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The Use of Safety Warning Triangle Among Malaysian Private Vehicle Users

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Abstract – *The Safety Warning Triangle (SWT) is a device to alert other road users on the hazard ahead. Currently, SWT usage in Malaysia is only mandatory for commercial vehicles. Therefore, this study aims to assess private vehicle (PV) users' knowledge and perception of SWT, and include a feasibility study to make SWT mandatory for PV. A total of 447 respondents answered an online survey and results show that almost 50% of PV users did not have clear understanding of SWT usage in terms of its practicality, even though 97% of them agreed on the necessity to use SWT if they face any emergency situation whilst on the road. Therefore, more initiatives including awareness campaigns and educational programs on the proper use of SWT are needed. As for the ideal SWT usage in Malaysia, after considering all the factors found in the review of international practices on SWT usage, two recommendations are proposed by the authors: (1) a similar concept applied in Japan to be referred to and implemented in Malaysia; (2) continue the current practices in Malaysia and to include private vehicles in the mandatory list.*

Keywords: Safety Warning Triangle (SWT), vehicle warning tools, Vehicle Emergency Kit (VEK), driver awareness

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1.0 INTRODUCTION

Rear-end crashes involving vehicles parked on the roadside may not occur as frequent as other crash types in Malaysia's context. Drivers in emergency situations such as breakdowns, out of fuel or involved in road accidents normally stop their vehicles on the roadside or the emergency lane. The worst case happens when the vehicle remains stationary in the aftermath of the above mentioned situations; and also when there is no space other than traffic lanes – that can mostly be found in large cities in Malaysia (e.g. along MRR2 and AKLEH Highway in Kuala Lumpur) – so the drivers have no other option for better and safer parking. These situations pose another threat, namely the risk of being hit by another vehicle from behind. According to the Royal Malaysia Police (RMP), around 3% to 6% of the total number of vehicles involved in fatal cases from 2010 to 2016 were related to parked vehicle crashes (RMP, 2011, 2017). Moreover, involvement of motorcyclists is also another major concern as around 1% to 4% riders or

pillions have been involved in related fatal cases. Fatalities or even crashes of such nature are theoretically preventable especially when proper signage is used. Even though RMP's database does not explain the situation in detail, specifically the usage of Safety Warning Triangle (SWT) during a mishap, such information can be considered relevant as the focal point of the issue.

SWT is a type of warning sign to caution other road users of the hazard ahead and is one of the items available in the vehicle emergency kits (VEK) (RSD, 2017). Proper use of SWT can help alert other road users of the risk at a distance, hence would enable them to react in time and prevent road crashes. Therefore, it is very important for all vehicle users to keep SWT in their vehicle and display it when they encounter any emergency situation whilst on the road. SWT has been widely used in many developed countries around the world, with several European countries making SWT usage as compulsory for all type of vehicles. In Malaysia, however, possession and usage of SWT is only compulsory for commercial vehicles as specified in the Motor Vehicle Rules 1959. Nevertheless, most car manufacturers normally provide SWT as among the standard VEK items in new cars despite the non-compulsory condition.

A competent and thoughtful road user is expected to be familiar with the functions and usage of SWT. However, no previous research in the local context has been found to explain users' knowledge of SWT. It is also common to observe impromptu yet creative usage of other objects such as pails, tree branches, boxes and many other things rather than SWT. Thus, the preparedness of vehicle users is under questioned, and this includes whether they lack awareness of the associated risk or they underestimate the risk.

1.1 Objectives of Study

This study aims to answer the following objectives: (1) to assess and explore VEK usage among private vehicle users during emergency situations while on the road; (2) to determine private vehicle users' knowledge and practice in using SWT during emergency situations; and (3) to review international practices on SWT usage and propose relevant mandatory requirements for Malaysian motorists.

1.2 Scope of Study

The Malaysian Institute of Road Safety Research (MIROS) has previously studied several automotive consumerism issues including car maintenance, auto tinting, and end-of-life vehicles (ELV) (Abdul Wahab et al., 2017; Md Isa et al., 2015; Mohd Jawi et al., 2012, 2017). For this study, the area covered is based on two conceptual views namely the role of users in vehicle ownership as explained by the simplified automotive ecosystem suggested by Mohd Jawi et al. (2012), as well as the emergency and post-emergency event based on a popular road safety concept known as the Haddon Matrix (Haddon, 1999) as illustrated in Figure 1. The study also focuses on users who own and use private four-wheelers only.

