A STUDY ON THE CONTEXTUAL VARIATIONS OF THE CONCEPT OF WALKABILITY

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108956A

Degree of Master of Science in Town and Country Planning

Department of Town & Country Planning

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DECLARATION

I declare that this is my own work except where due acknowledgement has been made and that it has not been previously included in a thesis, dissertation or report, submitted to the University of Moratruwa or to any other institution for a degree, diploma or other qualification. I also wish to declare that the total number of words in the body of this report (excluding the Appendices & the Bibliography) is 12160.

Signed :

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Date :

CERTIFICATION

I herewith certify that E.D.N.P.Edirisinghe index number 108956A in the Master degree of Town and Country Planning Programme has prepared this research project under my supervision.

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Abstract

Walkability provides a foundation for a sustainable city by reducing use of motor vehicles lead to reduce environmental hazards, increasing the healthiness of people, increasing social contacts and reduce economic loss. The effectiveness of walkability is linked with physical, socio-cultural, economic issues and the expectations and satisfaction of pedestrians. In order to increase the walking population there should be safety, comfort and convenience in the sidewalks. Present motorization and urbanization in Sri Lanken cities, resulting in reduced mobility and increasing hazards, has thrown a challenge to the planners and decision makers in favor of conversion of motorized cities to walkable cities. So this research emphasize, Is walkability a quality that is commonly accepted by all and that can be achieved with a set of universally accepted parameters or is it a quality perceived depending upon the physical, socio-economic and cultural variables? If is it a varying quality, then does the varying perceived level of walkability have any relationship with the socio- demographic and economic state of individuals and groups? This research was designed in order to give answers to those questions. Data and information was collected through questionnaire and interview. The data was analyzed through content analysis and descriptive statistical method by using SPSS. Results show that respondents who are in same urban space although consume same conditions their acceptation on walkability different. When considering the acceptation over the different socio-cultural and economic groups all are accepted the safety, comfort and convenience differently execept Tamil in ethnic groups and Labour in employment groups. Although there are same parameters accepted in different urban spaces there were specific parameters to the location too. All most all the parameters are same as universally accepted parameters but there were several new. When consider the satisfaction on different walkability attributes in different urban spaces although four different urban spaces had four different improved walkability conditions and people coming from different socio-demographic and economic conditions the people's perception on walkability was common. When increasing the age the dissatisfaction on considered attributes was gone up. With the increasing of the education level, the satisfaction on safety while walking goes up, satisfaction for the surface material is decrease. For the shade all over the socio demographic groups most of them are dissatisfied and with the increase of education level dissatisfaction goes up. With the increase of income level the satisfaction for the safety while walking is increasing.

Key Words: Walkability, Expectation, Satisfaction

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CHAPTER ONE – INTRODUCTION

1.1 Background of the Study

Literature shows that "walkability' of an urban environment depends upon a "match" between inhabitants' desires and expectations for certain types of destinations, their willingness to walk a given distance and the quality of the required path. These destinations could be schools, supermarkets, playgrounds, parks, neighborhood gathering places, libraries, community centers, shops and services. According to the past studies walkability mostly depends on the quality of the path. It should be safe, comfortable and convenient. Towns and cities that encourage the use of pedestrian networks, infrastructure, trails, or walkable facilities can help revitalize a downtown, increase private investment, increase property values, promote tourism, and support the development of a good business climate (Hanlon and Scott, 2010).

Other than this, walkable communities can have substantial environmental benefits such as decrease harmful auto emissions and also it helps to prevent obesity and it is one of the easiest and cheapest ways to stay physically fit (Hanlon, J. and Scott, J.,2010, Newmann, 2001; Poebo, 2002). Walking is also a socially beneficial activity because it offers unplanned social encounters and breaks the urban social barriers (Lynch, 1960). According to a new global policy report by the World Cancer Research Fund/American Institute for Cancer Research (2009), in order to reduce preventable cancers linked to obesity and inactivity, governments should require increased walking facilities.

As stated above walkability is also linked to quality of life in many ways. At the age of increasing energy costs and climate considerations, the ability to walk to important locations is a key component of sustainable communities (Roggers,2011). While the physical, health and environmental implications of walkable communities have been extensively studied, the studies on socio-economic aspects are rear. According to Doi, Kii and Nakanishi (2008), Community safety and security; prosperity and diversity; culture and education; community well-being and quality environment and sustainability are the five dimensions of quality of life. Among them community safety and security is the basic need and quality environment and sustainability both can acquired by having good walkability conditions.

1.2 Research Problem.

Since walking is advantageous in many ways there are a lot of researches done to find the walkability of different areas. For that they have used the parameters like walking path model conflict (separate pedestrians from vehicles – safety fence, green belts etc.), availability of walking paths, availability of crossings, grade crossing safety, the time spent waiting and crossing the street and the sufficiency of time given to pedestrians to cross signalized intersections, motorist behavior, amenities, disability Infrastructure, obstructions, security from crime etc… But all these parameters may not have in each sidewalk. In order to achieve better walkability the governments should invest profoundly. Especially in Sri Lankan urban context most of the cities are evolved without walking facilities. Government has to compensate a lot in acquiring the space to improve the walkability. Compensation in the urban areas is not as easy as in the case of rural people. Although walkability needs to be achieved in every city, it is not clear whether the requirements for walkability are universal or dependent upon the context. There are plenty of researches done on walkability but it is very rear to find contextual differences on walkability**.** Su, et al (2014) found the different in gender perception on environmental attributes of sidewalks such as the destinations, aesthetic quality and neighborhood density. Cain, et al (2013) had done a study on the associations of micro scale attributes with multiple physical activity measures across the four age groups in the areas of USA. But In Sri Lankan context it is not done so far. Therefore the objective of this research is to find the contextual differences on walkability.

1.3 The Objective of the Study

Having gone through the literature, it could be realized that facilitating walkability involves a complex set of tasks. However, providing proper pedestrian facilities is one of the responsibilities of the authorities. Therefore the objective of this research is to examine whether the 'Walkability' can have a common set of parameters or it's a quality that varies under given socio-cultural conditions, economic situations and activity settings.

1.4 Method of the Study:

It is presumed that walkability is a condition that is anticipated by users and the users anticipations vary with their social, cultural and economic backgrounds. Therefore the study is carried out as a comparison of the expectations and satisfactions of conditions of walkability across different socio-economic groups. Therefore in order to examine the walkability as a contextual phenomenon, the expectations have to be known first. The satisfaction is shaped by the expectations.

The study was carried out following a literature review regarding walkability facilities, parameters used to measure the walkability, the relationship between the walkability and quality of life, people's expectations and people's life satisfaction. This research is based on the questionnaire survey designed to measure people's expectations, satisfaction on walkability and to find the contextual difference on walkability. To find the expectations of pedestrians structured interviews were conducted and to measure the level of satisfaction walkability attributes were taken from the literature review and the pilot study. The dependent variables are people's satisfaction and expectations while independent variables are Age, Gender, Ethnicity, and Level of education, Level of income and Employment. Data analysis was carried out using the simple descriptive statistical analysis method.

