

# Empirical estimation of school siting parameter towards improving children's safety

I S Aziz<sup>1,3</sup>, Z M Yusoff<sup>1,2</sup>, A R A Rasam<sup>1</sup>, A N N A Rahman<sup>1</sup> and D Omar<sup>2</sup>

<sup>1</sup> Centre of Surveying Science and Geomatics, FSPU, UiTM, Malaysia

<sup>2</sup> Centre for Environmental Design and Management, FSPU, UiTM, Malaysia

E-mail: intanaziz@gmail.com

**Abstract.** Distance from school to home is a key determination in ensuring the safety of children. School siting parameters are made to make sure that a particular school is located in a safe environment. School siting parameters are made by Department of Town and Country Planning Malaysia (DTCP) and latest review was on June 2012. These school siting parameters are crucially important as they can affect the safety, school reputation, and not to mention the perception of the pupil and parents of the school. There have been many studies to review school siting parameters since these change in conjunction with this ever-changing world. In this study, the focus is the impact of school siting parameter on people with low income that live in the urban area, specifically in Johor Bahru, Malaysia. In achieving that, this study will use two methods which are on site and off site. The on site method is to give questionnaires to people and off site is to use Geographic Information System (GIS) and Statistical Product and Service Solutions (SPSS), to analyse the results obtained from the questionnaire. The output is a maps of suitable safe distance from school to house. The results of this study will be useful to people with low income as their children tend to walk to school rather than use transportation.

## 1. Introduction

On the present day, Malaysian's expansion in urbanization process makes transportation is necessary. A person needs transport to move from one place to another, regardless of the transportation modes. As the transportation, technology and the size of population increase, people become more aware that the road safety is highly important. Traffic accidents have risen at urban city where traffic congestion is frequent.

The number of traffic accidents in Malaysia has reached an alarming situation. In 2011, [1] has done a research report on road traffic injuries among children in Malaysia and its implication on road traffic injury prevention strategy for 2007-2010. This report analyse the types of transportation, age group and the place that often occurs accident, whether it is small injuries and fatalities. It is recorded that road traffic deaths rate per 100,000 population size differs by the group of age. From the report it is shown that school children aged 10-14 has the highest fatalities (18.5%) in road crashes. For children below 1 year old, the fatality percentage recorded was 6.8% while for children between the ages of 15-18 the fatality rate percentage was 3.9%. Meanwhile in 2011, a number of 17,228 cases of road accidents were recorded by the [2]. Among that, a number of 183 crashes involve fatalities and the death toll was 199. The figure only applies to the cases of road accidents that were actually reported, not to mention that the number of accidents that were not reported.

Yearly, various road safety campaigns were held, yet the statistics are still towering. The percentage of fatalities among school children especially has risen recently. Children travel by road every day to go to school despite the different mode of transportation. As the number of population

<sup>3</sup> To whom any correspondence should be addressed.



increases, traffic congestion has become a daily<sup>4</sup> basis. Careless driving may leads to accident as children has very few understanding about road safety. Even though road safety has been taught by teachers at school and parents at home, a child is easily vulnerable.

According to [3] accidental injury such as traffic, fire and drowning shows a great number of children age under 14. The predominant reason why children age under 14 is easily exposed to the danger is because the lack of knowledge about safety and self-protection. [4] studied the walking school bus intervention on children's safety. In his study, Mendoza found out that there are many policies to be change in encouraging children to walk from home to school. This clearly shows that school children's road safety must be improved.

Despite the road safety lesson given to the children, the safety of the road itself should be highlighted. School siting parameter was made in making sure that a school is built in a suitable place with a suitable environment. It is made by [5] to standardise the siting parameter for all school in Malaysia. A guideline on a '*Garis Panduan Perancangan Kemudahan Masyarakat*' has listed a set of parameter for public infrastructure, including school siting. This guideline states the specification to develop a new school, yet the safety aspects are not fully covered. Evidence by researcher [6] reported that most of schools in Malaysia were located in the radius distance of more than 1.5 kilometres where auto-mobile vehicle was best used. However, children from family with constraints on budget were walked or cycled to school even though the safety distance to walk is about 500 m to 750 m.