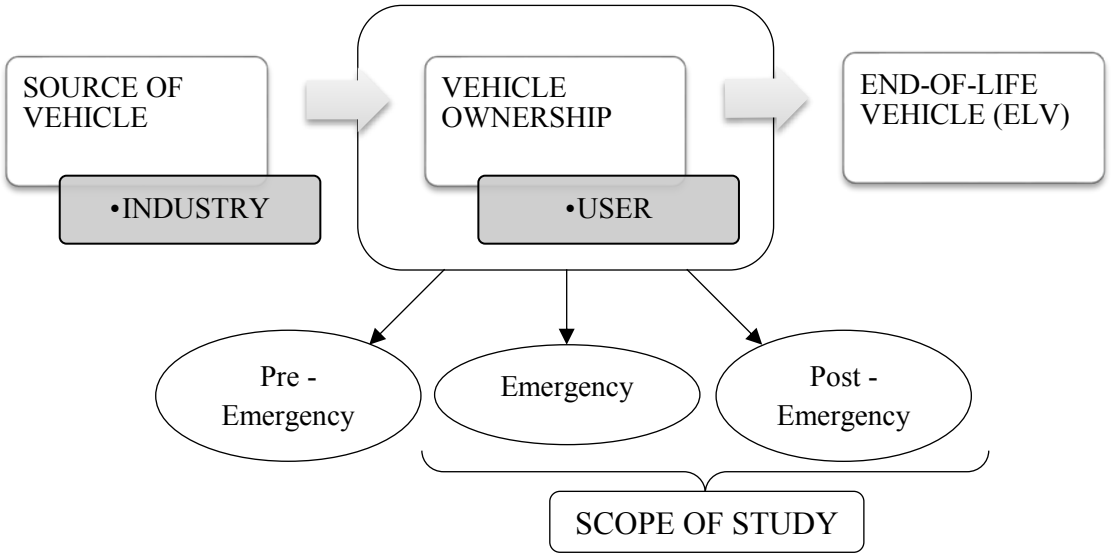


Figure 1: Scope of study from the simplified automotive ecosystem and Haddon Matrix viewpoints (Haddon, 1999; Mohd Jawi et al., 2012)

2.0 METHODOLOGY

This study employed two methods in order to achieve the specified objectives, which are described in the following sub-sections.

2.1 Online Survey

To achieve the first two objectives, a cross-sectional online survey was conducted. The questions were formulated by the authors, and purposive sampling was employed in this study involving only private vehicle users except motorcyclists in the Klang Valley (KV) area. The survey was reconstructed using Google Form and distributed via online platforms (social media). Since online survey is exposed to potential bias which does not necessarily affect accuracy, the authors initially targeted a sample size of at least 384 respondents (Krejcie & Morgan, 1970). The next target was 500 respondents considering the possibility of missing values and doubtful entries. The questionnaire was developed based on the objectives of study as shown in Table 1.

2.2 Review of International Documents

To achieve the third objective, a review of government or authorities' documents as well as from trusted websites (based on authors' direction) was conducted. Data collected through this reviews dealt only with international SWT usage, i.e. in terms of the number of SWT used or required, and distance to place or erect the SWT. Countries around the continents/regions are selected based on their traffic volume, road type and road condition.

2.3 Data Analysis

All the collected data were analysed and presented using Statistical Package for Social Science (SPSS) for descriptive analysis and tabulation, as well as Microsoft Excel for graphical presentation.