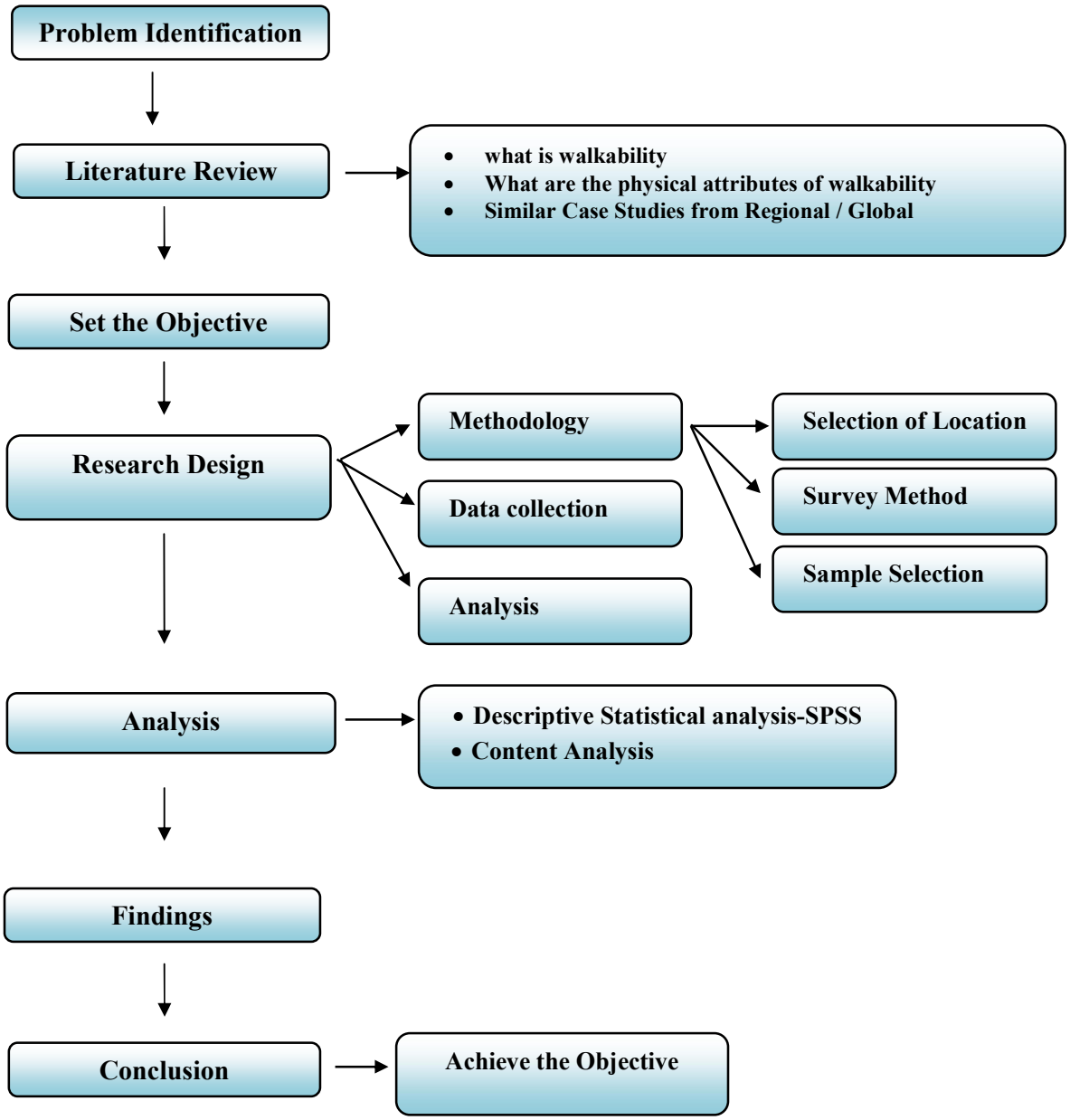
1.5 Scope and Limitations:

The objective of this study is to find out whether the walkability a universal phenomenon or is it a contextual characteristic. Therefore, this research expects to find the walkability and pedestrian facilities with pedestrian focused solutions.

Pedestrian's expectations and satisfaction may depend on the age, sex, ethnicity, education level, occupation and income level. For the study four different areas were selected according to the available walkability facilities and 30 respondents were interviewed from each area according to the time, convenience and resource available to study. A pilot study was conducted with 10 respondents and identified it is very difficult to interview pedestrians since most of them were in a hurry to go their destination. To get the real feeling about the perception of the existing condition, a discussion with each pedestrian needed to last at least 15 minutes. Therefore it was necessary to limit the number of respondents to 30. The research

included informal interviews to get ideas of employees of nearby offices which use the area regularly. The ordinary people didn't have any idea about the walkability. When the researcher explained only they realized the situation. Since the responsibility of authorities are to improve walkability and walkability is providing for people, this research will help to generate interest amongst policy makers and responsible authorities to improve walking in cities, as pedestrian friendly.

1.6 Flow of the Study



CHAPTER TWO - LITERATURE REVIEW

2.1 Introduction

The objective of this study is to examine whether the 'Walkability' can have a common set of parameters or they vary under given socio-cultural conditions, economic situations and activity settings. In this part going to study the definitions for walkability, importance of walkability, parameters of walkability, and also this chapter discusses the previous studies in this area.

2.2 Definitions for Walkability

Kevin & Ahmed (2011) defined walkability as a "match" between residents' desires and expectations for certain types of destinations, their willingness to walk a given distance and the quality of the required path. Neighbourhoods that find this match between built form and residents' needs will likely to have more people walking in them. Definitions of neighborhood walkability include walking proximity to amenities (such as movie theaters, clothing stores, parks and libraries) or may refer to community-built environment design features of neighborhoods (such as street connectivity and sidewalk access) (Duncan, 2011). Litman (2003) defines walkability as the quality of walking conditions including factors such as the existence of walking facilities and the degree of walking safety, comfort and convenience.

Likewise there are many thoughts about walkability but it is very difficult to find a scientific definition. According to above definitions it could be concluded that the Walkability is largely a function of the proximity and connectivity between destinations, or the degree to which we can travel directly between places where we live, work and play. But people tend to walk only if they have better pedestrian facilities such as safety, convenient and better environment. Walkability will help to solve a lot of health problems such as obesity, heart problems and diabetics as well as environmental problems like air pollution.

2.3 Importance of Walkability

Towns and cities that develop recreational programs to encourage the use of pedestrian networks, infrastructure, trails or walkable facilities can help revitalize a downtown, increase private investment, increase property values, promote tourism and support the development of a good business climate ((Hanlon and Scott,2010).

According to current estimates the number of people dying annually in road accidents may rise to 1 - 1.3 million over the next ten to twenty years with the increase of developing countries and countries in economic transition. According to the World Health Organization (WHO) road traffic accidents will be the third leading cause of illness or injury and the sixth leading cause of death in the world in 2020. Road accidents generally cost 1% to 3% of a country's Gross National Product (GNP) (Evdorides, 2008). By decreasing car travel walkable communities can have substantial environmental benefits. In fact, Delaware in USA is one of few states to have an executive-ordered Complete Streets policy that encourages walking and biking as means of decreasing harmful auto emissions ((Hanlon and Scott,2010).

Walking is also a socially beneficial activity because it offers unplanned social encounters and breaks the urban social barriers. It is an inexpensive way of getting from a place to another place and allows people to experience their local environments more closely and appreciate them (Lynch, 1960). Sri Lanka is no exception and has had a complex and meaningful variety of streets that were authentic and culturally relevant to daily life (Fernando, 2000; Dayaratne and Senanayake, 2002). Such streets were meaningful living places rather than conduits for travel. Today, however, many are transforming themselves to European models that are conduits for transport but are also chaotic and uninhabitable (Dayaratne, 2009).

As obesity rates across the country continue to rise, scholars and health officials alike are recognizing the importance of urban design and public policy to facilitate more active lifestyles and healthier eating habits. Providing opportunities for citizens to walk is one significant way to promote physical activity. So, walking is one of the easiest and cheapest ways to stay physically fit ((Hanlon and Scott 2010). According to a new global policy report by the World Cancer Research Fund/American Institute for Cancer Research (2009), in order to reduce preventable cancers linked to obesity

and inactivity, governments should require increased walking facilities, developers should construct more projects that promote walking, and employers should occupy buildings that facilitate physical activity (Gary and Jeffery -2010).

