

# A THEORETICAL REVIEW IN EVALUATING THE IMPACT OF TRAFFIC-CALMING MEASURES ON THE RESIDENTIAL LIVING ENVIRONMENT

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## ABSTRACT

A healthy living environment is vital to the positive lifestyle of a community. When traffic volumes or vehicle speeds in residential areas increase because of street design, social street activities are greatly reduced, and the feeling of well being in the affected neighbourhood is threatened. The cause of several accidents at the residential areas is also due to excessive speed caused mostly by the residents itself or persistent cut-through traffic, consequently leading to increase in noise pollution. Living environment in many residential areas has been deteriorating mainly because of these reasons. Addressing this issue, traffic calming measures is being perceived as a viable tool to reduce traffic speeds and accidents. The purpose of this research is to find the balance between traffic and environments by analysing the living environment through traffic calming measures. This paper highlights the literature background on traffic calming in Malaysia, impact of traffic calming to the residential living environment and other elements related to initial stage of study.

**Keywords:** traffic calming measures; living environment; residential areas; speed; noise level.

## INTRODUCTION

The improvement of residential environment quality had become one of the main targets of city policy and urban planning with various different methods of approaching the study resulted from the efforts of different disciplines, such as anthropology, architecture, economics, applying concepts and etc. which related to their own perspectives (Wardman and Bristow, 2004). Aspects such as social security and the quality of contact between neighbours are believed to be deteriorating whereas crime, anti-social behaviour and vandalism are prevalent (Lau, 2008). As urban size increases imbalance development pattern exist, and in that some cases there will be neighbourhoods that are prospering while others are deteriorating. It is the purpose of this study is to find the balance between traffic and environments by analysing the living environment through traffic calming measures.

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Furthermore, the study will attempt to investigate the impact of traffic calming measures to the residents' living environment. This paper highlights the literature background on traffic calming in Malaysia, its implementation in the residential areas, noise and speed level at residential areas, impact of traffic calming to the residential living environment and other elements related to initial stage of study.

## **LITERATURE REVIEW**

### **Traffic Calming**

Due to perceive growth in traffic flow through residential neighbourhoods, a new term has entered our transportation vocabulary; Traffic Calming. Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behaviour and improve conditions for non-motorized road users (Lockwood, 1997). Traffic calming can be installed as a component for improvement to an existing neighbourhood or in newly constructed neighbourhoods as a design feature (Murphy, 2003). If a residential street or housing estate road is being used by uncomfortably high volumes of potentially fast traffic, traffic calming measures may be necessary. Increasingly, traffic calming schemes are also applied on industrial estate roads and commercial frontages where authority deems there is a merit to do so (Patterson, 2004).

The traffic calming measures have been introduced in many other countries in the world since many years ago despite it is still in the infancy stage in Malaysia. According to Engel and Thomsen (1992) and Patterson (2004), they stated 30 to 40 years ago the beginnings of traffic calming programs came into popularity in Europe. The earliest roots of traffic calming have been traced backed to the Netherlands, where in the late 1960's, the desires were 'to turn the street into an obstacle course for motor vehicles, and an extension of home for residents'. The Dutch utilized diversion schemes, such as street closings, one-way streets, and other traffic calming devices using physical measures such as speed humps. These concepts quickly spread to other countries such as Germany, Sweden, Denmark, England France, Japan, Austria, and Switzerland (Engel & Thomsen, 1992; Ben-Joseph, 1995; and Patterson, 2004).

### **Definition of Traffic Calming**

There are many different definitions of traffic calming. According to the Virginia Department of Transportation (2002), traffic calming refers to various design features and strategies intended to reduce vehicle traffic speeds and volumes on a particular roadway. While according to Pannu (1999), it is the combination of mainly physical measures that reduce the negative effects of motor vehicle used, alter driver behaviour and improve conditions for non-motorized street users. Meanwhile Murphy (2003), stated that traffic calming is a way to redesign streets so that traffic is tamed to a level that allows it to coexist more peacefully with people.

