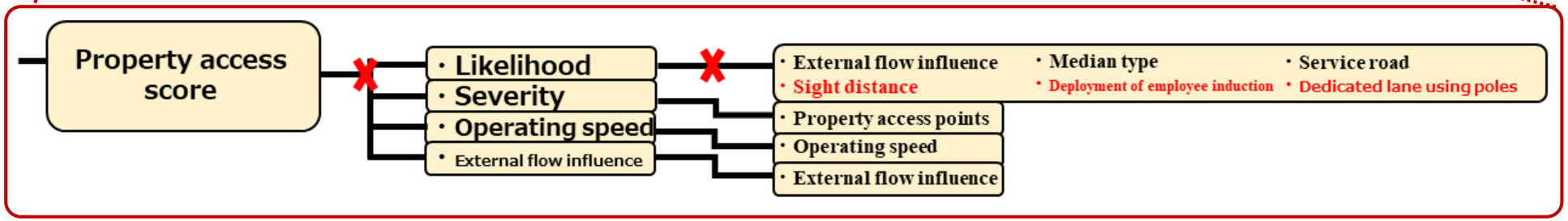


SYMBOLS		TYPES OF COLLISION	
→	Traffic flow line	↘	Rear-end collision from behind after leaving the parking lot
①, ②	Number of case		

- It became clear that the main cause of the Hiyari Hatto event was the lack of an auxiliary lane to safely join the main line after leaving the warehouse.
- In iRAP Star Rating, there is no index to evaluate the existence of auxiliary lanes at the entrance and exit of the parking lot.
- It became clear that the risk factors at the entrance and exit of the parking lot could not be evaluated.

Improvement of Evaluation Indexes for Parking Entrance in Star Rating Approach

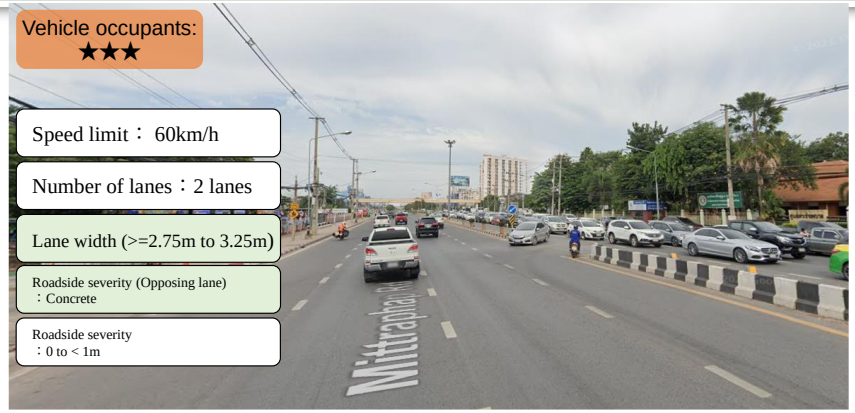




Dangerous Factors in Parking Entrance

<U-turn Lanes (Area 226-227)>

SYMBOLS		TYPES OF COLLISION	
→	Traffic flow line	2 → ↺ 1	When vehicle 1 makes a U-turn, it collides with vehicle 2 that goes straight
①, ②	Number of case		