2.4 Walkability Parameters

There are plenty of studies done to assess the walkability and pedestrian facilities in different countries. Fabian, et al's., (2006) research was on walkability and pedestrian facilities in 13 Asian cities. In each city surveys were carried out in Commercial areas, Public transport terminal, Educational area and Residential area. They have selected 9 parameters and rates were given from 1 to 05 for each parameter. Those parameters are:

1. Walking path model conflict, availability of walking paths
2. Availability of crossings
3. Grade crossing safety
4. The time spent waiting and crossing the street and the sufficiency of time given to pedestrians to cross signalized intersections
5. Motorist Behavior
6. Amenities
7. Disability Infrastructure
8. Obstructions
9. Security from crime

Evidence of Jackob's street life in the great Seoul city research done by Sung, et al (2013) used the side walk width at the pedestrian measuring point, number of street lanes, existence of street furniture, sidewalk type dummy, nearby cross walk dummy and street slope dummy as the physical parameters of the road. They found that almost all the parameters of the physical environment have a significant association with walking activity.

According to the Krambeck (2006) the Walkability Index comprises of three components: safety and security, convenience and degree of policy support.

Component 1: Safety and Security

This first component determines the relative safety and security of the walking environment, e.g., the odds a pedestrian would be hit by a motor vehicle? What safety measures are in place at major crossings and intersections? How safe would the pedestrians feel along walking paths from crime?

Component 2: Convenience and Attractiveness

The second component reflects the relative convenience and attractiveness of the pedestrian network, e.g., whether the pedestrians have to walk a kilometer out of their way just to cross a major road? Is there sufficient coverage from weather elements along major walking paths? Are paths blocked with temporary and permanent obstructions, such as parked cars or poorly placed telephone poles?

Component 3: Policy Support

The third component reflects the degree to which the municipal government supports improvements in pedestrian infrastructure and related services. Is there a non-motorized planning program? Is there a budget for pedestrian planning? Are pedestrian networks included in the city master plan?

According to the study done by Campos et al., (2003), street lighting, width of walk ways, gradient of walk ways, weather conditions, proximity to main transport facilities and signage show a higher degree of importance in encouraging people to walk. At the same time safety is also a point of concern for pedestrian's walkability. Individuals who live in areas that are more walkable and have lower crime rates get more encouragement to walk more (Doyle et al., 2007).

Craig et al. (2002) identified the absence of obstacles in pedestrians' desired routes, maintenance level, are the road safety. De Bourdeaudhuijetal (2003) revealed that perceptions about traffic are associated with walking for exercise or recreation as well as to get from place to place. A study by Saelensetal (2003) indicated that pedestrian/traffic safety and crime safety were strongly correlated with individual walkability.

2.5 Three Main Domains of Walkability - Safety, Comfort and Convenience

According to the literature Safety, Convenience and Comfort are the three main domains in walkability. The research done to find the walkability in Philadelphia Schaaf (2013) says that Walkability is a combination of the convenience, safety, comfort and attractiveness of walking.

Garrison (2001) emphasized that walking should be a natural part of our daily lives rather than something we add on specifically for exercise, health or fun. "I have the pleasure of walking every day to the store, the dry cleaner, the post office, to the park with my husband. That's no accident," she said. It's the result of deliberate urban planning that locates important destinations within walking distance— a traditional common-sense idea called walkability, which is at the heart of making our communities more safe, comfortable and convenient for walking.

Several organizations in America organized a campaign to press the government to develop streets and crossings within the mile-radius of schools safer with the following idea. "When it is safe, convenient and fun to walk, bike and access transit to neighborhood schools, our children are healthier, our streets are safer for everyone, and our communities thrive. Every kid in Oregon deserves a chance at a healthy future." Hagen (2006) noted that pedestrians have various needs; health, mobility and safety are categorized as basic needs and the other needs include reliability, convenience, comfort and esthetic.

2.6 Expectations and Satisfaction on Walkability

The word "satisfaction" is generally defined as a cumulative construct that is affected by user expectations and performance perceptions in any given period (Johnson et al., 1995). There has been a trend in many established democracies, including Britain, towards growing dissatisfaction with democracy (Dalton, 2004; Norris, 2011). Dalton (2004) argues that one reason for this trend may be that an increasingly educated and well-informed public now has higher expectations of what democracy can and should entail. These rising expectations have led to the emergence of "critical citizens" (Norris, 1999).

2.7 Case Studies

Su,M. et al., (2014) conducted a study on association between perceived urban built environment attributes and leisure time physical activity among adults in Hangzhou, China. This study was conducted in Hangzhou which is the capital of Zhejiang province in China. The eligible subjects were individuals aged 25-59 who had lived in the neighborhood for at least one year. A multistage random sampling strategy with stratification by functional units was used in this study. Face-to-face interview was used to collect data and all the participants provided written informed consent before the interview. They found male residents who perceived higher scores on access to physical activity destinations. Female perception is more on aesthetic quality and neighborhood density was inversely associated with women.

Contribution of streetscape audits to explanation of physical activity in four age groups based on the Microscale Audit of Pedestrian Streetscapes (MAPS) done by Cain et al., (2013). The present study examined associations of micro scale attributes with multiple physical activity (PA) measures across four age groups. Areas in the San Diego, Seattle and the Baltimore metropolitan areas, USA, were selected that varied on macro-level walkability and neighborhood income. Participants (n ¼ 3677) represented four age groups (children, adolescents, adults, older adults). MAPS audits were conducted along a 0.25 mile route along the street network from participant residences toward the nearest non-residential destination. The Microscale Audit of Pedestrian Streetscapes (MAPS) measures street design, transit stops, sidewalk qualities, street crossing amenities and features impacting aesthetics. MAPS data were collected in 2009 and 2010. Subscale and overall summary scores were created. Walking/biking for transportation and leisure/neighborhood PA were measured with age-appropriate surveys. Objective PA was measured with accelerometers. Mixed linear regression analyses were adjusted for macro-level walkability. Across all age groups 51.2%, 22.1%, and 15.7% of all MAPS scores were significantly associated with walking/biking for transport, leisure/ neighborhood PA, and objectively-measured PA, respectively. Supporting the ecological model principle of behavioral specificity, destinations and land use,

streetscape, street segment and intersection variables were more related to transport walking/biking while aesthetic variables were related to leisure/ neighborhood PA. The overall score was related to objective PA in children and older adults. Present findings provide strong evidence that micro scale environment attributes are related to PA across the lifespan. Improving micro scale features may be a feasible approach to creating activity-friendly environments.

According to the European Survey in 2012/2013 there has been a trend in many established democracies, including Britain, towards growing dissatisfaction with democracy (Dalton, 2004; Norris, 2011). Dalton (2004) argues that one reason for this trend may be that an increasingly educated and well-informed public now has higher expectations of what democracy can and should entail. These rising expectations have led to the emergence of "critical citizens" (Norris, 1999) the gap between the expectation and the reality may be the driving force for some individuals. As each goal is achieved new ones are identified, opening the gap again. It is a constantly changing picture. Quality of life, therefore, measures the difference at a particular moment in time between the hopes and expectations of the individual and that individual's present experience (Calman, 1984). Quality of life changes with time and under normal circumstances can vary considerably. The priorities and goals of an individual must be realistic and would therefore be expected to change with time and be modified by age and experience. To improve the quality of life, therefore, it is necessary to try to narrow the gap between hopes and aspirations and what actually happens. A 'good' quality of life is therefore usually expressed in terms of satisfaction, contentment, happiness and fulfillment and the ability to cope.