Pharoah and Russell (1991) defined traffic calming as the attempt to achieve calm, safe and environmentally improved conditions on streets. However Hass-Klau (1993) definition contradicted with the definition by Pharoah and Russell as the author claimed the definition did not go far enough. Hass-Klau stated that in the narrow sense, traffic calming meant 'to lower speeds' as in a broader sense, it must be thought of as 'an overall transportation policy concept' to promote non-automobile modes of transportation. Hass-Klau definition was, the combination of policies intended to alleviate the adverse environmental, safety and severance effects motor vehicles continue to impose on both the individual and society at large.

Another definition of traffic calming developed by a British group of engineers and surveyors is the application of traffic engineering and other physical measures designed to control traffic speeds and encourage driving behaviour appropriate to the environment. Apart of all the definition stated, Lockwood (1997) came into conclusion that traffic calming is the combination of mainly physical measures that reduce the negative impacts of motor vehicle use, alter driver behaviour, and improve conditions for non-motorized street users. The same definition had also being explained by Schroll (1999) in Chapter 22 of 'The Traffic Safety Toolbox- a primer on traffic safety' whereby it is also the identical definition according to the Institute of Transportation Engineers.

### **Traffic Calming in Malaysia**

Traffic calming schemes in reducing traffic speeds and accidents have been positively received by residents in Malaysia. Some of the devices are designed by local authorities such as the speed breaker, speed hump, speed bump, speed tables, raised crosswalk, raised intersections, textured pavement, traffic circles and roundabout (Muhammad Marizwan Abdul Manan et.al, 2009). However, most of these measures were implemented on an ad hoc basis without any proper standard or guidelines, but purely on the basis of experiences of the local traffic engineer and request from the residents. Furthermore, no studies have been carried out to check on the effectiveness or evaluating the implemented scheme, consequently there were various problems or issues that had surfaced due to improper implementations of traffic calming schemes as stated by Muhammad Marizwan Abdul Manan et.al, (2009):

- i. Non standard design – same device but different dimensions.
- ii. Unsuitable location – some measures are located too close to a junction.
- iii. Negative effect of measures – improper construction may confuse drivers, causing accidents, instead of preventing them.
- iv. Device installed has no effect on driver driving characteristics – rate of speeding is as before the installation of the device.

Based on the Traffic Calming Guidelines, published by the Highway Planning Unit (HPU) from the Ministry of Works, there are 12 speed controlling measures which are divided into two major categories as seen in Table 1.

**Table 1** Traffic calming measures based on Highway Planning Unit (HPU) guidelines

Vertical measures	Horizontal measures
1. Speed bump	1. Traffic circles
2. Speed hump	2. Roundabout
3. Transverse bar or alert bar	3. Chicane
4. Speed table	4. Choker
5. Textured pavement	5. Centre island
6. Raised crosswalk	
7. Raised intersection	

*Source: Highway Planning Unit (HPU), 2002*

According to the HPU guidelines (2002), vertical shift in the roadway is the most effective and reliable method for speed reduction. The deflection generally helps to increase the drivers' awareness and hence reduces the vehicle speeds and also has the effects of reducing speed.

Below are the descriptions for each vertical shift measure (HPU 2002).

- i. Speed hump – raised areas of a pavement typically with a rounded or flattop, usually 3.5 m to 4.0 m wide and 3.65 m, 6.71 m and 9.14 m long. Speed humps have profiles that are sinusoidal, circular, parabolic or flat-topped.
- ii. Speed bump – similar to speed humps but they are normally less than 1 m wide and its primary function is lowering the speed of motor vehicles.
- iii. Transverse bar – transverse bar is a coloured bar painted on the road surface which acts to attract the attention of drivers to slow down gradually due to the slight vibration it causes when a car is driven over it.
- iv. Speed table – a long flat-topped speed humps that slow cars more gradually than humps.
- v. Raised crosswalk – marked pedestrian crossing at an intersection or midblock location, constructed at a higher elevation than the roadway.
- vi. Textured pavement – created either by grooving the asphalt surface, coloured paving stones, brick or cobblestones. This causes driver to have a slightly bumpy ride over an extended distance.
- vii. Raised intersection – a flat raised area covering the entire intersection.