Table 1: Questionnaire items and variables

Section	Sub-sections	Descriptions
Section A: Demography & Travel Pattern	A1 – Demography	Age, gender, marital status, races, occupation, monthly income (individual)
	A2 – Vehicle Ownership	• Car make and model
	A3 – Driving Frequency & Distance Covered	• Frequency of driving in a week • Distance covered in a week
Section B: Emergency Situation Involvement & Handling	B1 – Emergency on the Road	• Respondents involvement of any emergency situation on the road in a year
	B2 – VEK Ownership	• Respondents ownership on VEK • Items in VEK kept in their vehicles
	B3 – On the Road Emergency Handling	• Items in VEK used during on the road emergency situation handling
	B4 – SWT Usage	• SWT usage during the on the road emergency situation handling
Section C: Knowledge, Practices & Perception on SWT Usage	C1 – Function of SWT	• Respondents knowledge on SWT function
	C2 – SWT Usage Practices	• Understanding the distance to locate SWT • Opinions on the suitable distance to locate SWT
	C3 – Perception on SWT Usage	• To use SWT if involve in emergency situation in near future

3.0 RESULTS AND DISCUSSION

Results of this study are presented in line with the objectives and are discussed accordingly.

3.1 Demographic Profiles

A total of 510 responses were successfully recorded in the survey. However, due to several irrelevant and inaccurate answers, only 447 responses of the survey were analysed. Table 2 represents the overall demographic profile of respondents. The mean of respondents' age was 38.74 (SD = 10.03) whereby the youngest was 18 years old while the oldest was 70 years of age (mode = 30, N = 6.7%). The majority of respondents were Malay (92.6%). Male respondents made up the majority (with 64.7 %) while 81% of the respondents were married.

Furthermore, almost 80% of respondents worked in the government sector (41.6%) and private sector (38.3%) with a majority of them drawing more than RM5,000 in monthly income (34.9%). The respondents' main vehicle however is consistent with a previous study conducted by MIROS (Mohd Jawi et al., 2017), whereby both national car makers, Perodua (29.8%) and Proton (26.2%), were widely used by the respondents with another 29.8% comprising a combination of the "Big 3" (Honda-Toyota-Nissan) and other manufacturers.

On the other hand, the majority of respondent possessed driving experience exceeding 10 years (71.4%) with most of them drove more than 5 times a week (88.8%) covering 100 to 200km a week throughout the year 2017.

Table 2: Respondents' demographic profiles

Description	Category	Frequency (N)	Percentage (%)
Age	20 and below	3	0.7
	21 – 30	89	19.9
	31 – 40	192	43.0
	41 – 50	92	20.6
	51 and above	71	15.9
Gender	Male	289	64.7
	Female	158	35.3
Marriage Status	Single	78	17.4
	Married	362	81.0
	Others	7	1.6
Races	Malay	414	92.6
	Chinese	8	1.8
	Indian	13	2.9
	Others	12	2.7
Occupation	Government	186	41.6
	Private	171	38.3
	Business / Self-employed	51	11.4
	Students	13	2.9
	Others	26	5.8
Monthly Income (RM)	1,000 and below	29	6.5
	1,001 – 2,000	47	10.5
	2,001 – 3,000	87	19.5
	3,001 – 4,000	63	14.1
	4,001 – 5,000	65	14.5
	5,001 and above	156	34.9
Driving Experience (Years)	0 – 2	8	1.8
	2 – 5	40	8.9
	5 – 10	80	17.9
	More than 10	319	71.4
Car Manufacturer (Respondents' Main Car)	Perodua	133	29.8
	Proton	117	26.2
	"Big 3" (Honda-Toyota-Nissan)	133	29.8
	Others	64	14.3
Frequency of Driving in a Week Throughout 2017	Once	0	0
	1 – 2 times	7	1.6
	3 – 5 times	43	9.6
	More than 5 times	397	88.8
Distance Covered in a Week Throughout 2017 (km)	0 – 100	107	23.9
	100 – 200	122	27.3
	200 – 300	82	18.3
	300 – 400	44	9.8
	400 – 500	36	8.1
	More than 500	56	12.5

3.2 Emergency Involvement and Handling

3.2.1 Emergency situation

In this section, respondents were asked regarding their involvement in emergency situation throughout the year 2017. 26.6% of the total 447 respondents claimed that they have been

involved in an emergency situation requiring them to stop and park their vehicle on the roadside. Among the 119 respondents who were involved in such a situation, they were again asked on the type of emergency situation experienced. The breakdown of emergency situations is shown in Figure 2.