According to the above literature quality of life depends on the expectations and the level of satisfaction. When meet the expectation they achieve the satisfaction. But when they meet the satisfaction the expectations generally goes up. The expectation is largely geared by what is known to the user. What is known is supported by the level of education and the exposure.

2.8 Conclusion

The exploration of literature shows that adequate work has been done to examine the walkability index, compare walkable streets and find the walkability parameters in other countries. There is very limited research on the perception of walkability. Therefore most of governments are spending lot to supply walkability without adequate investigation as to how the users value them. Studies on the perception on walkability are not available in Sri Lankan context. The question that arises from this situation is that whether there is a requirement for all the parameters that were prescribed by previous studies in all the situations. If it is not, it is better to spend only for the required parameters. Considering the above gap this study examines whether the 'Walkability' can have a common set of parameters or they vary under given socio-cultural conditions, economic situations and activity settings.

CHAPTER THREE–RESEARCH DESIGN

3.1 Introduction

This Chapter formulates the research question for the study and then introduces the methodological framework, research hypothesis, the selected case study area, data collection, data analysis methods, sample selection and preparation of questionnaire.

3.2 The Objective of the Study

Most of the governments tend to improve the walkability since it offers us many advantages in social, economical and environmental. In economical terms aspect it increases private investment, increase property values, promotes tourism and supports the development of a good business climate (Julia and Jacquel, 2010). By decreasing car travel, walkable communities can have substantial environmental benefits such as reducing harmful auto emissions, socially it is a beneficial activity because it offers unplanned social encounters and breaks the urban social barriers. Walking help to reduce obesity and obesity related a lot of diseases. There is a large body of research done to find the walkability parameters, walkability index and walking and health. Since walking is for people it should match with the expectations and satisfaction of people. But research done on this is very rare. No research has been conducted on this aspect in Sri Lankan context. Therefore the objective of this research is to examine whether the "Walkability" has a common set of parameters or whether it vary according to different socio-cultural and economical groups. In order to find this the following research questions are formulated.

3.3 Research Questions

1. Is walkability a quality that is commonly accepted by all and that can be achieved with a set of universally accepted parameters or is it a quality perceived depending upon the physical, socio-economic and cultural variables?
2. If is it has a varying quality, then does the varying perceived level of walkability have any relationship with the socio-demographic and economic state of individuals and groups?

3.4 Three Main Domains of Walkability - Safety, Comfort and Convenience

According to the literature there are three main domains of qualities that affect the walkability in a given area. Those are safety, comfortable and convenience. So in this research the expectations and levels of satisfaction were measured under these three domains. In the expectations it is measured whether they perceived the safety, comfort and convenience while walking in the relevant sidewalks and reasons to have or not. In the satisfaction the criterions were divided into these three domains. Safety while walking and Safety at crossings were taken as safety and for comfortable smoothness of the surface, free of obstructions, cleanliness of the surface; street lights and shade were taken. As convenience materials covered the side walk, drainage facilities in the side walk, enough width of the sidewalk and crossings are located at proper places were taken (Krambeck, 2006).

3.5 Method of Investigation/Observation

3.5.1 Locations of study

The study has to limit for four locations according to the allocated time and easiness to compare. Those four locations were in different levels of walkability. Those were respectively Bambalapitiya, Baththaramulla, Mahraragama and Delkanda. Bambalapitiya has well developed sidewalks. The width of the sidewalk is satisfactory and seems to be well paved. Safety from hitting by vehicles high due to the presence of a wide pavement and road is one way. Since crossings are also signalized pedestrians can cross safely. Baththaramulla is gradually converting to be the administrative city of Sri Lanka. So there is a big crowd of pedestrians throughout the day. Although nowadays sidewalks are being developed they are not at required level. The sidewalk is very narrow and within this narrow area also lot of obstructions like electricity posts, telecommunication posts. Also the surface is very undulated it there is a risk of falling down when walking. Although crossings are located at proper places, they are not signalized. Maharagama also has similar safe features as well as concerns to those of Baththaramulla. It is also renovating but not at a satisfied level. The main problem in Maharagama is the obstructions caused by payment vendors. Delkanda does not have even a pavement although it is a crowed

area. There are several schools, a popular Sunday fair and a supermarket. A small section of the road is separated by a line for pedestrians but vehicles are parked on that area and since they are many vehicle spare parts shops in this area their stocks are also placed in this separated area for pedestrians. So, pedestrians have to walk on the road. Safety is a big concern. These four areas have identifiable differences on walking facilities for pedestrians.

3.5.1. a. Bambalapitaya

Bambalapitiya is a neighbourhood of Colombo, Sri Lanka. The area, numbered Colombo 4, spans about one and a half kilometres of the Galle Road in Colombo. The west of the suburb is bordered by the Indian Ocean, the east is bordered by Havelock Town , to the north lies Kollupitiya and to the south is Wellawatte.

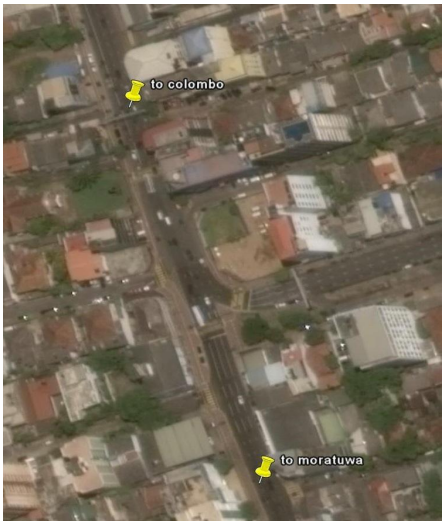


Figure 3.1: 200 m length including Bambalapitiya junction along the Galle road
Source: Google Image, 2016

By this 200 m length including Bambalapitiya junction along the Galle road was selected as the survey area. This area has good walkability condition when compare with other areas. The pedestrian walkway has enough width, a smooth paved surface, safe crossings, and safety, disable infrastructure. All the service lines (electricity, telecommunication, drainage, sourage lines) are located underground. So, the aesthetic value is also very high compared to other areas.

3.5.1. a .1 Existing walkability condition of the area

Figure 3.2: Walkability condition in Bambalapitiya area
Source: Author from field observation

3.5.1. b. Maharagama

Maharagama is a large suburb of Colombo city in Colombo District, Sri Lanka on the High-Level (A4) Road about 15 km from the centre of the commercial capital. It has developed rapidly in the 1980s as a dormitory suburb. Governed by the Maharagama Urban Council, the town possesses facilities like supermarkets, department stores, and clothing, food and beverages shops to fulfill the needs of citizens.

There are number of bus routes passing the area and starting from the suburb that connect Maharagama to all the suburbs. Since the largest textile market (cut pieces garments) is also located in this area, the daily commuters population is very high.

Figure 3.3 : 200 m length from Bo-tree near the bus stand to the police station
Source: Google Image, 2016

From the Bo-tree near the bus stand to the junction where the police station is located (along the high-level road) 200 m area was selected as the survey area. Although sidewalk of this area is currently been renovated Maharagama is having less walkability conditions when compared with Bambalapitiya.

