

TRAVEL BEHAVIOUR OF SCHOOL CHILDREN IN WESTERN PROVINCE, SRI LANKA

T.P Amalan ^a, B.P.Y Loo ^b and A.S Kumarage ^c

^a *Department of Transport and Logistics Management,
University of Moratuwa, Sri Lanka*

Email: thivyaa@uom.lk

^b *Department of Geography, The University of Hong Kong, China*

Email: bpyloo@hku.hk

^c *Department of Transport and Logistics Management,
University of Moratuwa, Sri Lanka*

Email: amalk@uom.lk

Abstract: In recent years there have been requirements for an environment that can enhance the safety, comfort and convenience of travel of school children and their use of public transport in particular. The data of the Household Visit Survey (HVS) collected in Western Province, Sri Lanka in 2013 are used to analyse the travel behaviour pattern of school children with a view to provide guidelines for policy makers to respond to the current and future needs of children and their families. This paper systematically examines the differences of young transportation users' travel behaviour according to three groups by age (5-9, 10-14 and 15-18), based on their higher physical and cognitive ability to navigate the transport system as they grow older.

Keywords: Travel behaviour, Household Visit Survey, Age groups, Trip rate, Travel time

1. INTRODUCTION

Young transportation users are generally not considered as the main actors in the transportation sector. It is broadly accepted that young children are totally dependent on their parents to fulfill their daily life activities especially for their mobility. They rely on parents to take them where they want to go, and are strongly influenced by their parents travel behaviour. Moreover their mode choice is also influenced by factors like their parents' vehicle ownership and the household income. In order to drive a car or motorcycle, it is necessary for an individual to hold a driving license, typically at a minimum age of 18 years and after getting through a written and practical driving examinations.

The purpose of this paper is to examine relevant evidence of young transportation users' travel behaviour in Sri Lanka by age group in order to provide recommendations to policy makers to respond to the current and future needs of children and their families. It systematically examines the differences of young transportation users' travel behaviour according to the three age groups of 5-9, 10-14 and 15-18 years old. Moreover the travel behaviour of children's will be analysed by socio-economic factors which may influence their travel patterns to school.

2. LITERATURE REVIEW

Children have physical and mental characteristics that impact their travel behaviour and make it dissimilar from that of adults (Roger, 2012). The growing availability of cars in households have made family life more complex, often revolving around the use of cars to escort children to various activities, making cars an important element of many children's lifestyles (Mackett, 2002). School location influences travel distance, which in turn influences travel behavior

(McDonald, 2005). However, there are many consequences for the use of cars to take children to schools. They include:

- Increase in peak period traffic congestion
- Increase in atmospheric pollution around schools
- Children with less opportunity to develop road safety and personal safety skills
- Lack of exercise and resulting impact on poorer general health and well-being
- Children's independence and social interaction reduced (Mackett, 2002)

Moreover a number of demographic and socio-economic factors, such as age, gender, home location and family's socio-economic situation, also influence children's travel behaviour (Zwerts et al, 2010).

3. METHODOLOGY

In Sri Lanka, the Household Visit Survey (HVS) was conducted for the study of Urban Transport System Development Project for the Colombo Metropolitan Region and Suburbs (CoMTrans) from 2013 to 2014 with an objective to prepare a comprehensive long-term transportation plan. During the HVS, the study team collected the previous day's travel activity information of the residents from 38,500 households along with the socioeconomic information of the respective household and individuals through home visitation. The database includes information on each trip undertaken by each member of the household, including origin and destination, trip purpose, mode of transport, transfer point, departure and arrival time. The HVS survey covers the entire Western Province, Sri Lanka, which includes three districts - namely, Colombo, Gampaha, and Kalutara. The survey covers the activity-travel information of individuals of all generations including children 5 years old or above. It was found that nearly 22% of the total population in the Western Province were children aged between 5 and 18 years.

This study examines the possible differences of young transportation users' travel behaviour according to three groups by age (5-9, 10-14 and 15-18). There are several good reasons for choosing these age groups as the target groups. Firstly, the perception of risks and dangers regarding the society are not the same for all age groups (Noreen CM and Annette EA, 2009). Secondly, the education system of Sri Lanka is different for the above three age groups. The age group between five and nine belongs to primary education, while other two groups belong to secondary school. Furthermore some schools' primary and secondary sections are located in two different places. Finally, influencing factors of children's travel behaviour such as demographic and socio-economic variables, household structure and the family's socio-economic situation can be vary between these three groups (Wilson et al, 2008).

