

# ASEAN NCAP's Contribution to Malaysia's Automotive Ecosystem

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## REVIEW

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**Abstract** – After five years of establishment, ASEAN NCAP has assessed 62 distinct car models available in the ASEAN market and produced 96 ratings based on the Adult Occupant Protection (AOP) and Child Occupant Protection (COP) rating system. The program has so far drawn participation from 20 different brands or OEMs, signifying a mutual understanding between ASEAN NCAP and OEMs to create a 'safer car' environment in the region. This review presents a compilation of the results as well as ASEAN NCAP's distinctive contribution to the automotive ecosystem in Malaysia, where the program was initiated. In a broader sense, ASEAN NCAP has achieved meaningful and promising results toward a safer automotive ecosystem for Malaysian road users and provided added-value to car ownership.

**Keywords:** Automotive ecosystem, New Car Assessment Program, ASEAN NCAP, safer vehicle

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## 1.0 INTRODUCTION

The New Car Assessment Program for Southeast Asian Countries or ASEAN NCAP became the latest NCAP initiative in December 2011 after several years of research and development efforts (Mohd Jawi et al., 2013a). ASEAN NCAP conceptually covers the Southeast Asian region's automobile safety rating, being the third of such establishment in the Asian continent as well as the ninth on the global scale (Mohd Jawi et al., 2013b). Historically, NCAP started in the United States (US NCAP; 1978) following the establishment of a vehicle rating program by the US-based Insurance Institute for Highway Safety (IIHS) in 1959, followed by Japan (J-NCAP; 1991), Australia (ANCAP; 1992), Europe (Euro-NCAP; 1997), South Korea (K-NCAP; 1999), China (C-NCAP; 2006) and Latin America & the Caribbean (Latin NCAP; 2010) (Mohd Jawi et al., 2013b).

The automobile safety rating initiative is aligned with the vision of the United Nations (UN) through its Global Plan for the Decade of Action (DOA) for Road Safety 2011-2020, with the objective to reduce and stabilize the number of road casualties across the continents (World Health Organization, 2015). One of the main pillars in the DOA is to enhance vehicle safety through among others, a combination of harmonized relevant global standards, consumer information schemes and incentives. The Southeast Asian region, in which eight out of ten ASEAN member countries fall into the Low or Middle Income Countries (LMICs) category, is among the main contributors to the global annual road deaths of more than one million victims (World Health Organization, 2015). Malaysia alone ‘contributes’ 15 to 20 deaths to the daily global figure on average and stands among the riskiest countries based on internationally comparable indices (fatalities per: 10,000 registered vehicle; 100,000 population; 1 billion Vehicle Kilometre Travelled, VKT) (Sarani et al., 2012; World Health Organization, 2015).

Prior to ASEAN NCAP’s formation, MIROS had conducted a precursor program based on secondary data assessment voluntarily provided by car manufacturers (OEMs) which was known as the Malaysian Vehicle Assessment Program (MyVAP). The program also applied a star-rating system and was designed in such a way to fill the gap before the actual NCAP program could be realized (Abu Kassim et al., 2013; Ariffin et al., 2009). MyVAP was a “wake-up call” for OEMs to seriously look into passive and active safety aspects of passenger vehicles in the market. In the meantime, MIROS was also doing its own capacity building through various benchmarking exercises, developing a crash lab and assembling a team of crash test experts in preparation to establish NCAP (Abu Kassim & Mohd Jawi, 2014). In 2011, Global NCAP supported MIROS’ effort to establish NCAP for Malaysia (initially called ‘MyNCAP’) and proposed the program to cover the entire region; hence the establishment of ASEAN NCAP (Abu Kassim et al., 2016a).