The Traffic Calming Guideline by HPU stipulates specific dimensions and locations that are required to install traffic calming measures. However, these guidelines were never tested nor properly enforced by the local road authorities. As a result, the implementations and outcomes of the traffic calming measures vary from one location to another (Muhammad Marizwan Abdul Manan et.al, 2009). The different styles and designs could translate into inconsistent speed reduction due to different driving reactions, and finally, may lead the public to have negative perception regarding traffic calming measures.

## **Traffic Calming Measures at Residential Areas**

In most localities, the immediate and long-term goals of traffic calming are directly related to the concerns of the residents. Parents and citizens are demanding that speeds be reduced and cut-through traffic eliminated, particularly on residential streets near schools and parks. In many communities, citizens have conveyed their traffic-related concerns to local leaders who, in turn, have sought direction from transportation experts to implement traffic calming measures (Koorey, 2011).

In a residential area, traffic calming measures utilize design strategies to slow down cars and increase the visibility of pedestrians and bicyclists. It particularly complement areas that already have well-designed sidewalks. For example, vertical installations, such as speed humps, force pedestrians to negotiate an elevation change. Horizontal installations, such as neighborhood traffic circles, may cause pedestrians to be "squeezed" by vehicles (Murphy, 2003). With lower vehicles speed and in some circumstances, a lower volume of traffic, local residents including children can reclaim their streets as social places where walking and cycling can flourish (Papacostas and Prevedourus, 2001)

### **1. Britain Traffic Calming Neighbourhood Schemes**

According to guideline written by Murphy (2003) for the Neighbourhood Traffic Calming Policy and Procedures, he identified the traffic calming scheme is based on the hierarchy of roads. The roads are classified as arterial, collector or local roads. The road classification designates the intended function of the road. The function of an arterial road is to carry trips of longer duration, through traffic, and to accommodate significant volumes of traffic. The function of a collector road is to collect and distribute traffic into and out of a neighbourhood, and provide property access. The function of a local road is to provide property access (JKR, n.d).

Sometimes motorists can develop a pattern of using a road in a manner, which was not intended, such as using a local road as a through route or travelling at inappropriate speeds. The purpose of traffic calming is to restore roads to their intended function and correct motorist behaviours to acceptable community norms as define by Murphy (2003). He also stated that traffic calming measures would generally only apply to local roads that are not bus routes or primary emergency response routes. If directed by Council, a collector road may be considered for traffic calming, but generally only with measures that do not involve vertical changes to the road or route changes. Generally, roads in rural or agricultural areas are not considered for traffic calming.

Traffic calming measures will be applied to the different road classes and route types as shown in Table 2. The traffic calming plans will consider the objectives of the neighbourhood, accessibility needs, safety and environmental standards. Improvements to the arterial system surrounding the study area will be considered within the available options for traffic calming. Each alternative solution will include a statement of the effectiveness of meeting the objectives of the neighbourhood, any disbenefits to the neighbourhood, total project cost, annualized cost to the benefiting properties (if applicable) and the impacts to the larger community (Murphy, 2003).

**Table 2** Applicability of Traffic Calming Measures

TRAFFIC CALMING DEVICE	APPLICABLE TRAFFIC CALMING MEASURES				
	Road Classification			Other Considerations	
	Local Road	Collector Road	Arterial Road	Emergency Response Route	Transit Route
<b>Vertical Deflection</b> <ul style="list-style-type: none"> <li>• Raised Crosswalk</li> <li>• Raised Intersection</li> <li>• Rumble Strip</li> <li>• Sidewalk Extension</li> <li>• Speed Hump</li> <li>• Speed Cushion</li> <li>• Textured Crosswalk</li> </ul>	✓	✓	x	x	✓
<b>Horizontal Deflection</b> <ul style="list-style-type: none"> <li>• 1-Lane Chicane</li> <li>• 2-Lane Chicane</li> <li>• Curb Extension</li> <li>• Curb Radius Reduction</li> <li>• On-Street Parking</li> <li>• Raised Median Island</li> <li>• Traffic Circle</li> </ul>	✓	x	x	x	x
<b>Obstruction</b> <ul style="list-style-type: none"> <li>• Directional Closure</li> <li>• Diverter</li> <li>• Full Closure</li> <li>• Intersection Channelization</li> <li>• Raised Median Through</li> <li>• Right-in/Right-out Island</li> </ul>	✓	x	x	✓	✓
<b>Signage</b> <ul style="list-style-type: none"> <li>• Maximum Speed</li> <li>• One way</li> <li>• Stop</li> <li>• Through Traffic Prohibited</li> <li>• Traffic Calmed</li> <li>• Turn Prohibited</li> <li>• Yield</li> </ul>	x	x	x	x	x
<b>Notes:</b> ✓ - Applicable for use in this road class or route type x - Not applicable for use in this road class or route type					