4. DATA ANALYSIS

4.1 Population

The population of children in the Western Province by age group estimated using the HVS data is compared with the estimates of census data for 2013, and shown in Table 1.

Table 1: Children Population (HVS data and Census Data)-2013

Age Group	Population (HVS 2013)	Male (%)	Female (%)	Census Data*(2012)
5 to 9	393,020	51.3	48.7	454,933
10 to 14	484,409	50.5	49.5	420,301
15 to 18	364,471	51.1	48.9	396,906

*Note: Population by age group in 2012 are estimated by CoMTrans Study Team

Source: Census of Population and Housing 2001 and 2012, Department of Census and Statistics

4.2 Trip Rate

Based on the HVS data, the young transportation users in Western Province reported an average of 2.2 trips per day. Boys in the age group 5 to 9 made an average of 2.23 trips per day while the girls in the same age group made 2.27 trips. In the second age group (10-14), the averages were 2.30 for boys and 2.31 for girls. The age group between 15 and 18 made fewer trips compared to the above two groups with 2.04 and 2.16 trips respectively for boys and girls (Table 2). It can be argue that age between 15 and 18 trip rate is less than other groups due to the increase in special in home classes to prepare for high competitive exams of GCE ordinary and advanced levels.

Table 2: Trip Rate

Age Group	Trips		Population		Trip Rate	
	Boys	Girls	Boys	Girls	Boys	Girls
5 to 9	450,229	433,668	201,604	191,417	2.23	2.27
10 to 14	563,851	554,606	244,647	239,761	2.30	2.31
15 to 18	378,762	385,892	186,103	178,368	2.04	2.16