### **1.1 ASEAN Road Safety in Relation to NCAP**

Motorcycles and scooters dominate the Southeast Asian region’s private vehicle ownership due to their cheaper price compared to cars (Md Isa et al., 2011). In Malaysia, Indonesia, the Philippines, Vietnam and Thailand, these two-wheelers constitute more than half of the registered vehicle population with Vietnam being top of the list with 95%. Unfortunately, such a scenario has led to high number of road fatalities in the region as motorcyclists together with pedestrians and cyclists (identified as Vulnerable Road Users – VRUs) contribute approximately 90% to road deaths in middle-income countries (MICs) and 60% in low-income countries (LICs) (Mohd Jawi et al., 2013a).

Despite the popularity of motorcycles, the demand for four-wheelers is growing since more people can afford to own cars. Vehicle sales are expected to rise from 2.4 million units in 2011 to 4.7 million in 2018, making ASEAN the sixth biggest automotive market globally (Mohd Jawi et al., 2013a). Therefore, introduction of ASEAN NCAP in the region should be considered a proactive step to prepare for the shift in vehicle ownership pattern. This is important considering the different risk scenario in the future, especially in the highly mixed traffic of two- and four-wheelers. Thus, ASEAN NCAP will provide direct and indirect pressure to OEMs to embed current best practices for occupant protection and accident avoidance technologies in their cars (Lie & Tingvall, 2002). Based on this argument, NCAP is a more realistic approach as the starting point to create the anticipated ‘safer vehicle’ environment in Southeast Asia, rather than to solve the motorcycle issues that are more related to socio-economic and socio-technical factors (Md Isa et al., 2011).

## **1.2 ASEAN NCAP Rating System**

ASEAN NCAP uses two ratings for each model's variant undergoing its assessment regime, namely the Adult Occupant Protection (AOP) and Child Occupant Protection (COP) (Mohd Jawi et al., 2013a). AOP is based on the final score of the offset frontal crash test result that will be converted into 6-scale star-rating (zero to five stars). AOP assessment also takes into account the 'modifier' assessment or the 'post-test penalty-based' assessment. This method is performed to accommodate variation of occupant's size, seating position and the potential of more severe injuries in real-world car crashes (Solah et al., 2014a). In addition to that, AOP score is also pre-determined by the fitment of Safety Assists Technologies (SATs) including Seatbelt Reminder (SBR) and Electronic Stability Control (ESC; or equivalent system) as the pre-requisite to 5-Star rating (Ariffin et al., 2014a; Mohd Jawi et al., 2013a). In September 2013, ASEAN NCAP introduced another pre-requisite at the 4-Star level (and above) which is the lateral impact (or also referred to as side impact test) following UN Regulation No. 95 (UN R95) (Ariffin et al., 2014b). This requirement has become more stringent starting from January 2015, whereby passing the UN R95 is required for 3-Star (and above) in AOP.

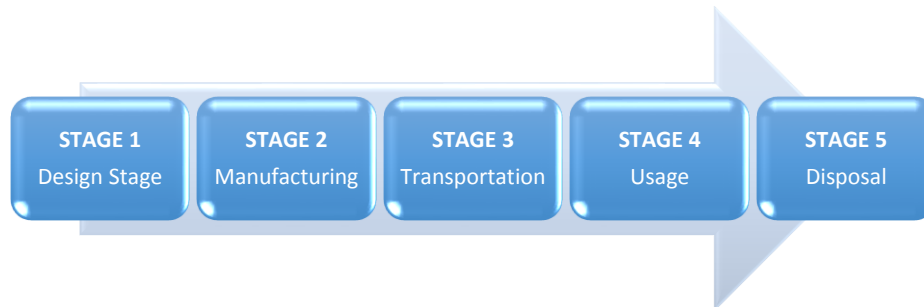
On the other hand, the COP assessment is based on the percentage of compliance from three different scopes of assessment, namely dynamic test result from the offset frontal crash test (maximum 24 points), Child Restraint System (CRS) based assessment (max. 12) and vehicle based assessment (max. 13) (total 49 points) (Solah et al., 2014b). In the dynamic assessment, the scoring will be based on head injury (Head Injury Criterion – HIC), neck injury (tension applied) and chest injury (chest acceleration). Similar to AOP, the COP rating is based on 6 scales from zero to five stars (rating introduced in September 2013; prior to this the COP was just referred by the percentage) (Solah et al., 2014b).