A pervious study by [7] tackled the spatial-multi criteria decision analysis for school site selection. The study used Analytical Hierarchy Planning (AHP) in checking the proposed school site by Kuala Lumpur City Hall (KLCH). The outcome shows that some of the KLCH proposed site lies in the constraint area, generated by the AHP analysis. [8] on the other hand did a research on using the AHP analysis to locate a new school location in Perlis. Factors such as population density, road accessibility, flood risk, and slope degree were taken into account. The result shows a map containing from the most suitable to the least suitable area in developing a new school.

However, in this study, the empirical estimation of school siting parameter towards improving children's safety will be investigated. The analysis consists of combination of Geographic Information System (GIS) and SPSS in order to obtain the suitable distance for school children to go to school by active commuting. Combining the data from SPSS and the analysis from GIS, a new parameter will be introduced to the existing school siting parameter.

## 2. Objectives

The aim is to detect the empirical estimation of school siting parameter towards improving school children's safety. Agreeing on the aim, the objectives are;

- To analyse the safety of children going to school by active commuting.
- To assess the use of GIS in determining the suitable distance from school to house for safety measures.
- To introduce new parameter on road safety for school children.

## 3. Case study

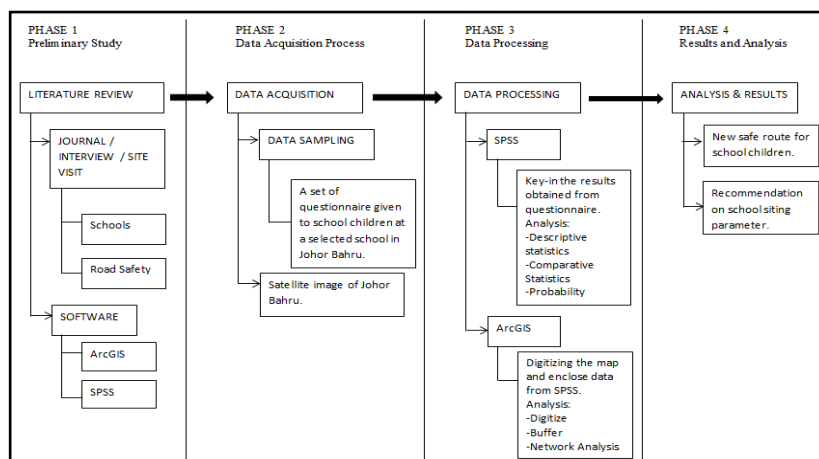
In this study, the chosen area is in Johor Bahru, Malaysia where it is supervised by Johor Bahru City Council (JBCC). There are fifteen areas fractioned based on the administrative area. The study is in focuses to primary and secondary school, where three of primary and three of secondary schools are chosen. The selected schools are SMK Bandar Baru Uda, SMK Sri Rahmat, SMK Sultan Ismail, SK Kompleks Uda, SK Taman Bukit Mewah and SK Pengkalen Rinting.



**Figure 1.** Case study area in Johor Bahru, Malaysia. [9]

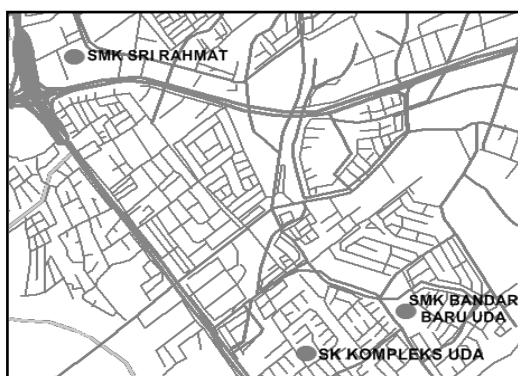
#### 4. Methodology

There are four principal phases involve in this section explicitly. The data are obtained from a set of questionnaire given to the school children in the selected schools. The questionnaire was essentially tackles on the modes of transportation used by the school children to go to school. There are four methods stated namely by school bus/van, privately own vehicle, cycling and walking. The respondent's house locations were a key point as it will be needed in estimating the route used to go to school. Those data from survey questionnaire will be processed in SPSS and analyse in ArcGIS, in the phase 3 based on the figure below;