Source: Murphy (2003)

## 2. Virginia Traffic Calming Measures

Based on guidelines by the Virginia Department of Transportation (2002), it stated the implementation of traffic calming measures is based on the traffic volume on the roads. Traffic volumes on the residential street will determine the appropriate traffic calming measures as follows:

**Table 3** Traffic Volumes and Traffic Calming Measures

Traffic volume (vehicles per day)	Traffic Calming Measures
Fewer than 600	<ul style="list-style-type: none"> <li>○ education</li> <li>○ enforcement</li> <li>○ non-physical measures</li> </ul>
600- 4,000	<ul style="list-style-type: none"> <li>○ education</li> <li>○ enforcement</li> <li>○ non-physical measures</li> <li>○ physical measures</li> </ul>
More than 4,000	<ul style="list-style-type: none"> <li>○ education</li> <li>○ enforcement</li> <li>○ alternative actions only</li> <li>○ no traffic calming measures</li> </ul>

*Source: Virginia Department of Transportation (2002)*

Based on Table 3, the community awareness and education is an important first step. The residents should be made aware of the speeding concerns and should be reminded of the importance of driving safely in their neighborhood. Meanwhile, enforcement is traditionally the primary means of addressing speeding problems. The local police officers will monitor and enforce the posted speed limit. Enforcement efforts should be undertaken as much as possible prior to implementation of traffic calming measures (Virginia Department of Transportation, 2002).

Furthermore, non-physical measures are defined as the low-cost measures that do not physically restrict driver maneuvers, such as pavement markings to narrow travel lanes. While, physical measures aimed to reduce speed by creating a vertical or horizontal shift in the roadway or travel lanes. Lastly, alternative actions will be considered when traffic volumes on the study street exceed 4,000 vehicles per day. A network analysis is suggested to thoroughly examine the road network in the area and identify potential improvements on major routes that may provide relief to the ‘study’ street (Virginia Department of Transportation, 2002).

### Living Environment at Residential Areas

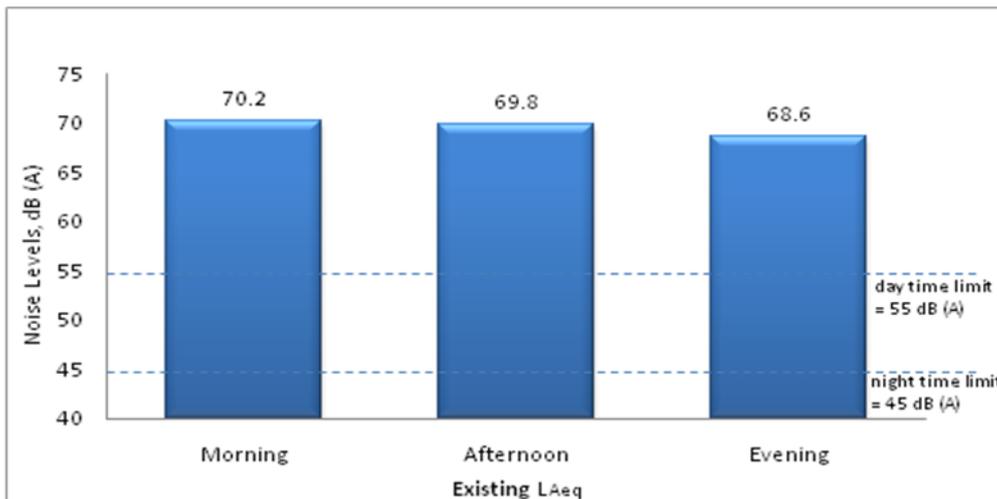
The complex interaction between the community and its environment could be exemplified through the term liveability. A liveable neighbourhood is one that offers quality and good environment to ensure inhabitants are able to live their lives in a satisfying way (Lau, 2008). There is a growing awareness of the deterioration of liveability particularly in urban built environment due to the pressure of rapid development and growing population.