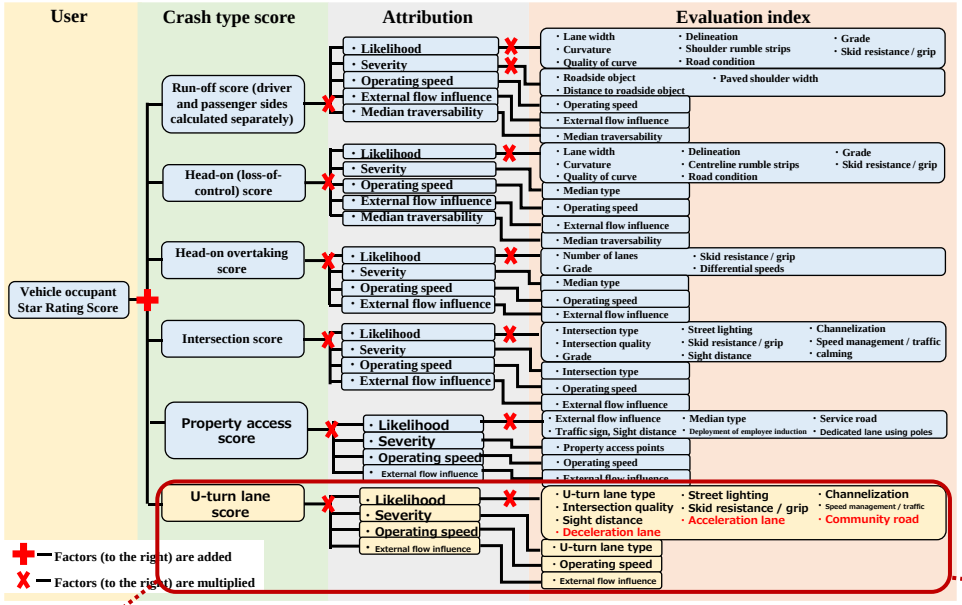


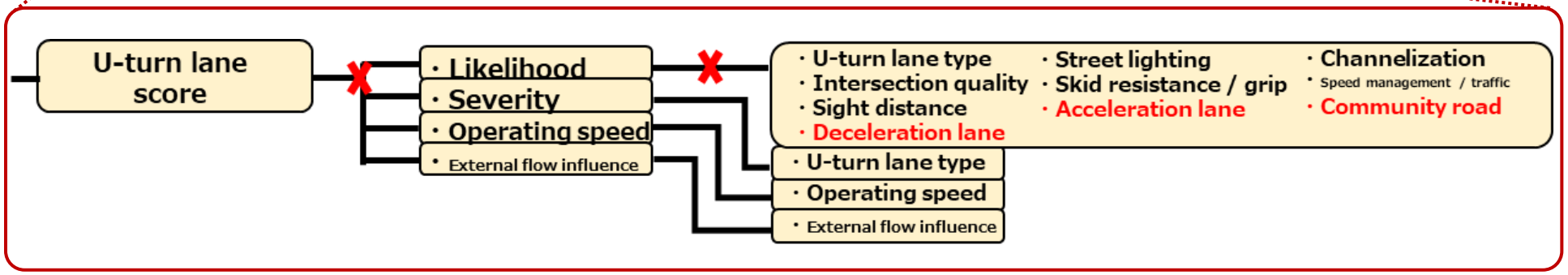
Intersection type	3-leg (signalised) with protected turn lane
	3-leg (signalised) with no protected turn lane
	4-leg (unsignalised) with protected turn lane
	4-leg (unsignalised) with no protected turn lane
	4-leg (signalised) with protected turn lane
	4-leg (signalised) with no protected turn lane
	Unused code (non-major inters.)
	None
	Railway Crossing - passive (signs only)
	Railway Crossing - active (flashing lights/boom gates)
	Median crossing point - informal
	Median crossing point - formal
	Median crossing point - protected turn lane
	Mini roundabout
	** Commercial access 1+
	** Residential access 1+
	** Residential access 1 or 2

▹ The reason for the occurrence of Hiyari Hatto is that the lack of the auxiliary lanes for safe vehicle entry into the main lanes after the U-turns.

▹ The existing Star Rating Approach has no evaluation indexes for the auxiliary lanes in the U-turn lanes.

Improvement of Evaluation Indexes for U-turn Lanes in Star Rating Approach





Conclusion and Future Issues

▹ As clarifying there were problems in the evaluation indexes of the Star Rating Approach for the parking entrance and U-turn lane.

▹ Adding evaluation items on parking lot entrance and Exits and U-turn lanes to the iRAP Star Rating.

▹ Proportion of Adding to iRAP star Rating

- Parking entrance
- U-turn lane

Thank you for your attention