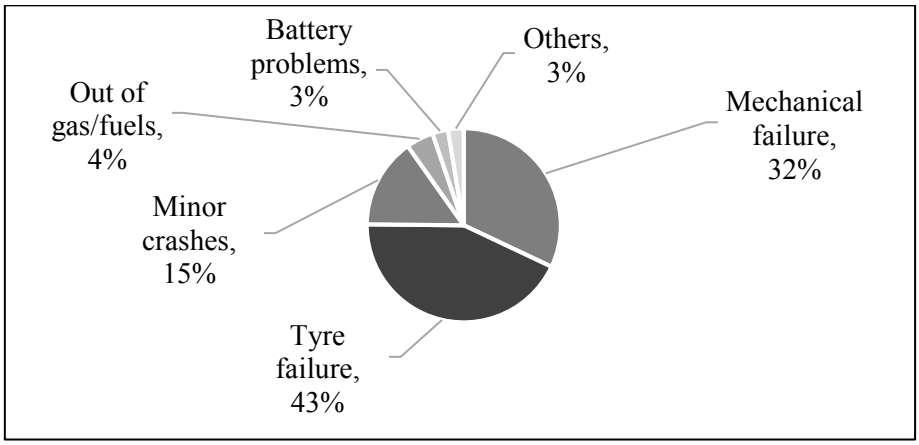


Figure 2: Type of emergency situations experienced by the respondents (about a quarter of them)

It can be seen that tyre failure contributed the highest percentage (43%) of emergency situation experienced followed by mechanical failure (32%), minor crashes (15%) and others. With regards to tyre failure, this may be due to improper tyre maintenance or the users' attitude of neglecting tyre maintenance as they consider the tyre to be less important compared to other mechanical parts of the vehicle.

3.2.2 Vehicle Emergency Kit (VEK)

The respondents were asked whether they own and keep any VEK items in their vehicle. The answers are shown in Figure 3. Only 62.4% of the total 447 respondents reported that they own and keep VEK items in their vehicles.

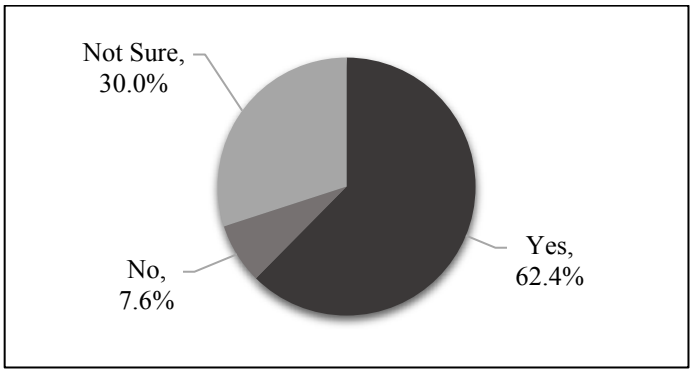


Figure 3: The breakdown of respondents who owned and kept VEK in their vehicles

Surprisingly, the values are almost consistent with a previous study from MIROS by Mohd Jawi et al., (2017) in which the respondents were asked a similar set of questions. It can be hypothesized that only 62.4% percent of respondents are ready to face any event of emergency on the road. Among the 279 respondents who owned and kept VEK in their vehicles, they were again asked regarding the items in VEK that they have in their vehicles. The items are as listed and illustrated in Figure 4.

				
First Aid Kit	Reflective Safety Vest	Safety Warning Triangles	Small Fire Extinguisher	Spare Tyre & Tyre Changing Tool
48.4%	25.1%	72.4%	30.8%	95.7%
				
Multipurpose Tool	Jumper Cables	Flashlight & Extra Batteries	Water Bottled	Umbrella
68.1%	56.3%	56.3%	79.2%	87.1%
				
	Multipurpose Safety Hammer	Car Handphone Charger	Tyre Inflator	
	34.4%	67.0%	16.5%	

Figure 4: The breakdown of VEK items kept by respondents in their vehicles

Not all the items are kept by users in their vehicle. In fact, the spare tyre and tyre changing tool which are considered as common items are not kept by all the respondents. This maybe because some manufacturers only provide tyre repair kit as an emergency tool for tyre problem or the items may be taken out from a second-hand or third-hand car. The data also shows that only 72.4% of the respondents keep SWT in their vehicles. This maybe due to some manufacturers not providing SWT in the vehicles as it is not compulsory for private vehicles. Out of 119 respondents who experienced emergency situation as in sub-section 3.2.1, they were asked about the items in VEK used during the said emergency. The result is tabulated as in Figure 5 and surprisingly, less than half of the respondents (47.9%) used SWT during their on-the-road emergency.