Furthermore, healthy living environment is one of the factors vital to the positive lifestyle of a residential environment (Abdul Azeez Kadar Hamsa et.al, 2006). Living environment today in many residential areas has been deteriorating mainly because of increase in traffic volume, excessive speed, road alignment and other related factor. Hence, as the city grows, it is important to ensure that the major arterial roads in the community accommodate the increased growth and the local roads continue to serve the residential road.

### 1. Noise Levels at Residential Areas

Noise can be defined as an unwanted or undesirable sound whereas environmental noise is any unwanted or harmful outdoor sound created by human activities that is detrimental to the quality of life of individuals (Nadaraja et.al, 2010). The last several years, a lot of researches have been done regarding noise and its effect to human. Noise also could lead to human annoyance, reduces life quality, and might affect health and physiological well-being (Ohrstrom et.al, 2006, Nadaraja et.al, 2010).

Significantly, based on Figure 1, a study by the DOE (2008), the existing noise level at suburban residential area has quite high noise level ranging from 69.8 to 70.2 dBA on day time whereby the acceptable noise level during day time is only 55 dBA. Furthermore the noise level at night time also results in high numbers with 68.6 dBA while the night time limit is only 45 dBA. On the long term, this can results in permanent damages to the residents who are dealing with this problem every day and as stated by Botteldooren et.al, (2011) exposure to noise levels of relatively high degrees can lead to direct hearing loss and/or hearing impairment.



**Figure 1** Existing Noise Level in Suburban Residential Areas (Medium Density)  
*Source: Department of Environment (DOE), 2008*

Development of residential area surrounding the city increases the activities in the city such as construction and traffic, consequently lead to the increase noise pollution problems at neighbourhood areas. Traffic influences the quality of life in a neighbourhood in many different ways. In many patsy of the world the benefits of accessibility are taken for granted and traffic is perceived as having a negative impact on satisfaction with the neighbourhood (Botteldooren et.al, 2011). Hence, the noise produced by traffic is one of the most important contributors to the appreciation of the quality of life.

Some studies indicated that residents are often concerned that vertical measures such as humps, tables, and especially textured surfaces will raise noise levels in the community (Hidas et.al, 1997). However, a study conducted in the United States (Clark, 2000) indicated that the lower speeds resulting from the proper design and application of traffic calming measures tend to lower noise levels. European studies have reached similar conclusions, for example, a study of British traffic-calming schemes in villages (Cline and Dabkowski, 2005) found that, alongside the speed reduction, there was a reduction in noise of around 10%.

## **2. Speed Levels at Residential Areas**

The perception of speeding on local streets is probably the most persistent problem facing residents and traffic officials, alike. Although local or residential streets carry the lowest traffic volumes and suffer the fewest traffic crashes, they are the single largest consumer of a traffic engineer's time and energy (Institute of Transportation Engineers, 1999). Residents observe vehicles being driven at speeds they perceive are too fast and conclude that the speeds would decrease if traffic calming measures e.g. stop signs were installed. Speeds considered excessive by residents are considered reasonable by these same persons when they are driving in another neighbourhood.

However there are in some cases shows that the implementation of traffic calming devices may cause an extreme reduction in traffic (Patterson, 2004). Significantly, the choices of design speed are also influenced by the geometric design of roadways and have been established to provide motorized efficiency which is often incompatible with the essence of residential liveability (Koorey, 2011).