3.5.1. b. 1 Existing walkability condition of the area

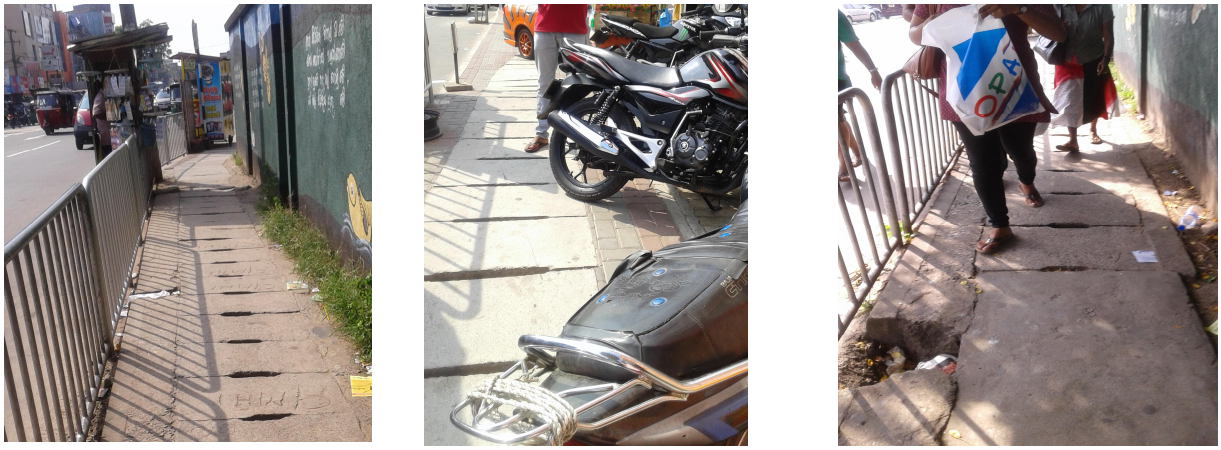


Figure 3.4: Walkability condition in Maharagama area
Source: Author from field observation

3.5.1. c. Baththaramulla

Battaramulla is a suburb of the city of Colombo, situated 5.2 miles from the City Centre at Colombo Fort, near the Parliament of Sri Lanka. It is one of the fastest developing administrative, commercial and residential areas in the Colombo District being home to the country's elite. Currently Battaramulla is an important town in Sri Lanka since the Sri Lankan government's decision to locate head offices of all the government departments in this town.

Figure 3.5: 200 m length starting from Diyatha Park to the Baththaramulla junction
Source: Google Image, 2016

Starting from Diyatha park to the Baththaramulla junction which is about 200 m (along the) area was selected as the survey area. Baththaramulla area has less walkability conditions when compared with Bambalapitiya and Maharagama.

3.5.1. c. 1 Existing walkability condition of the area

Figure 3.6: Walkability condition in Baththaramulla area
Source: Author from field observation

3.5.1.d.Delkanda

Figure 3.7 : 200 m either side including the Delkanda junction along the high level road.
Source: Google Image, 2016 and author from field observation

Delkanda is situated where the High-level road and Nugegoda Kesbewaa (old) Road cross each other. Delknda is between Nugegoda and Gangodawila in the High Level Road and Nugegoda and Rattanapitiya on the Old Kesbewa Road. Delkanda is well

known for its Sunday fair where a large number of petty traders bring many varieties of vegetables and fruits from remote villages. Delkanda is about one kilo meter from Sri Jayawardhenepura University. There is also a very high commuters numbers especially in weekend fairs and there are also several schools located in this area. Delkanda is also becoming commercial area but this area has very poor walkability. The selected area for the survey is 200 m either side including the junction along the high level road.

3.5.1. d. 1 Existing walkability condition of the area

Figure 3.8: Walkability condition in Delkanda area
Source: Author from field observation

All these towns have linear developments along the High-level road which is A class road maintained by Road Development Authority.

3.6 Survey Method

This research was based on the questionnaire survey, designed to measure leading elements concerning expectation and people's life satisfaction. The questionnaire was comprised of three sections. In part A of the questionnaire consisted of items related to personal and socio demographic data such as age, sex, educational background, income level and occupation etc. Hagen(2006) noted that pedestrians have various needs: health, mobility, and safety are categorized as basic needs and the other needs include reliability, convenient, comfort, and aesthetic. So, the part B of the questionnaire included questions regarding expectations mainly on safety,

convenience and comfort while walking in the sidewalks. Part C of the questionnaire included questions regarding level of satisfaction mainly on safety, convenience and comfort. The factors obtained from the pilot survey and the literature was used as the attributes of walkability. The following are the attributes used in this research.

3.7 The Attributes Affect the Walkability.

Eleven attributes were selected for the study by going through the literature and discussions held with the respondents in the pilot study. They were categorized as follows with the help of past studies (Krambeck, 2006, Campos, et.al., 2003).

Table 3.1: The Attributes affect the walkability

Safety	**Comfort**	**Convenience**
1.Safety while walking	1. Smoothness of the surface	1.Shade
2.Safety at crossings	2. Cleanliness of the surface	2.Free of obstructions
3.Street lights	3. Drainage facilities	3.Crossings are located at proper places
		4.Material covered the sidewalk
		5.Sidewalk width

Source: Literature review

To test whether expectations on walkability among the pedestrians is common or depend on the context, personal data (demographic data) and expectations of walkability (Part A & Part B) was used.

Satisfaction on different attributes in four locations were tested by using the data obtained by part A (personal data) and part C (Likert scale).

3.8 Sample Selection

Random sampling method was used for the sample selection as the probability sampling technique. In this method every unit in the population has a chance (greater than zero) of being selected in the sample, and this probability can be accurately determined.

The pilot survey was useful to understand the difficulty of having discussions with pedestrians since they must go to the destination on time. Some of them were going to meetings, to take their children from the schools or tuition classes and some of them were using the way for the first time etc. So, although data was collected it was very difficult to get their heartiest feelings. To get a deep insight, it was necessary to have a discussion with each pedestrians for at least fifteen minutes. To compensate for this it was decided to interview both pedestrians and people who are working within the offices and also households that have experience on the relevant location or who are residing in those locations. So in this research it was necessary to use random sampling method.

3.9 Method of Recording/Assessment

3.9.1 Structured interview

To find out the expectations it was necessary to discuss with pedestrians. So structured interviews were held with pedestrians.

3.9.2 Likert scale

To find out the satisfaction of pedestrians a likert scale was used. Rensis Likert was an American psychologist who introduced Likert method for people's attitude measurement in his doctoral thesis. According to Likert, attitudes regarding such an object or other phenomenon varied from negative to positive. It can be recognized as the techniques of measuring the difference attitudes towards a statement by asking from respondent. Table 3.1 shows judgment and descriptions regarding the assigning values for different location factors.

Table 3.2: Judgment and description regarding feeling of satisfied factors

Judgment		**Description**
Quantitative Value	Qualitative Value	
5	Satisfied	I am satisfied with this factor.
4	Somewhat Satisfied	I am somewhat satisfied with this factor.
3	Neither satisfied nor dissatisfied	I am neither satisfied nor dissatisfied.
2	Somewhat satisfied	I am somewhat dissatisfied with this factor.
1	Dissatisfied	I am dissatisfied with this factor.

Source: Literature review

3.10 Method of Analysis

The simple descriptive statistical analysis was carried out for the data collected as above. Content analysis and crosstabs of SPSS was used.

3.10.1 Relative importance analysis

RII is used to determine the relative ranking of the factors; the scores were transformed to importance indices based on the following formula.

$$\text{Relative Importance Index} = \frac{\sum w}{AN}$$

Where w is the weighting given to each factor by the respondents, ranging from the 1 to 5, A is the highest weight and N is the total number of samples. Based on equation, the relative importance index (RII) can be calculated from 0 to 1.

3.11 Conclusion

In this study four locations were selected according to the level of development of the side walk. Those were respectively Bambalapitiya, Mahraragama Baththaramulla, and Delkanda. Data were collected from questionnaire survey and structured interviews by 30 respondents from each area.

Content analysis and crosstabs in SPSS, in simple descriptive statistical analysis method and Relative Important Analysis methods were used to analyze the data. The next chapter will discuss how the existing situation feels while walking in the relevant area and expectations, the satisfaction of respondents on existing situation and the order of parameters that respondents satisfied.