ASEAN NCAP allows 'dual rating' for any model with two or more variants due to SAT pre-requisite (e.g. 4-Star for the low (tested) variant and 5-Star AOP for top variant, from just a single test). Also, 'dual rating' can be produced by conducting separate variant assessments and crash tests. In addition to that, OEMs may also apply to the ASEAN NCAP secretariat for 'extended rating' for 'similar' cars based on the structural design (chassis) e.g. "carry over" from a sedan to hatchback or vice versa; or from a sedan into MPV, SUV or "crossover" (with technical evidences such as OEM's in-house test results surrendered to ASEAN NCAP secretariat for analysis and approval).

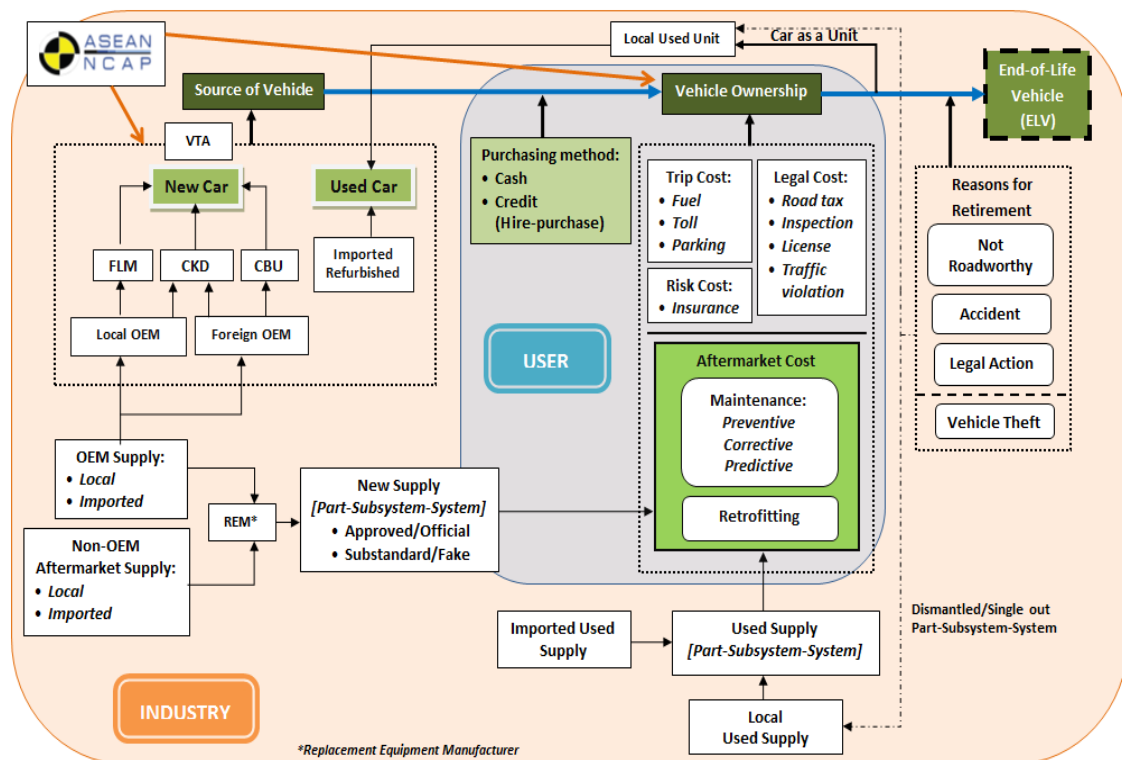
## **1.3 ASEAN NCAP's Role in Malaysia's Automotive Ecosystem**

The automotive ecosystem framework was developed based on life cycle of a product (Figure 1 & 2) (Mohd Jawi et al., 2012). The first three stages are grouped under the source of vehicle, in order to put more focus on the interaction in the usage stage or the vehicle ownership phase. The NCAP program as visualized in Figure 3 acts as the 'third party' between car manufacturers (OEMs) and consumers (Abu Kassim et al., 2016a; Mohd Jawi et al., 2013b). The Vehicle Type Approval (VTA) which is carried out by the Road Transport Department (RTD/JPJ) acts as the 'gatekeeper' of vehicles' roadworthiness and crashworthiness based on the Malaysian legal framework (Mohd Jawi et al., 2016).