Appleyard (1981) hypothesized that when traffic volumes increase beyond what is considered normal by local residents, or vehicle speeds increase because of street design, social street activities are greatly reduced, and the feeling of well being in the affected neighbourhood is threatened. Although, Ben-Joseph (1990) recommended criteria refer to issues of liveability and safety on residential streets, many cities are finding themselves under pressure to further address the issues through the reduction of speed and volume of traffic in residential areas. This can be due to high traffic volume which is often the result of a poorly planned street system as safety and excessive speed are related to the street's geometrical design. The practice of constructing wider road alignment in residential streets where there is little traffic (less than 1000 trips per day) also permits and encourages high vehicle speeds (Ben-Joseph, 1990).

The vehicle speed chosen by a driver may influenced by the presence of other vehicles, weather, road conditions, road geometrics, adjacent land use, and other factors. Unfortunately, speed law enforcement appears to have little permanent effect on driver behaviour. Motorists tend to pay little attention to speed limit signs, which they consider unreasonable, unless there is an excessive degree of enforcement. Unreasonably low speed limits are commonly violated by a majority of motorists, making enforcement difficult.

## **Impact of Traffic Calming Measures toward Environment**

The environmental effects need to be considered carefully for measuring the effectiveness of traffic calming devices, including noise and speed quality. The environmental impacts can be positive and negative. They are dependent on the changes in traffic volume and vehicle speeds after using the traffic calming devices. Numerous studies have demonstrated that most traffic calming schemes have successfully achieved the objectives set in terms of reduction in accidents, speeds and volumes, and there is ample evidence of the general positive response to traffic calming by the public (Schroll, 1999; Morrison et.al, 2003 Patterson, 2004). However, despite the significant benefits of such schemes there is considerable professional and community opposition towards the use of physical traffic calming devices. Opinion surveys have shown that motorists feel disadvantaged by speed humps or raised platforms and that residents living near the devices often complain of deterioration of, rather than improvement in, environmental conditions (Hidas et.al, 1997).

There have been cases where some devices were even removed because of community complaints (Cline and Dabkowski, 2005). Notwithstanding the overall success of traffic calming in local streets, these claims suggest that, while physical speed control devices are very effective in improving the safety and amenity of the street environment, they also produce undesirable side-effects to the community. It seems quite reasonable to assume that these effects may become more important if such devices are installed on routes with higher traffic volumes. Hence there is a need to investigate any possible side-effects associated with these traffic management techniques.

To investigate the improved amenity and to test the effectiveness and the impacts of speed control, numerous studies have been conducted on vehicle speeds, journey times, accident rates, traffic flow changes, noise levels and community reactions to these devices. According to (Hidas et.al, 1997; Cline and Dabkowski, 2005) some of these studies have indicated that speed control devices may have some minor negative environmental impacts in terms of noise and air pollution in the vicinity of the devices. While based on a study by Mao and Koorey (2010), traffic noise pollution levels will generally decrease if there is reduction in traffic speeds. However, it may increase as a result of vertical deflections such as road humps.

In residential areas, speed reductions from 50 to 30 km/h typically reduce noise levels by 4 to 5 decibels, or more in some circumstances (Engel and Thomsen, 1992). Conversely, Hidas et.al (1997) reported that the noise level is negatively affected when more noise can be produced in areas with or near traffic calming devices. This is due to increases in the number of accelerations or decelerations. He also reported that the effects of traffic calming measures have positive outcomes, although traffic calming devices can result in some undesirable side effects in relation to traffic noise of individual cars that are due to decreased traffic volumes. However, no previous attempts have been made to research other possible side-effects. Some authors suspected that speed control devices may induce changes in the traffic flow which, in turn, may increase the delays of vehicles entering from driveways and the delays for pedestrians attempting to cross the road (Koorey, 2011). Except for the occasional contradictory views expressed by residents living near such devices, no evidence is currently available to support or refute this assumption.

Indisputable, the application of the traffic calming measures is one of the tools that need to be highlighted in order to improve the residential environment for people living in the area. Additionally, traffic calming measures is the technique that applied the reduction in average speeds of vehicles in built up area as well as a measure to change the driver's perception of an area. As Engel & Thomsen, (1992) and Schroll, (1999) highlighted, the traffic calming can alter the balance and impress upon the driver that the street is primarily for residential use. Overall, it can be concluded that the changes in environment are dependent on the traffic calming schemes applied, the traffic volume, the reductions in travel speed and any changes in driving style.