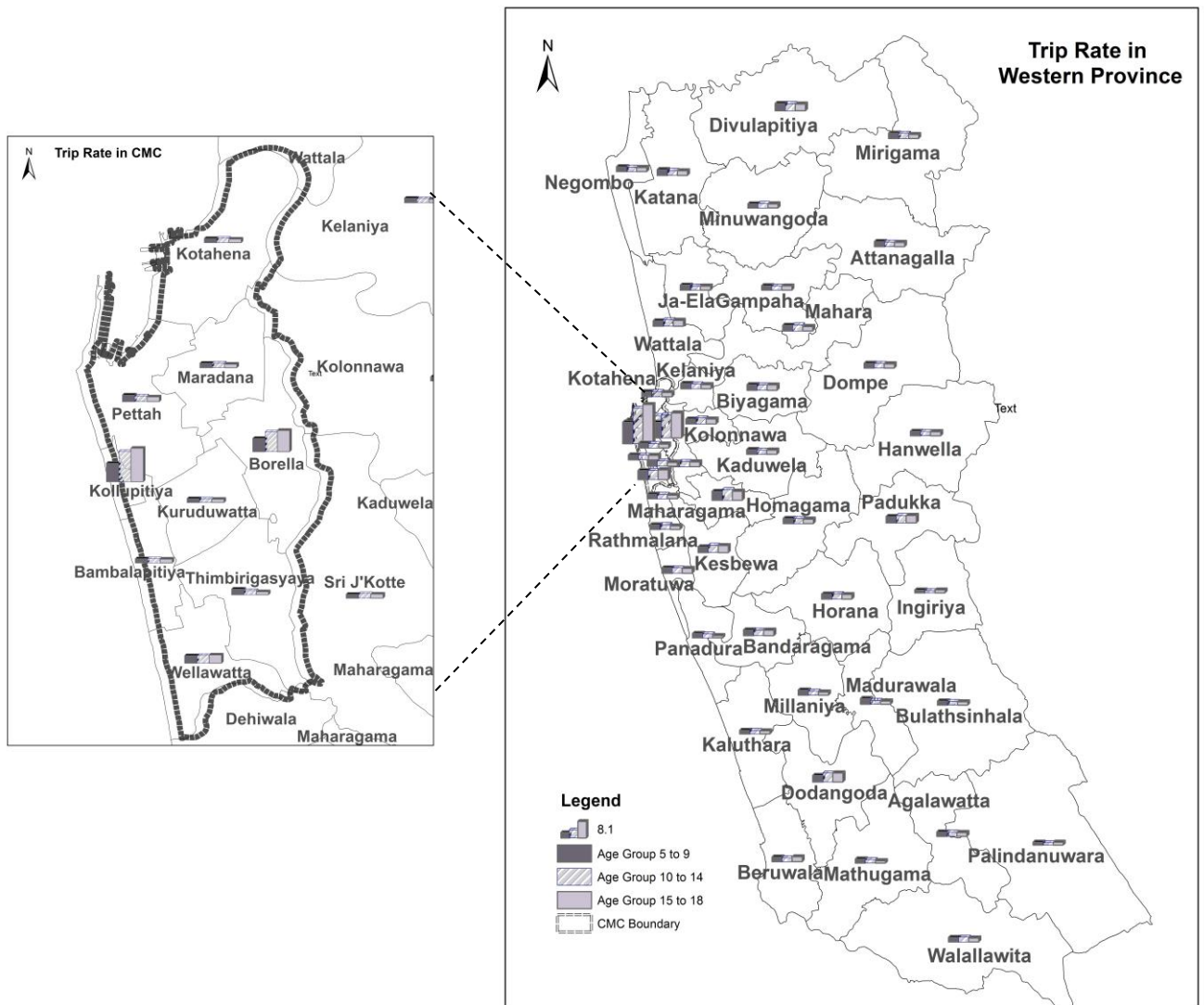


Figure 1: Trip Rate in Study Area

Table 3: Trip Rate in outside CMC area

District	Age Group 5- 9	Age Group 10-14	Age Group 15-18
Hanwella	1.8	1.7	5.9
Homagama	2.1	1.8	6.5
Kaduwela	1.8	1.8	6.9
Maharagama	4.0	3.9	8.5
Kesbewa	3.2	2.9	8.4
Sri Jayawardanapura Kotte	2.1	2.0	8.5
Dehiwala	1.6	1.5	8.8
Moratuwa	2.3	1.9	9.6
Kolonnawa	2.0	2.3	10.1
Padukka	2.9	2.9	10.9
Rathmalana	1.8	1.6	10.9
Gampaha	1.8	1.7	11.4
Divulapitiya	3.0	2.9	12.5
Katana	2.1	2.0	12.6
Negombo	1.8	1.7	12.9
Wattala	2.5	2.4	13.7
Ja-Ela	1.8	1.8	13.9
Kelaniya	2.0	1.8	14.5
Biyagama	2.2	2.2	15.1
Dompe	2.0	1.7	15.5
Attanagalla	1.9	1.7	16.0
Minuwangoda	1.9	1.6	16.4
Mirigama	1.9	1.8	17.0
Mahara	2.4	2.9	17.8
Beruwala	2.0	1.7	17.9
Mathugama	1.3	1.3	18.2
Walallawita	1.8	1.6	18.9
Agalawatta	1.9	1.5	19.4
Dodangoda	3.9	3.7	20.7
Bulathsinhala	1.5	1.5	20.3
Horana	2.1	2.1	21.0
Bandaragama	2.4	2.3	21.7
Kaluthara	1.4	1.3	21.7
Panadura	1.4	1.1	22.2
Madurawala	1.4	1.5	22.9
Millaniya	1.6	1.5	23.4
Ingiriya	1.0	1.2	23.6
Palindanuwara	1.0	1.2	24.1

Figure 1 shows the trip rate in the Western Province of Sri Lanka for each age group. Children living in the Colombo Municipal Council Area (CMC) area have higher trip rates average 4.2 compared to other study area (Table 3) in Western Province and it has highest per capita income within Western Province. Moreover children aged between 15 and 18 had a higher trip

rate compared to the other age groups within the CMC.

In addition children’s accounted higher trip rates in Kollupitiya GNDs (Grama Niladari Division) mainly due to Kollupitiya has the highest per capita income among Grama Niladari Divisions (GNDs) within the CMC. Furthermore, there are nearly 11 schools located in Kollupitiya and urban areas with more schools also mean that there are more commercial or other activities for children in the neighbourhood for them to take part in outside homes. Hence, the trip rates of children are higher in areas where there are more schools as well.