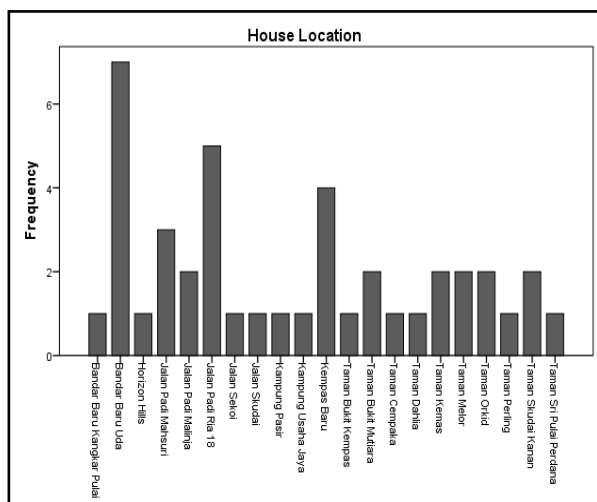
**Figure 2.**Methodology framework.

For the pilot study, a total of 100 set of questionnaire from three schools were studied. The chosen schools for the pilot study are SMK Bandar BaruUda, SMK Sri Rahmat and SK KompleksUda. All of these schools are located in the urban area where traffic congestion is regular. The locations of those schools are as shown below;

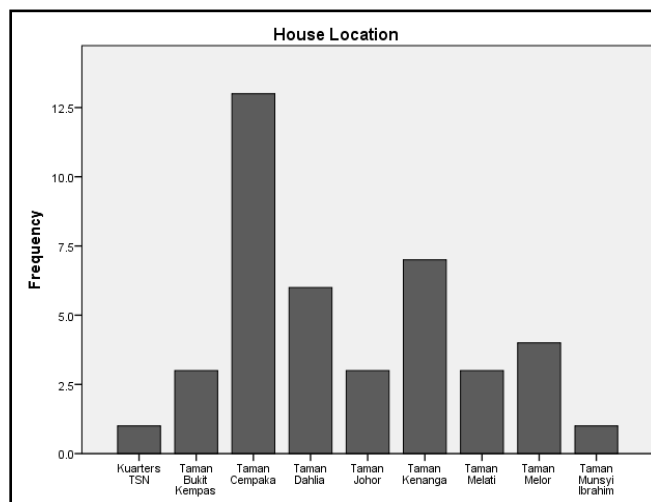


**Figure 3.**Schools location mapped in ArcGIS.

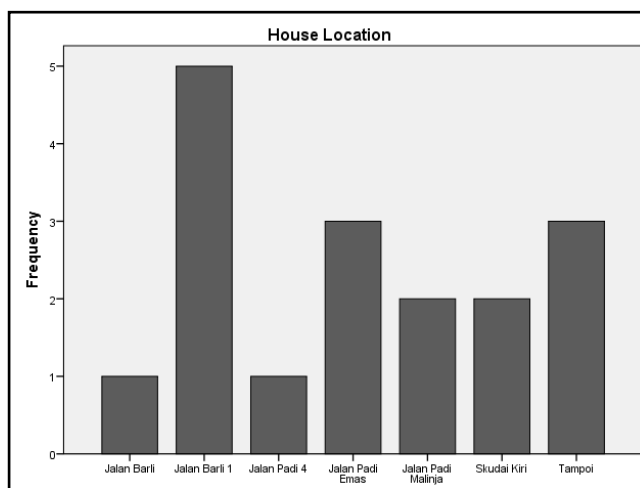
Data from questionnaire were keyed into SPSS and the results for the schools are as follows;



**Figure 4.** SPSS results for SMK Bandar BaruUda.



**Figure 5.** SPSS results for SMK Sri Rahmat.



**Figure 6.** SPSS results for SK KompleksUda.

It is shown from the results that for SMK Bandar BaruUda, majority of the respondents live in Bandar BaruUda residential area. While for SMK Sri Rahmat, most of the school children have approached lives in Taman Cempaka and for SK KompleksUda the survey shown that JalanBarli 1 is the frequent location. Based on the questionnaire, the school children's house locations were gathered and the frequent location is marked on the digitized map in ArcGIS.



**Figure 7.** School and frequent house location mapped in ArcGIS.

By allocating the school children's house, the route network between house and school can be made in ArcGIS. The route chosen will then be evaluate and modify to acquire the safest route to school. Each school and house will have four different routes, according to the modes of transportation listed.

### Acknowledgement

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