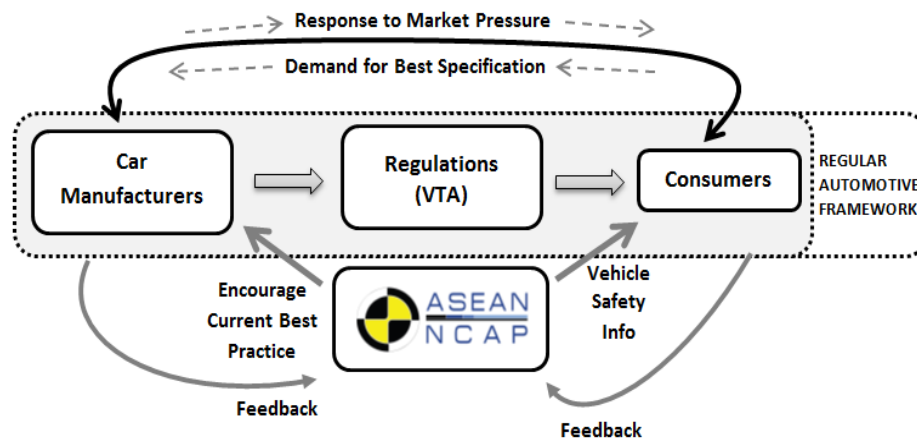
ASEAN NCAP supplements that role with more focus on the power of consumers by educating consumers on safety as well as encouraging OEMs to embed the latest automotive technologies (Abu Kassim et al., 2016a). Therefore, this paper aims to review ASEAN NCAP's achievements in producing safety rating as well as highlight its notable contributions after five years of establishment.



**Figure 1:** Life cycle of a product



**Figure 2:** ASEAN NCAP in the automotive ecosystem



**Figure 3:** Role of ASEAN NCAP in promoting safer cars

## 2.0 METHODOLOGY

The first part of this review shall focus on ASEAN NCAP tests results and ratings, while the second part aims to summarize ASEAN NCAP's contribution to Malaysia's automotive ecosystem. In the process of writing this review, the authors use published results on ASEAN NCAP's website and social media platform as well as other published materials including journal articles and proceedings, reports, news, etc. In line with the theme of this review, more focus has been given on ASEAN NCAP results relating to make and models available in the Malaysian market.

## 3.0 RESULTS & DISCUSSION

This section will highlight the summary of test results and ratings as well as ASEAN NCAP's contribution to Malaysia's automotive ecosystem.

### 3.1 Summary of Test Results and Ratings

Since the first series of tests from May 2012 (known as the pilot phase) until December 2016, ASEAN NCAP has produced a total of 96 ratings including dual and extended ratings as shown in Table 1. They involved 20 distinct makes (or also referred to as brands or OEMs), and it should be noted that Datsun is counted separately from Nissan though Nissan owns that particular brand.