4.3 Modal Split Trends

Figure 2, based on data from the HVS survey, portrays the percentage of trips undertaken by different modes for each age group of children for Education Purposes. It also compares the modal share of others above age of 19.

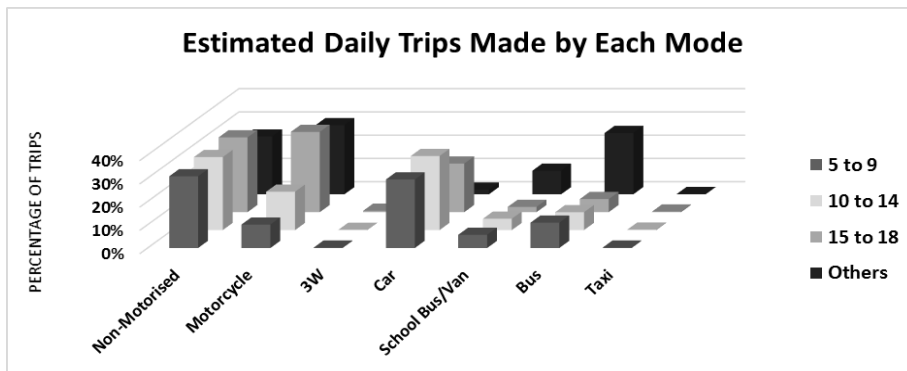


Figure 2: Estimated Daily Trips Made by Each Modes for Education Purposes

It is evident that from Figure 2 car, motorcycle and non-motorised are the predominate modes. Public transport such as bus share is very low among all the age groups and it is a popular mode for the age above 19.

About 30% trips were made by car and average 27% by non-motorised modes like walking and cycling for all age groups. The walkers were escorted by their parents, friends or siblings or walk themselves. For auto trips of car and motorcycle, many parents save time by organizing drop-off of children with their own work trips. Roughly 60% of the trips for 5-9, 35% for 10-14 and 28% for 15 -18 were made with an escort by at least one of the parents for education purposes.

4.4 Trip Purpose

The majority of trips are made for education (nearly 40% for all three groups) and non-home based purposes as illustrated in Figure 3.

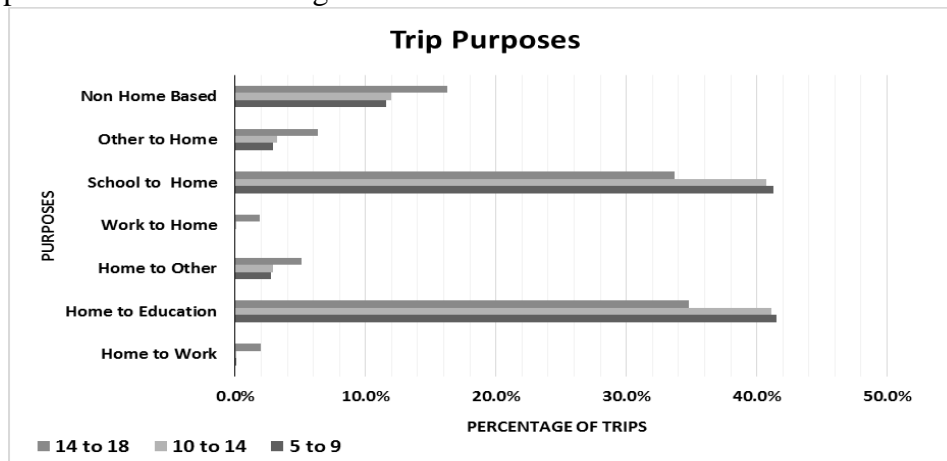


Figure 3: Age group vs Trip purposes

More than 35% of all trip motives were education/school related (Home- education or school –home trip). The age group between 5 and 9 years old made fewer trips than the other groups for the education purpose. Non-home based accounted for above 13% of all age groups, which indicated trips for tuition classes directly from schools and other non-home based leisure activities. Fewer students were driven by their parents in the afternoon to home due to the difficulty of coordinating school and work schedules. Because of that children are engaged with other leisure activities and tuition classes directly from school.