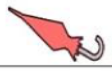
				
First Aid Kit	Reflective Safety Vest	Safety Warning Triangles	Small Fire Extinguisher	Spare Tyre & Tyre Changing Tool
8.4%	14.3%	47.9%	8.4%	54.6%
				
Multipurpose Tool	Jumper Cables	Flashlight & Extra Batteries	Water Bottled	Umbrella
26.9%	23.5%	30.3%	21.9%	20.2%
				
	Multipurpose Safety Hammer	Car Handphone Charger	Tyre Inflator	
	2.5%	9.2%	5.9%	

Figure 5: The breakdown items in VEK used during emergency situations

3.2.3 SWT Usage

As mentioned above, only 47.9% of the total 119 respondents who experienced an emergency that required them to stop and park their vehicle on the roadside used SWT during the situation. However, a higher percentage of usage during emergency situation handling was recorded as shown in Table 3 whereby out of 80 respondents who keep SWT and are involved in an emergency situation, 71.3% of them did use SWT to handle the situation.

Table 3: Number of respondents who owned and kept SWT against who used SWT during emergency situation handling

		Number of respondents who kept SWT in their vehicles and involved in emergency situation		Percentage used (%)
		Yes	**No**	
Number of respondents who used SWT during emergency situation.	Yes	**57**	0	**71.3**
	No	23	39	28.7
	Total	80	39	119 / 100.0

Unfortunately, it can be said that more than half of the respondents (52.1%) who were involved in an emergency situation did not use SWT to manage the situation although 37.1% of them had SWT in their vehicles. The most common reason given included unavailability of SWT in their vehicles. There were also respondents who believed that SWT was not required as for them, hazard light was already sufficient. Indeed, the hazard light can provide some sort of warning on a busy road but is considered insufficient on a quiet road where most users drive at high speed.

3.3 Knowledge and Perception of SWT Usage

In the final section of the questionnaire, respondents were asked about the function of SWT. Out of the total 447 respondents, 97.8% of them said that they understood and knew the functions of SWT. Respondents were also asked whether they knew the function in terms of SWT usage and practices. Surprisingly, only 54.6% said they knew how to use and where to locate SWT to handle an emergency situation. Respondents who reported that they knew the SWT function were then asked to provide the appropriate distance to place SWT from the rear end of the vehicle. The remaining respondents were asked to state their opinion on the suitable distance to place SWT away from the vehicle. The results are as tabulated in Figure 6.

The findings also show that most respondents (59.8% for respondents who know and 44.3% for respondents who don't know) believed that 10 – 50 meters is the most appropriate distance to place SWT away from vehicle followed by 50 – 100 meters. It can be assumed that the distance between 10 to 100 meters is the most appropriate and safest to place SWT away from vehicle and provide sufficient gap to warn other road users on the hazard ahead. The final question posed to respondents was whether they will use SWT in future when faced with an emergency situation that require them to stop and park their vehicle on the roadside.

97.5% out of 447 respondents, 97.5% gave a positive response and agreed they will use SWT in future. This was primarily due to its usefulness. However, some said they will use SWT provided that they have clear knowledge and understanding of the proper use of SWT. Furthermore, some also said that they will use SWT if it is provided in their vehicle and is compelled to use it. Therefore, it can be concluded that most private vehicle users don't have enough knowledge of SWT usage as they are unaware and have never been taught how to use it. Lack of information or awareness campaign may be the reason for such insufficient knowledge. The findings also explain that users will only use SWT if they have clear understanding on the use of SWT and only if its usage is compulsory.