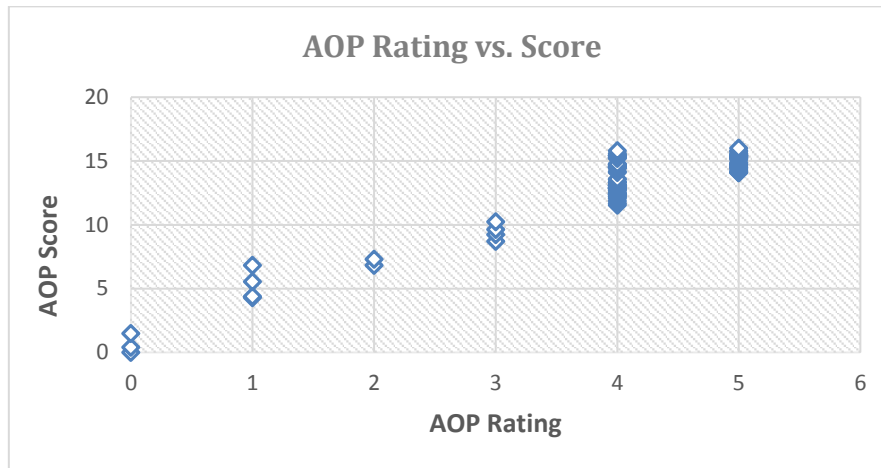
Ratings were produced from a total of 71 tests, with the majority being carried out at MIROS very own crash laboratory in Malaysia (MIROS PC3 in Melaka; 38 tests) and at the Japan Automobile Research Institute (JARI) test facilities (Tsukuba, Japan; 23 tests). Other crash facilities involved in ASEAN NCAP assessments were: (i) at Non-OEM facilities i.e. Crashlab<sup>TM</sup> in Australia (New South Wales Government; 4 tests); and (ii) at OEM facilities i.e. Daihatsu (Japan; 3 tests) and Nissan (Japan; 1 test) in Japan. As mentioned earlier, all the tests were executed in the presence of ASEAN NCAP representative (NCAP inspector) who performed the verification as well as conducted the modifier assessment (Solah et al., 2014).

Honda became the top brand with most ratings and this was mainly due to the number of dual ratings (eight out of nine tests were based on dual rating) and re-testing of the same models after major facelift (in the case City and Civic models). Toyota was in second spot with 14 ratings, followed by Nissan (8), Proton (7) and Mitsubishi (7). Overall, 62 distinct models were rated by ASEAN NCAP, in which re-tested models were counted as one. Figure 4 and 5 summarize the score of all 96 ratings based on the AOP and COP rating. The majority of the ratings for AOP and COP are at the 4-star level (53 or 55% for AOP; 55 or 57% for COP). Also, it is worth noting that Nissan Teana became the only car to achieve full points in AOP (perfect score of 16.00) and also the first and only car that achieved 5-star COP with 88% compliance (Global NCAP, 2014b).

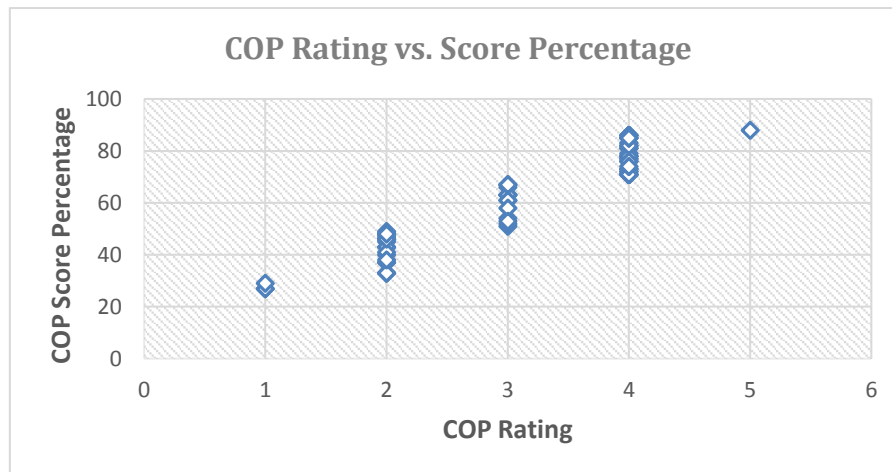
**Table 1:** Summary of ASEAN NCAP test results and ratings (2012 - 2016)