CHAPTER FOUR – FINDINGS AND DISCUSSION

4.1 Introduction

The previous chapter discussed the research design and the data collection methods used. This chapter discusses the analysis of the data collected through questionnaire survey and interviews. The expectation and satisfaction of the respondents were measured according to the different categories of age, sex, and ethnicity, level of education, income and employment.

4. 2 Profile of the Sample

This research was carried out in four areas in Colombo district: Bambalapitiya, Maharagama, Baththaramulla and Delkanda. In each area 30 people were interviewed. The total sample interviews was 120. The age range of the respondents was from 15 year to those over 60 years.

Table No 4.1 Summary of data from the sample.

Item	Code	Content / categories	Bambalapitiya		Maharagama		Baththaramulla		Delkanda	
			No.	%	No	%	No.	%	No.	%
Age	1	15-30	11	37%	17	57%	13	43%	17	57%
	2	31-45	11	37%	9	33%	7	23%	10	33%
	3	46-60	7	23%	3	3%	4	13%	1	3%
	4	>60	1	3%	1	7%	6	20%	2	7%
Sex	1	Male	17	57%	22	73%	16	53%	22	73%
	0	Female	13	43%	8	27%	14	47%	8	27%
Ethnicity	1	Sinhala	22	73%	23	77%	21	70%	23	77%
	2	Tamil	4	13%	3	7%	5	17%	2	7%
	3	Muslim	4	13%	4	10%	4	13%	3	10%
	4	Other		0%		0%		0%	0	0%

Education Level	1	Primary		0%	2	7%	4	13%	2	7%
	2	G.C.E.O/L	4	13%	1	3%	8	27%	1	3%
	3	G.C.E. A/L	17	57%	18	60%	7	23%	18	60%
	4	Tertiary	9	30%	9	30%	11	37%	9	30%
Income Level	1	0-25000	9	30%	9	30%	8	27%	9	30%
	2	25000-50000	12	40%	10	33%	8	27%	10	33%
	3	50000-75000	5	17%	11	37%	8	27%	11	37%
	4	>75000	4	13%		0%	6	20%		0%
Employment	1	Professional	11	37%	13	43%	7	23%	13	43%
	2	Administrative	8	27%	7	23%	8	27%	7	23%
	3	Labor		0%	2	7%	2	7%	2	7%
	4	Private Business	11	37%	8	27%	13	43%	8	27%

Source: The Questionnaire Survey (2016)

4.3 Results

4.3.1 Pedestrian's perceptions on safety, convenience and comfort regarding walkability

Thirty respondents were interviewed in each area (Bambalapitiya, Maharagama, Baththaramula and Delkanda) in order to get their perception on the Safety, Comfort and Convenience conditions of 200m lengths in selected areas. Respondents were asked "Whether you feel Safe while walking in this sidewalk? "Whether you feel Convenience while walking in this sidewalk? And "Whether you feel Comfort while walking in this sidewalk? The answers were either "Yes" or "No" to these questions. Content analysis method was used to arrive at the following results. The results are shown in Table No.4.2.

Table No.4.2. Pedestrians' perceptions on safety, convenience and comfort on different locations

Location	**Safety**				**Convenience**				**Comfort**			
	Yes		**No**		**Yes**		**No**		**Yes**		**No**	
	No.	**%**	**No.**	**%**	No.	**%**	No.	**%**	No.	**%**	No.	**%**
Bambalapitiya	15	50	15	50	13	43	17	57	19	63	11	37
Maharagama	10	33	20	67	9	30	21	70	9	30	21	70
Baththaramulla	13	43	17	57	5	17	25	83	3	10	27	90
Delkanda	7	23	23	77	3	10	27	90	2	7	28	93

Table 4.2 shows, 15 out of 30 respondents in Bambalapitiya agreed on the safety aspect while the remaining 15 disagreed. This means that the respondent's perception on the safety while walking on the sidewalk is equally divides, with 50% saying that they felt safe while the remaining 50% saying that they didn't felt safe while walking on the sidewalk. In terms of responses to the question on convenience of walking on the sidewalk, 13 out of 30 have said yes to the question while 17 have said no. This means that 43% felt that walking on the sidewalk was convenience while 57% which is majority felt that it was not convenience. As far as the respondents' perceptions on the third aspect, comfort, and 19 out of 30 have said that they felt comfortable walking on the sidewalk while the remaining number of respondents (11) have said no. This means a majority (63%) have felt that the sidewalk was comfort while the minority (37%) was of the opposite view.

In Maharagama, in response to the question on safety, 10 out of 30 have said yes while the remaining 20 have said no, meaning a higher percentage (67%) thinking that it was unsafe to walk on the sidewalk while a small percentage (33%) having the opposite view. In terms of convenience factor, 9 out of 30 respondents answer to the question on convenience was yes while the remaining 21 responded saying No to the question. This means that a significant majority of respondents (70%) thought that it

was not convenient to walk on the sidewalk while a small percentage (30%) thought that walking on this sidewalk was convenient. The responses to the third factor, comfort, were similar to those for convenience factor. Nine out of 30 respondents have said yes to the question on comfort and the remaining 21 have said No to the question, meaning a significant majority (70%) agreeing that it was inconvenient to walk on the sidewalk and 30% offering the view that walking on this sidewalk was convenient.

In Baththaramulla, 13 out of 30 respondents have said Yes to the question on safety while the remaining 17 have answered No, meaning a majority of 57% thought it was unsafe to walk on the sidewalk while 43% thought it was safe. In response to the question on convenience, a small number of 5 out of 30 have agreed while the remaining 25 have said no. This means that a large majority of 83% were of the opinion that it is not convenient to walk on the sidewalk chosen for the survey. Similar responses can be seen with regard to the comfort factor, too. Only a small number of 3 out of 30 have answered yes to the question on comfort, while the rest of 27 respondents have selected No as their answer to this question. This means that a very large majority of respondents (90%) thought that it is uncomfortable to walk in the sidewalk.

Finally, in Delkanda 7 out of 30 respondents have answered yes to the question on safety while the remaining 23 have said No as their answer. This means that a large majority of respondents in Delkanda thought that it was unsafe to walk on the sidewalk. A similar pattern can be seen for other two questions, too. Three out of 30 have said yes to the question on convenience and the remaining 27 have said no. Here too, a large majority of respondents thought that it is inconvenient to walk on this sidewalk. As far as the question on comfort, only 2 out of 30 have said yes and the remaining 28 have said No, meaning that a very large majority (93%) of respondents thought that it is uncomfortable to walk on this sidewalk.

After analyzing the answers to the three questions (on safety, convenience, and comfort) it can be seen that the opinions of sample interviewed in Bambalapitiya was largely divided. On safety 50% thought it was safe to walk on the sidewalk while the

remaining 50% thought it was unsafe to walk. On convenience a slightly large majority (57%) thought it was inconvenient to walk, while on comfort the reveres opinion was observed. That means a majority of 63% thought that it was comfort to walk. The majority of respondents interviewed in other three areas (Maharagama, Baththaramulla and Delkanda) have a negative view on safety, convenience and comfort of the sidewalks selected in these areas for the study.