## **STUDY OBJECTIVES AND METHODOLOGY**

The ongoing study revolves around achieving the following objectives:

- I. To identify and review the available literature on the living environment in residential areas through the measurement of traffic calming;
- II. To analyse the existing road characteristics at the selected residential areas;
- III. To measure speed, noise and traffic volume at selected residential locations provided with traffic calming measures;
- IV. To evaluate the perceptions of residents on living environment that they are subjected to;
- V. To recommend proposals in improving living environment further at the residential areas.

The first objective of the study would be achieved by reviewing the available literature to analyse the impact of traffic calming on the residential living environment. Reviewing literature is an integral part of the entire research process and makes a valuable contribution to almost every operational step (Kumar, 2010). This is the initial stage in the research to help in establish the theoretical roots of the research, clarify few ideas, and develop the methodology.

While the second objective will touch on the variables such as the road geometric, the width of the road that contains the traffic calming devices, and the design characteristics of the traffic calming devices. The data will be collected by inventory survey and observation. The geometrical details of the road with the traffic calming devices will also be studied in order to test whether the road width influenced the speed of vehicles or otherwise.

In achieving the third objectives, it will involve in conducting primary survey for traffic volume, noise level, and speed level. The traffic volume survey will be conducted by using the manual count that will determine the vehicle classification, direction of travel, and vehicle occupancy. As the selected study area is a residential road, only cars and motorcycles will be evaluated. For the noise level survey, it will be measured by using the Sound Level Meter and several monitoring points will be selected in different distance from the located traffic calming devices to carry out the noise measurements. Lastly, the data for speed level are gathered through spot speed survey. The spot speed data will be measured using a hand-held digital radar gun and this survey will also be conducted for cars, MPVs and motorcycles only.

Nevertheless, to achieve the fourth objective, questionnaire survey will be distributed on the selected household in the study area. The questions will be asked on the perceptions of the residents regarding their living environment. The variables will include awareness concerning pollution; traffic volume and speed; safe, healthy and comfortable living conditions; and the resident's expectation of the factors governing healthy living conditions. The perception variables in this study will be collected in the form of ordinal data. Kumar (2010) defined it as 'if any observation is rated high on the first variable, and then it tends to be medium or high on the other,' meaning to measure the variable in order of magnitude (ranking). The measure that can be used for this variable is the Likert scale.

Achieving the aforementioned objective will contribute directly to achieving the final objective of the study, which discussed the recommendations to be implemented for the improvements of living environment at the residential areas. Recommendations are formulated based on the findings derived from the analysis, and consequently improved the quality of life of the neighbourhood area with the implementation of traffic calming measures.

## **CONCLUSION**

This research derives its basis from the viability of traffic calming as a measure to reduce vehicular traffic's intrusion into and its effects on urban life. Traffic calming typically consist of various forms of physical management of vehicles implemented at a street or neighbourhood level. Moreover, as automobile travel increases, the communities become more aware with traffic that can no longer be accommodated on the traditional arterial roadway system. Although the most familiar forms of traffic calming action worldwide involve the use of physical treatments at the local street level, however international traffic calming practice is not limited to low-volume neighbourhood streets.

Regardless of the main cause of accidents, it has long been recognized that there is a direct relationship between accident severity and vehicle speed. Excessive speed for the prevailing road conditions can be the prime cause of some accidents. Speeding traffic can cause severance effects between two parts of a community due to the difficulties experienced when pedestrians attempt to cross the road. Hence, traffic calming measures is being perceived as a viable tool to reduce traffic speeds and accidents.

However, after several years of implementing traffic calming strategies on literally hundreds of streets and in hundreds of neighbourhoods, evidence of backlash arise especially with the residents concern over the living environment in term of noise and speed level in their residential areas. This paper attempts to present an overview of the literature on the beneficial of traffic calming and its impacts on residents' living environment. Despite the fact that the study is at an initial stage, it is expected to contribute to the understanding and potential of traffic calming as a strategies to reduce the impact of noise and speed levels and further improve the living conditions at the residential areas.

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