<b>Description</b>	<b>Frequency</b>
Number of ratings ( <i>as of Dec. 2016</i> )	<b>96</b>
<i>Single rating</i>	37
<i>Dual rating (single test)</i>	33
<i>Dual rating (separate test)</i>	12
<i>Related to extended rating</i>	14
Number of actual tests (per model)	<b>71</b>
<b><i>Test Lab Facilities:</i></b>	
<i>MIROS PC3 (Malaysia)</i>	38
<i>JARI (Japan)</i>	23
<i>Crashlab<sup>TM</sup> (Australia)</i>	4
<i>OEM: Daihatsu (Japan)</i>	3
<i>KATRI (South Korea)</i>	2
<i>OEM: Nissan (Japan)</i>	1
Number of makes/brands/OEMs	<b>20</b>
<b><i>Top makes by number of ratings:</i></b>	
<i>Honda</i>	(17 ratings)
<i>Toyota</i>	(14 ratings)
<i>Nissan</i>	(8 ratings)
<i>Proton</i>	(7 ratings)
<i>Mitsubishi</i>	(7 ratings)
Number of models	<b>62</b>
<b><i>Top models with most ratings:</i></b>	
<i>Honda City</i>	(4 ratings/2 tests)
<i>Honda Civic</i>	(4 ratings/2 tests)
<i>Proton Saga</i>	(3 ratings/3 tests)
<i>Mitsubishi Pajero Sport</i>	(3 ratings/2 tests)
<i>Nissan Navara</i>	(3 ratings/2 tests)
<i>Volkswagen Polo/Vento</i>	(4 ratings/1 test)





**Figure 4:** Summary of ASEAN NCAP AOP rating and score (N=96)



**Figure 5:** Summary of ASEAN NCAP COP rating and percentage score (N=96)

### 3.2 ASEAN NCAP's Contribution to Malaysia's Automotive Ecosystem

Involvement of 20 OEMs in ASEAN NCAP tests clearly indicates their willingness to partake in the safety branding effort. This is an unexpected scenario, at least to the ASEAN NCAP team members (comprising the Steering Committee, Technical Committee and MIROS personnel), as such success was achieved in a rather short time. This achievement also meant that ASEAN NCAP was able to publish ratings for almost all popular makes and models in ASEAN especially those in the Malaysian market. As per ASEAN NCAP internal analysis based on the sales volumes, eight out of ten new cars sold in ASEAN are rated by ASEAN NCAP. Unfortunately, ASEAN NCAP was unable to reach the luxury car segment due to the high cost of purchasing the cars, with the OEMs themselves showing little interest to sponsor the test.

Specifically, in Malaysia's case, ASEAN NCAP together with VTA by RTD has brought the norm of car safety specifications to a new level, with almost all cars in the new car market equipped with minimum double airbags for driver (DAB) and front passenger (PAB). The majority of Malaysia's cars tested by ASEAN NCAP achieved four and five stars in AOP, in which the result is mainly associated or referred to as the overall 'safety level of a car' aside from the COP result. Furthermore, cars in the market are now equipped with child safety features, namely ISOFIX and top tether for CRS usage (Solah et al., 2014b). Results of Child Occupant Protection (COP) proved that these features do increase a child's safety i.e. the test results are highly significant for those CSS fitted with 'ISOFIX and top tether' compared to 'seatbelt-only' fitment of CSS.

In terms of Safety Assist Technologies (SATs), the ESC technology which was previously only seen in luxury cars has now become 'standard fit' among entry market models (e.g. Proton Iriz) (Md Isa et al., 2015). This has also changed the technology package offering, which previously just the Anti-Lock Braking System (ABS). Besides the braking system, more SATs are being offered to users including the hill hold assist (HHA), blind spot camera, reverse camera, navigation system, etc. Therefore, safety package as a whole is no longer a luxury and is within the majority of users' reach.

The latest base models or the cheapest cars in the country – produced by the so-called national car manufacturers, Proton and Perodua – have also come with better structural strength and safety equipment although they have not significantly increased in price. For example, the cheapest car in Malaysia, Perodua Axia scored 4-Star in both AOP and COP (starting ~ USD 8,000) (Global NCAP, 2014c). On the other hand, Proton Iriz became the most affordable 5-Star car (based on AOP) in Malaysia (starting ~ USD 13,000) as well as among the cheapest 5-star car in ASEAN region (Lee, 2015).