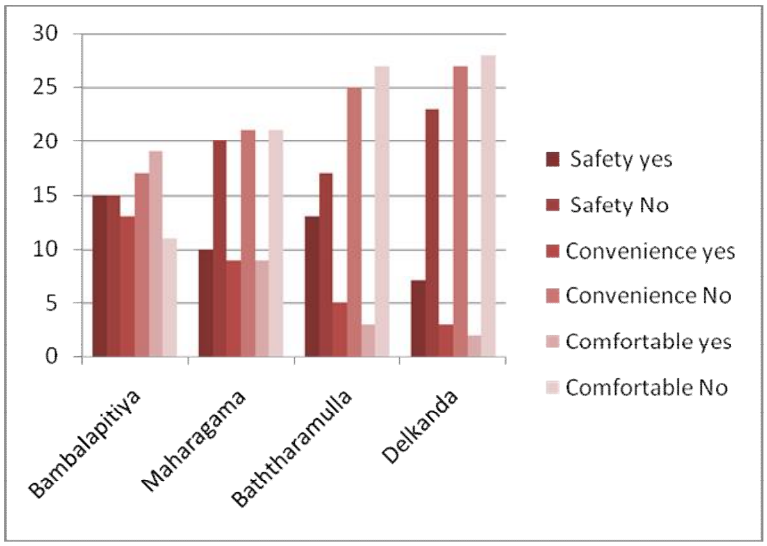


Figure 4.1 Respondents on safety, convenience and comfort on different locations.

4.3.2 Respondents' Perception on safety, convenience and comfort for a given urban space over the different socio–cultural groups

The objective of the test is to identify the walkability of a given urban space; whether it is a quality that is commonly perceived by all or not over the different socio cultural and economic variables. To find this the descriptive analysis method in SPSS was used. Among the four areas of locations Maharagama location was used to this study.

Among these four areas Maharagama can be considered as having different socio-cultural and economic groups for a number of reasons. Maharagama has the largest whole sale textile market in Sri Lanka, the only hospital treating for the cancer treatments, the most common teaching dental hospital, National Institute of Education and most common tuitions classes. There are about more than 200,000

daily commuters in Maharagama, according to data from the Department of Statistics.

Table No.4.3. Acceptation of safety, comfort and convenience by different age groups

Age	Number of	Safety		Comfort		Convenience	
	Respondents	No	Yes	No	Yes	No	Yes
15-30	17	50.00%	50.00%	33.30%	66.70%	46.70%	53.30%
31-45	9	31.10%	68.90%	31.10%	68.90%	33.30%	66.70%
46-60	3	21.40%	78.60%	22.90%	77.10%	28.60%	71.40%
Above 60	1		100.00%		100.00%		100.00%

According to the table 4.3 within the 15-30 age group, the perception on safety was equally divided, 50% of the respondents saying yes and 50% saying no. However, in the 31-45 age group, 31.10% of the sample has said No while 68.9% has said yes for the question on Safety. This can be interpreted as over the age groups the perception of safety is becoming high.

Results presented in Table 4.3 show similar pattern of perceptions for comfort and convenience among the age group 31-45, 46-60 and above 60. Among the age group 15 – 30 the majority (66.7%) answered yes to the question on comfort and a small majority of 53% answered yes to the question on convenience.

The reasons why the older age groups tend to have a positive attitude towards safety, comfort and convenience may be that with the age their experience also increases and they may know about the level of safety, comfort and convenience on sidewalks in other area of the country and sometimes in other countries. They might think that Maharagama has somewhat better walkability compared with other areas. They may think comparatively and decide there is safety, comfort and convenience in Maharagama.

Table No.4.4. Safety, convenience and comfort according to different ethnic groups

Ethnicity	Number of	Safety		Comfortable		Convenience	
	Respondents	No	Yes	No	Yes	No	Yes
Sinhala	23	68.20%	31.80%	50.00%	50.00%	45.50%	54.50%
Tamil	3		100.00%		100.00%		100.00%
Muslim	4	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
Other	-						
Total	30	56.70%	43.30%	43.30%	56.70%	46.70%	53.30%

According to the above results a 68% of the Sinhala respondents have answered No to the question on safety while Tamil respondents have answered yes. The opinion of the Muslim respondents is divided with 50% saying yes and 50% saying no. Tamil respondents' perceptions on comfort and convenience were similar to their responses on safety. Tamil respondents view was unanimous on the aspect of safety, comfort and convenience while the Muslim respondents' opinions were equally divided.

Table No .4.5 Safety, convenience and comfort according to the gender

Gender	Number of	Safety			Comfort		Convenience
	Respondents	No	Yes	No	Yes	No	Yes
Female	8	50.00%	50.00%	37.50%	62.50%	37.50%	62.50%
Male	22	59.10%	40.90%	45.50%	54.50%	50.00%	50.00%
Total	30	56.70%	43.30%	43.30%	56.70%	46.70%	53.30%

According to the results in Table 4.5, among the females, 50% have said to the question on safely while the remaining 50% have said No, meaning that the perception on safety is equally divided among the females. Among males 59.1% said No to the question on safety while 40.90% accepted it. These results show that there

is a difference in how male and female respondents perceived the level of safety in the sidewalk.

The results on respondents' perception on convenience was different to those on safety. Here, the opinions of the males were equally divided with 50% agreeing and 50% disagreeing on the level of convenience on the sidewalk. 62.5% of the female respondents agreed that was convenient to walk while 37.5% disagreed. In terms of the comfort factor opinions of the male and females were slanted towards an agreement. 62.5% females have agreed that the sidewalk was comfortable while 54.5% were of the same opinion. Majority of both male and female were of the view that the sidewalk was comfortable. The results in Table 4.5 shows that how males and females felt about safety and convenience which both sexes had the same opinion on comfort factor of the sidewalk.

Table No.4.6 Safety, convenience and comfort according to the different educational groups

Level of Education	Number of Respondents	Safety		Comfort		Convenience	
		No	Yes	No	Yes	No	Yes
Primary	2		100.00%		100.00%		100.00%
G.C.E. O/L	1		100.00%		100.00%		100.00%
G.C.E. A/L	18	33.30%	66.70%	44.40%	55.60%	44.40%	55.60%
Tertiary	9	44.40%	55.60%	44.40%	55.60%	55.60%	44.40%

The results show that all the respondents (100%) primary and G.C.E.O/L education answered yes to the question on safety, convenience and comfort. That the respondents with primary and G.C.E. O/L educational level perceived all three domains commonly. G.C.E. A/L also responded positively to the questions on safety (66.70%), comfort (55.6%) and convenience (55.6%), although there were significant minority disagreeing on all three aspects. Those with tertiary education also has shown positive perception about safety (55.6%) and comfort (55.6) while on

convenience the majority (55.6%) response was No. Respectively 66.7% and 55.60% perceived as safe and comfort.

Respondents from all three groups agreed that the walkability conditions were acceptable. However it appears with the level of education their expectations going up.

Table No.4.7 Safety, convenience and comfort according to the different income groups

Income level (Rupees)	Number of Respondents	Safety		Comfortable		Convenience	
		No	Yes	No	Yes	No	Yes
0-25000	9	33.30%	66.70%	11.10%	88.90%	11.10%	88.90%
25000-50000	10	50.00%	50.00%	50.00%	50.00%	40.00%	60.00%
50000-75000	11	81.80%	18.20%	63.60%	36.40%	81.80%	18.20%
Over 75000	-	0%	0%	0%	0%	0%	0%
Total	30	56.70%	43.30%	43.30%	56.70%	46.70%	53.30%

In the 0-25,000 income level group, a majority of respondents showed agreement on all three walkability conditions: 66.7% on safety, 88.9% on comfort, and 88.9% on convenience. In the next income level group 25,000-50,000, the opinion on safety and comfort was equally divided with 50% agreeing and the remainder disagreeing. However, a 60% agrees that it was convenient to walk on the sidewalk. When it comes to the 50,000-75,000 the results show a reversing of attitudes. Majority in this high income group disagreed on all the three walkability condition. 81.8% answered No to the question on safety, 63.6% answered No to the question on comfort and a majority of 81.8% answered No to the question on convenience. These results can be interpreted as with increasing income level the majority of respondents tend to think that on the walkability conditions are not sufficient. They expect more safety, comfort and convenience in sidewalks.

Table No.4.8 Safety, convenience and comfort according to the different professions.