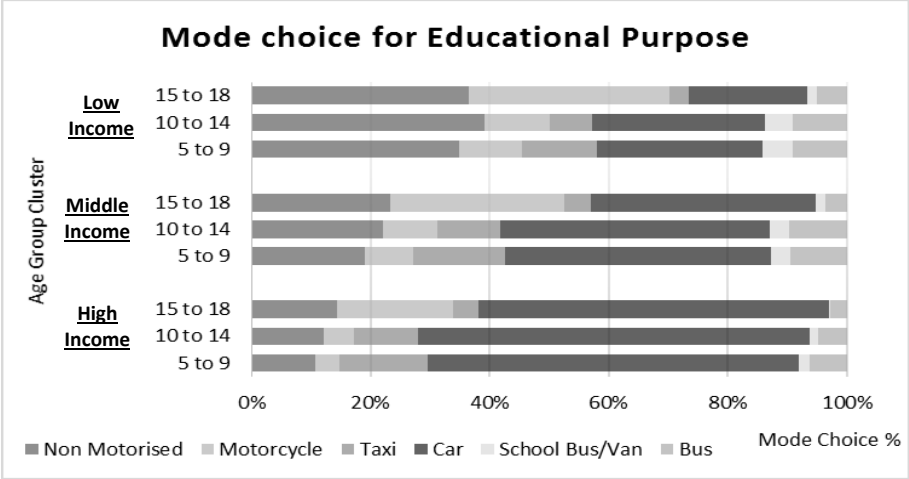


Figure 4: Mode Choice according to the income for Educational Purpose

In order to analyse the relationship between mode choices according to the income basis for educational purpose, Figure 4 shows how trip mode of educational purpose for all three age groups changes by income of the households. Based on this analysis, the three income groups as classified in the HVS will be used throughout the remaining chapters of this paper:

- Low Income : Less than Rs. 40,000 per month;
- Middle Income : Rs. 40,000 – Rs. 79,000 per month;
- High Income : Rs. 80,000 per month or more.

The figure reveals some interesting differences according to the income groups. For example, in terms of children in low income households, non-motorised mode dominates the mode distribution, with an average percentage of 37% and motorcycle driven trips are higher in children aged between 15 and 18. This phenomenon indicates that the low-income children tend to go to school which are located nearby their neighborhoods and motorcycle can be substituted for non-motorised travel mode. For children from the high income and middle income groups, their travel patterns are more dominated by car, with the average percentages being 62% and 43% respectively.

4.5 Trip Length

Trip length has been analysed by considering two aspects, namely: overall trip length by each age group and trip length by income. Considering overall trip length of each age group, percentages of trip travelled increasing with distance travelled (Figure 5). Nearly 70% of the trips made were between 2 and 4 km long with the majority of trips being below 6 km.