ASEAN NCAP has also inculcated the spirit of 'high level achievement' or competition among OEMs. For example, both Honda and Toyota have actively participated in ASEAN NCAP assessment with their popular models (most of them through sponsored test). This included the replacement (major facelift) model for 'Honda City 2014' that produced better results in both AOP and COP. Another example is Perodua Myvi, in which the latest version (Myvi 2015) had improved in both AOP (from 3-star to 4-star) and COP (from 54% to 71%) score. As mentioned earlier, the Teana model by Nissan was the main highlight – being the first car in ASEAN NCAP to achieve perfect score in AOP and also the first to achieve 5-Star in both AOP and COP (COP 88% is the all-time record high to date) (Global NCAP, 2014b). All these achievements will be given recognition in 'ASEAN NCAP Grand Prix Awards', which have been held in 2014 and 2016 (Gerard Lye, 2016; Global NCAP, 2014a).

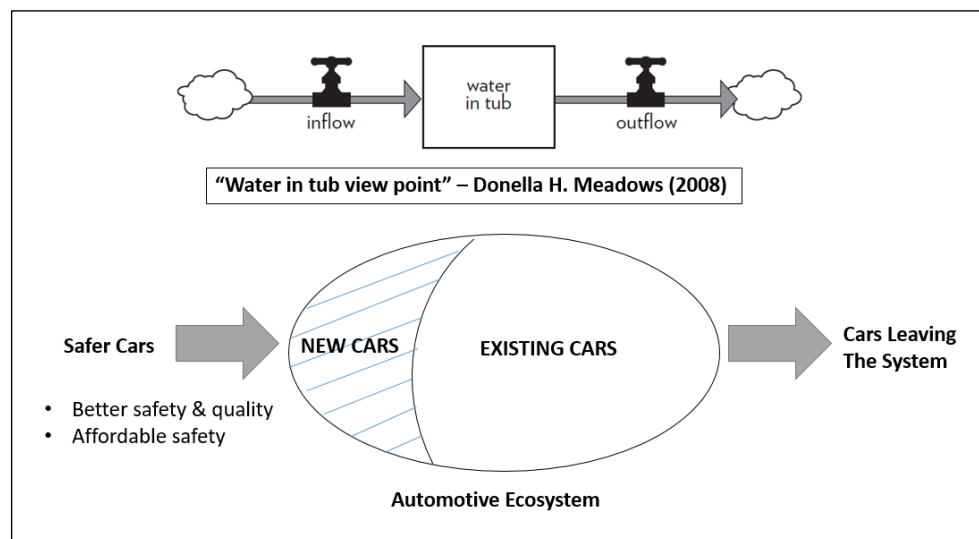
Considering all that ASEAN NCAP has contributed so far, can we conceptually explain a situation similar to the concept of 'safety in numbers' in the country's road safety scenario? The answer may be "yes" and "no". In 'safer car' initiative, we strive to only allow cars with certain quality and safety standard into the so-called automotive ecosystem so that we can hope for a better outcome 'slowly but surely' – number of accidents reduced by means of 'avoidance effort' (active safety) and deaths can be avoided as well as injury level can be reduced by means of 'occupant protection' (passive safety). In systems thinking perspective, Leveson (2011) suggests that we should think of building safer systems with a new approach and forget about simpler systems of the past, in order to accommodate more current complex systems (Leveson, 2011). Furthermore, Meadows (2008) implies that the behaviour of a complex system is similar to 'water in the bathtub' i.e. if the bathtub is filled with water, with its drain plugged up and its



faucets turned off it will produce an “unchanging, not dynamic and boring” system (Meadows & Wright, 2011).

In Malaysia’s case, around half a million passenger cars are sold each year (Mohd Jawi et al., 2012); and in 2015 alone, it is safe to conclude that more than half of the newly registered cars have obtained 4-star and 5-star (referring to AOP) with the likes of Perodua, Proton, Honda and Toyota dominating 80% of the market share (Hafriz Shah, 2015). Therefore, the new cars entering the ecosystem are better in quality and safety. The lack of end-of-life vehicle (ELV) policy (Figure 2) means that a car may permanently retire due to other reasons such as not being roadworthy or involved in road crashes (total loss).