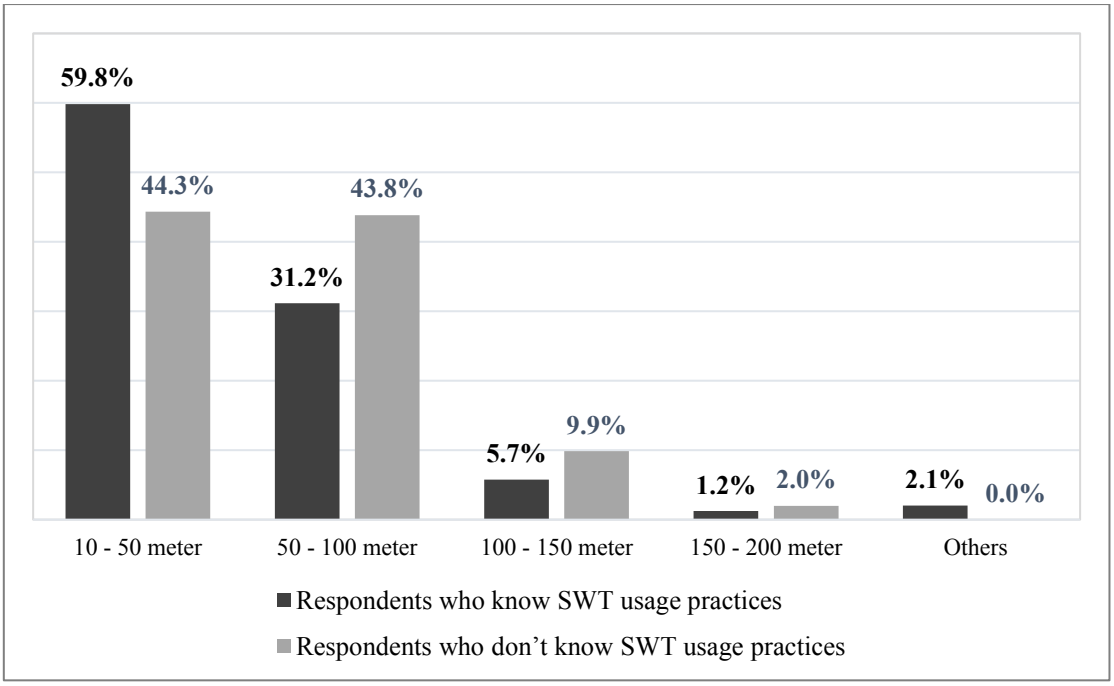


Figure 6: Opinions from respondents on the distance to locate SWT during emergency situation handling

3.4 International Practices on SWT Usage

Various countries were selected from different regions based on traffic volume, road type and road condition. The practice of using SWT in each country was reviewed and the findings were tabulated according to their region.

It can be seen that both USA and Canada have made SWT usage compulsory for commercial vehicles (Table 4). However, in terms of quantity and usage, there are differences between both countries whereby in USA, the use of SWT is different based on distance and is dependent on the type of road. While in Canada, SWT usage depends on speed limit of the road and visibility limitation.

From Table 5, most European countries have compelled all vehicles to use SWT in any emergency situation on the road. However, the usage is different for each county in terms of quantity and also type of roads. It can be understood that the practice of using SWT in European countries is based on road traffic situation and road type.

Table 4: SWT usage in North American countries

CONTINENT / REGION: NORTH AMERICA				
No	**Countries & Type of Vehicles**	**Number of SWT Used**	**Type of Road**	**Distance Required to Locate SWT**
1	United States of America *(USA)* **Commercial Vehicles**	3	Two – ways road	1 & 2 are placed at least 3 & 30 meters from behind of vehicles. 3 placed at least 30 meters in front of vehicles. (GPO, 1999)
			Hill, curve or any near visual obstruction	2 is placed at least 30 – 150 meters from behind of vehicle before hill, curve or any near visual obstruction. 1 & 3 are at the same location as two – ways road. (GPO, 1999)
			One way road & divided highway	3 is placed at least 60 meters from behind of vehicle. 1 & 2 are at the same location as two – ways road. (GPO, 1999)
2	Canada *(CAN)* **Commercial Vehicles**	2	Roads with speed limit of 60 km/h and above & when visibility is limited	1 is placed at least 30 meters in front of vehicle. 2 is placed at least 30 meters from behind of vehicle. (Government of Ontario, 2017)