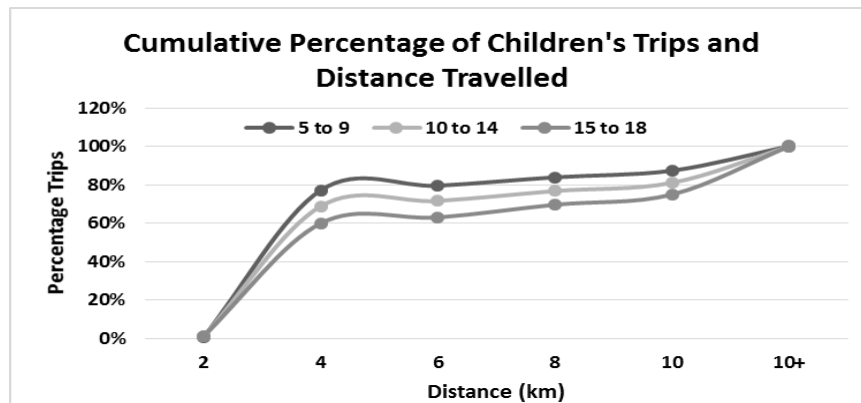


Figure 5 : Cumulative Percentage of Children's Trips and Distance Travelled

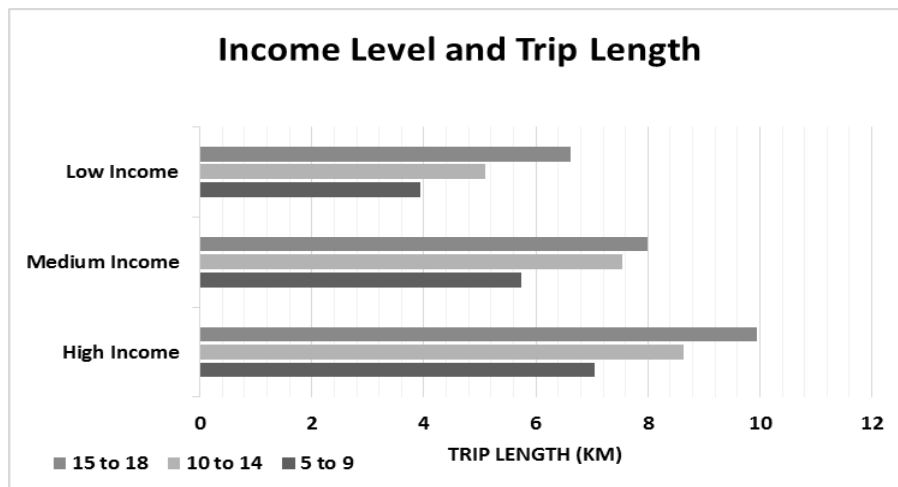


Figure 6: Trip Length According to the Income Level

Table 4: Distance Travelled by Trip Purpose (km)

	Purposes								
	Education			Leisure/Shopping			Non- Home Based		
	Mean	Std. Deviation	Median	Mean	Std. Deviation	Median	Mean	Std. Deviation	Median
5 to 9	4.47	0.23	4.46	4.55	0.74	4.45	3.17	0.32	3.13
10 to 14	5.84	0.48	6.05	4.95	0.38	5.19	5.69	1.50	5.31
15 to 18	7.26	1.05	7.29	6.89	1.28	7.13	7.47	1.13	7.29

A more understanding of trip distances for three age groups emerges when this analysis is placed in the context of trip purpose. Differentiating between trips for diverse purposes provides an understanding of the demand for different types of destinations, and places prominence on local accessibility to various services. In respect to Table 4 that while distance travelling increases with age, the distance travelled for purpose of education is longer than the other trip purposes. According to the statistics shown in above table 4, there are significant travelled between the age group for each purposes. When consider the primary purpose of school children, there is a significant difference among groups for the education. This may be associated with parents choosing schools primarily based on factors not related to distance from home but the quality of schools. Generally, children from high income households are more dependent on cars (because longer commuters are not willing to go on foot or by bicycle) and children from lower income groups are more reliant on non-motrised transport

modes (Figure 4). Yet, we also see that the high income group commuting trips are much longer than the other two income groups for all three age groups (Figure 6).

5. CONCLUSION AND DISCUSSION

This study results have shown marked differences in the age group and other socio-economic factors of the households. Trip rates change according to the location of schools. Based on the outcome of the travel characteristics and trip chain pattern, the following conclusions are made:

1. The average trips rate is 2.2 for all three age groups which increase with income.
2. The primary mode for travel to school for low income households is non-motorised which changes to motorised in higher income households. The overall modal share for motorised modes is 48% and non-motorised is 32%, which shows that spatial distribution of school location within the city has an effect on travel mode choice.
3. The trip length for education for school children increase with age while being higher than for other trip purposes. Commuting length of children aged between 15 and 18 years old is higher for educational, leisure/ shopping and non-home based purposes than the other two age groups.
4. Most of the trips made by the three age groups are of short distance generally less than 4 km. Commuting trip length is higher for the high income and shorter for the lower income groups.
5. Other than for educational purpose, the second major travelling purpose for all three age groups is non-home based purpose. This includes school to tuition classes and other leisure activities like to playground etc. The age group between 15 and 18 years old has higher number of these trips than the other age groups as they face two competitive public examinations (Ordinary level at age of 16 and Advanced level at age of 18 to 19).

It is evident that choice of schools play a vital role in the transport mode choice and the commuting length. Two main reasons of choice of schools are (1) enhanced educational performances and (2) socio economic diversity. The fact that more popular schools are mostly located in and around Colombo city is confirmed by the longer distances for travel to schools therein.

6. ACKNOWLEDGEMENT

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