Here, the presumption is that the more number of safer cars in the system might reduce the probability of occupants getting killed or seriously injured in car crashes, provided they are properly restrained at all times as shown in Figure 6. This concept explains how safer vehicles initiative through NCAP and VTA can gradually ‘clean up’ the system, as new cars that are generally safer will replace existing ones.



**Figure 6:** ASEAN NCAP pushes only ‘safer cars’ entering the system

Eventually, consumers or specifically car users are the ones to determine the success of such initiative. As shown in Figure 3, consumers can create pressure onto OEMs by supporting the safety rating. A continuous assessment by MIROS showed that consumer awareness about ASEAN NCAP initiative is on the rise (Table 2) (Abu Kassim et al., 2016b; Md Isa et al., 2014, 2016; Mohd Jawi et al., 2014). In addition, ASEAN NCAP YouTube channel is able to gain more than two million views and is subscribed by more than seven thousand users, with the majority of them from Malaysia (37%), Indonesia (30%) and India (10%). On the other hand, ASEAN NCAP’s social media presence as shown in Table 3 may not be as ‘impressive’ as ASEAN NCAP has not advertised aggressively or used paid services to get the “likes” and “followers” (e.g. all Facebook likes are ‘organic’).

**Table 2:** Findings with regard to consumer awareness on ASEAN NCAP existence

Reference	Data Date	Sampling Method	Sampling Area	No. of Samples	Awareness (%)
(Md Isa et al., 2016)	Mac 2016	Purposive	Klang Valley	500	38.5
(Abu Kassim et al., 2016b)	July 2015 – Aug. 2015	Random	Klang Valley	103	32.0
(Mohd Jawi et al., 2014)	Aug. 2014	Random	Kajang & Bangi	180	18.0
(Md Isa et al., 2014)	Nov. 2013 – Jan 2014	Systematic	Klang Valley	660	15.5

**Table 3:** Summary of ASEAN NCAP social media statistics

Social Media Platform	Info/Statistics
Twitter	
<i>Tweethandle</i>	@aseancap
<i>First tweet</i>	March 2013
<i>Followers (as of January 2017)</i>	556
Facebook	
<b><i>Account 1 (ASEAN NCAP):</i></b>	@AseanNcap
<i>Date joined</i>	June 2013
<i>Likes</i>	1,522
<b><i>Account 2 (ASEAN NCAP Malaysia - MY):</i></b>	@aseancapmy
<i>Date joined</i>	December 2014
<i>Likes (as of January 2017)</i>	1,279
YouTube	
<i>Channel name</i>	ASEAN NCAP
<i>Date joined</i>	March 2014
<i>Subscribers (as of January 2017)</i>	7,279
<i>Views (as of January 2017)</i>	2,147,943

To a certain extent, car users can also become the ‘enemy’ of ASEAN NCAP judging by their behavior with regard to seatbelt wearing. Based on previous observational studies, the findings have not been favorable with seatbelt wearing rate for drivers at just around 80%; with front passengers constituting 70% and below 10% among rear seat passengers (Mohd Jawi et al., 2015). After all, unrestrained car occupants will not be fully protected in the event of crash impact and this will totally reverse the original idea of having a ‘safer car’ initiative in the country.

## 4.0 CONCLUSION

This review has discussed ASEAN NCAP's achievements after approximately five years of establishment and its contribution to Malaysia's automotive ecosystem. In general, the absolute objective, namely to reduce the number of fatalities and serious injuries among car occupants in road crashes, is yet to be determined and requires extensive research and conclusive findings. However, ASEAN NCAP has definitely made significant improvements in terms of elevating the norm of safety level of new cars coming into the automotive ecosystem. Nevertheless, the importance of road users as consumers and car occupants in supporting the intended outcome of the program must never be excluded.

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