Table 5: SWT usage in European countries

CONTINENT / REGION: EUROPE				
No	**Countries & Type of Vehicles**	**Number of SWT Used**	**Type of Road**	**Distance Required to Locate SWT**
1	United Kingdom *(GBR)* **All Motor Vehicles**	1	All roads	SWT is placed at least 50 yards (45 meters) from behind of vehicle. (GOV.UK, 2015)
2	Germany *(GER)* **All Vehicles**	1	Public road	SWT is placed at least 100 meters from behind of vehicle. (RAC, 2016)
			Highway	SWT is placed at least 200 meters from behind of vehicle. (RAC, 2016)
3	France *(FRA)* **All Vehicles**	2	All roads / motorways	SWT is placed at least 30 meters from behind of vehicle. (Legifrance, 2015)
4	Spain *(ESP)* **All Vehicles**	2	Two-ways road	1 is placed at least 50 meters in front of vehicle. 2 is placed at least 50 meters from behind of vehicle. (N332, 2016)
			One way road or highways	Only 1 SWT is placed at least 50 meters from behind of vehicle. (N332, 2016)

Table 6: SWT usage in Australasia countries

CONTINENT / REGION: AUSTRALASIA				
No	**Countries & Type of Vehicles**	**Number of SWT Used**	**Type of Road**	**Distance Required to Locate SWT**
1	Australia *(AUS)* **Vehicles with GVM[1] more than 12 tonnes**	3	All roads with speed limit of 80 km/h and above	1 is placed at least 200 – 250 meters in front of vehicle. 2 is placed at least 200 – 250 meters from behind of vehicle. 3 is placed beside of vehicle facing the roadways. (NTC, 2011)
			All roads with speed limit of 80 km/h and below	1 is placed at least 50 – 150 meters in front of vehicle. 2 is placed at least 50 – 150 meters from behind of vehicle. 3 is placed beside of vehicle facing the roadways. (NTC, 2011)
2	New Zealand *(NZL)* **All motor vehicles**	No specific quantity	All roads / motorways	Assign other people or locate SWT 200 meters away from vehicle. Not mandatory. (NZTA, 2010)

In Table 6, the difference of SWT usage in Australasia region is clearly highlighted. In Australia, only heavy vehicles are required to use SWT during emergency. For the usage, there are differences in terms of placement distance of SWT and it depends on the type of road whereby road with higher speed limit requires further SWT distance than road with lower speed limit. However, in New Zealand, all motor vehicles can use SWT to warn other road users during emergency situation on the road though it is not compulsory to use SWT as even individuals are allowed to warn other road users. This may due to the traffic condition whereby the average driving speed in New Zealand is only around 50km/h to 70km/h.

Table 7: SWT usage in Asia & ASEAN countries

CONTINENT / REGION: ASIA & ASEAN				
No	**Countries & Type of Vehicles**	**Number of SWT Used**	**Type of Road**	**Distance Required to Locate SWT**
1	Japan *(JPN)* **All Vehicles**	2 or 3	All straight roads / motorways	1 is placed at least 20 – 30 yards from behind of vehicle. 2 is placed at least 10 – 15 yards away from 1. (Todoroki, 2016)
			Curve roads	1 & 2 are placed at the same distance as in straight roads / motorways. 3 is placed before the curve. (Todoroki, 2016)
2	Singapore *(SIN)* **All Vehicles**	Not stated	All roads	SWT is placed at least 20 meters from behind of vehicle. (STP, 2017)
3	Malaysia *(MAS)* **Commercial Vehicles**	1	All roads	SWT is placed at least 50 yards from behind of vehicle. (RTA, 2013)

[1] GVM = Gross Vehicle Mass

Finally, in Table 7, SWT usage in Asia & ASEAN countries suggest some differences in terms of quantity and placement of SWT. In Japan, SWT usage is compulsory for all vehicles and it usage is also different whereby the quantity of SWT is different according to type of road in which extra SWT is required when an emergency occurs at curve road with limited visibility.

Whereas in Singapore, due to its high traffic density, SWT must be placed within merely 20 meters away from vehicle and this applies to all types of vehicle and roads. However, in Malaysia, SWT usage is only compulsory to commercial vehicles. As for the usage and distance to place SWT, the practice in Malaysia is similar to UK.

3.4.1 Summary of international practices on SWT usage

All the findings with regards to the practice of using SWT from the above tables are summarized and divided as shown in Table 8 according to their respective schemes. The schemes are determined based on overall practices whereby almost all selected countries implement the practice according to road type and condition. Furthermore, the distance to place SWT also varies according to road type and condition.

From the table, it is shown that every country has different ways of using SWT whereby road type and condition are the main factors. Furthermore, traffic volume also plays a part in the difference of each country's practice. All these factors shall be considered in determining the ideal practice in order to ensure SWT usage among private vehicle users is suitable with the road and traffic condition in Malaysia.

4.0 CONCLUSION AND RECOMMENDATION

It is important to own and keep VEK in vehicle as we would not know when and where we are going to face an emergency situation. Vehicle users must always make sure that they have at least basic VEK items in their vehicle and also have ample knowledge in operating it during an emergency.

SWT is one of the important VEK items that users must always have in their vehicle. It is crucial to use SWT during emergency situation on the road and users have to understand and know how to properly use it. The use of SWT can help warn other road users and provide them enough time to respond and prevent road crash.

Despite nearly half of the users having insufficient knowledge and understanding of SWT usage, most of them strongly support the effort to use SWT in future whenever they are faced with an emergency on road. Furthermore, more initiatives in terms of awareness campaign, educational programs and related programs are required by users. Hence, efforts from relevant parties must be amplified and extended especially among private vehicle users.

Table 8: Overall summary on SWT usage and practices according to respective schemes

Scheme	Road Type/ Condition	Countries	Minimum Required Distance To Locate SWT (meter)																	
			3	10	20	30	40	50	60	70	80	90	100	150	200	210	220	230	240	250
1	*All Road*	*GBR*						R												
		FRA				R														
		NZL													R					
		SIN			R															
		MAS						R												
2	*Road Type*																			
	Two-way Road	*USA*	R			F|R														
		ESP						F&R												
	Public Road	*GER*											R							
	One-way Road & Highway	*USA*	R			R			R											
		ESP						R												
		GER													R					
		JPN			R	R	R													
3	*Road Condition*																			
	Hilly & Curvy Road	*USA*	R			F|R	←	—	—	—	—	—	→	R							
		JPN			R	R	R	←	—	—	—	—	—	→		Before hill / curve					
4	*Road Speed Limit*																			
	Low Speed Limit Road	*AUS <80km/h*						F&R	←	—	—	—	→	F&R						
	High Speed Limit Road	*CAN >60km/h*				F&R														
		AUS >80km/h													F&R	←	—	—	→	F&R

Commercial Vehicle Only
All Vehicles

F Front of Vehicle
R Rear of Vehicle

↔ Distance In Between

Current practice of using SWT in Malaysia is similar to UK in terms of the distance to locate SWT. However, it is only compulsory to heavy vehicle while it is agreed that private vehicles also get involved in such emergency situations causing their vehicles to remain stationary on the roadside without displaying proper signage. Hence, it is suggested that the current rules be extended to include private vehicles except motorcycle. As for the ideal SWT usage, after considering traffic condition, road condition and road type in Malaysia, two recommendations are proposed by the author: (1) refer to a similar concept as in Japan; (2) remain the current practices in Malaysia and include private vehicles. The overall concept is elaborated in Table 9. Nevertheless, all the recommendations are subject to discussion among the researchers involved in this study only and the responsible authorities may decide whether this study can be used to determine the use of SWT for private vehicles in Malaysia.

Table 9: Recommendation of SWT usage in Malaysia

CONTINENT / REGION: ASIA & ASEAN				
Concept	**Vehicles Involved**	**Number of SWT Used**	**Road Condition**	**Distance Required to Locate SWT**
Similar practices in **Japan**	All four-wheeled vehicles	2	All straight roads / motorways	SWT 1 – minimum 20-30 meters from behind of vehicle. SWT 2 – minimum 30-45 meters from behind of vehicle.
		3	Hill, curve or any near visual obstruction roads	SWT 1 – minimum 20-30 meters from behind of vehicle. SWT 2 – minimum 30-45 meters from behind of vehicle. SWT 3 – before hill/curve/visual obstruction.
Remain current practice in **Malaysia**	All four-wheeled vehicles	1	All type of roads	SWT to be located at least 50 yards (45 meters) from behind of vehicle.

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