Employment	Number of Respondents	Safety		Comfortable		Convenience	
		No (%)	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)
Professionals	13	61.50	38.50	23.10	76.90	23.10	76.90
Administrative	7	14.30	85.70	42.90	57.10	42.90	57.10
Labour	2		100.00		100.00		100.00
Private Business	8	100.00		87.50	12.50	87.50	12.50
Total	30	56.70	43.30	43.30	56.70	43.30	56.70

According to the results in Table 4.8, large majorities of respondents from professional and those who are doing private business felt that walking on sidewalks was not safe, with 61.5% from professionals and 100% doing private businesses disagreeing the level of safety administrative and labour groups had the opposite view with 85.7% and 100% respectively answering Yes to the question on safety. These results suggest that the different employment groups have different perceptions on safety of walking on the sidewalks.In terms of the question on both comfort and convenience, the percentage of respondents who answered yes was 76.9% among the professionals, 57.1% from the Administrative group and 100% from the labour group, and a minority of 12.5% among the private business group.

4.3.3. Attributes of sidewalks perceived by pedestrians depending upon the different urban spaces

The data collected from the structured interviews held in four different locations were analyzed using the content analysis method. This is the data obtained as reasons for answering “No” to the questions on safety, convenience or comfort while walking in the area (4.3.4.). The results were shown in Appendix II. In all three locations except in Bambalapitiya it is possible to see the same attributes on Safety, Comfort and Convenience. According to the respondents’ answers, feeling of no safety is due

to reasons such as having lot of pedestrians, lots of vehicles on the road, vehicles being parked on sidewalks. So that pedestrians have to walk on the road and the sidewalks are always under constructions. Lack of comfort due to unclean ,not smooth surfaces, damaged drainage, goods are on the road, noise, material of the surface is not comfortable, vehicles being parked, obstructions, absence of safety fences, no attractions, full of sidewalk bazaars, lack of safety crossings and presence of pavement vendors. Feeling of lack of convenience was due to high pedestrian traffic, no disable infrastructure, crossings are not at proper places, damaged drainage cover, lack of shade and width is not enough to walk. In addition respondents in Bambalapitiya reported another set of attributes that were not common to other. Table 4.9 summarizes the attributes which are specific to each urban space.

Table 4.9 Attributes which is specific to each urban space.

Domain	Bambalapitiya	Maharagama	Baththramulla	Delkanda
Safety	Branches of trees can fall		Undulated surfaces	
	Crossing signals don't work properly	Vendors in the sidewalks means pedestrians have to walk on street		Not having a pavement means pedestrians risk of coming face to face with vehicles
Comfort	Time allocated for pedestrians is not enough	Full of sidewalk bazaars	Material not comfortable	Vehicles are parks in the area which is allocated for walking
		No dustbins		

		Pavement vendors		
			Undulated surface	
Convenience			No source of water	No toilet facilities
		Crossings are not in proper places	No relaxing places, benches, trees	No drinking water facilities
		No source of water	No toilet facilities Narrow sidewalk	Sidewalk covered by vehicles

Different urban spaces have different kind of attributes that are related to lack of better walkability conditions. In Bambalapitiya, an observer can see good walkability conditions (See Appendix III). But there are some problems related to walkability. In Maharagama there are a number of social groups one can see somewhat better conditions. According to the above table street vendors are the major problem in Maharagama.

A businessman who have textile shop in Pamunuwa said that “Most of people are coming from all over the Sri Lanka to Maharagama Pamunuwa since it is the largest whole sale textile market in Sri Lanka. This business is going on early in the morning. So there should be enough water and toilet facilities. Although toilet facilities are there no drinking water facilities.” Several tertiary level educated people said “When we want to throw a bus ticket, or bills issued from shops and especially in Rambuton season people put the peel of Rambuton everywhere since there are no dustbins. If dustbins are there we can keep our town cleaner than this.” In Baththaramula although the sidewalks are being improved conditions are very poor. Even width of the side

walk is not enough. In Delkanda they don't have a pavement to walk. Therefore at least having a pavement is basic requirement of pedestrians in Delkanda.

4.3.4. Attributes of sidewalks perceived by pedestrians depending the physical, socio-economic and cultural variables

To find this information given by respondents in structured interviews as reasons to feel safe, comfort and convenience while walking in the area was used. Content analysis method was used.

According to the appendix Nos. III to VIII it is possible to understand that the attributes on walkability is common over the different socio cultural and economic variables. They were not different according to the different socio-cultural and economic groups. But some attributes were different according to the urban space (as described in 4.3.4) when considering above almost all the attributes reported by respondents for agreeing and disagreeing on walkability conditions were the same as those found in literature. But several parameters were found that was not in literature (Table No.4.16)

Table no. 4.10 Attributes which found from this research.

Safety	Convenience
Not safe due to the 1. No bus bays 2. Due to pedestrian have to walk on the street 3. Not having signalized crossings 4. Always Under constructions	Convenient due to having 1. Toilet facilities Not convenient due to 1. Not having drinking water facilities 2.Not having dustbins 3.Having damaged drains and cover slabs

4.3.5. Satisfaction of respondents on walkability attributes in different urban spaces

The objective of the following test is to identify the varying perceived level of walkability have any relationship with the socio-demographic and economic state of individuals and groups. To find this the satisfaction on 11 different walkability attributes were taken by the survey. Those 11 factors were selected from the pilot survey conducted before final survey and the literature. The satisfaction level varied from dissatisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat satisfied and satisfied. The weighted values varied up to 1 to 5. 1 is equal to dissatisfied and 5 is equal to satisfied. According to the survey results, satisfaction levels with selected walkability attributes in four different locations were analyzed by using the method of Relative Important Index.

$$\text{Relative Importance Index} = \frac{\sum w}{AN}$$

Where w is the weighting given to each factor by the respondents, ranging from 1 to 5, A is the highest weight and N is the total number of samples. Based on equation, the relative importance index (RII) can be calculated from 0 to 1. The results are shown in Table No.4.17.

Table No.4.11 Satisfaction on different walkability attributes in different urban spaces

Bambalapitiya		Maharagama		Baththaramulla		Delkanda	
Parameter	RII value	Parameter	RII value	Parameter	RII value	Parameter	RII value
Shade	0.37	Shade	0.37	Shade	0.36	Free of Obstructions	0.32
Location of crossings	0.57	Safety at crossings	0.53	Width	0.51	Materials	0.33
Cleanliness	0.65	Cleanliness	0.56	Safety at crossings	0.59	Width	0.34
Drainage	0.65	Safety While	0.57	Smoothness	0.64	Smoothness	0.35

		walking					
Free of Obstructions	0.7	Location of crossings	0.59	Cleanliness	0.64	Shade	0.37
Smoothness	0.71	Width	0.59	Drainage	0.66	Drainage	0.4
Safety at crossings	0.76	Free of Obstructions	0.61	Free of Obstructions	0.67	Safety While walking	0.55
Width	0.78	Drainage	0.65	Safety While walking	0.72	Cleanliness	0.61
Materials	0.84	Smoothness	0.68	Materials	0.73	Location of crossings	0.61
Safety While walking	0.87	Street lights	0.7	Location of crossings	0.79	Safety at crossings	0.63
Street lights	0.87	Materials	0.72	Street lights	0.85	Street lights	0.67

The above results show how respondents perceived the different attributes in different urban spaces. In Bambalapitiya most satisfied factor is 0.87 for street lights and least satisfied factor is 0.37 for Shade. In Maharagama most satisfied factor is 0.72 for Materials covered the sidewalk while least satisfied factor is 0.37 for Shade. In Baththaramulla most satisfied factor is Street lights (0.85) and shade is the least satisfied (0.36). In Delkanda also street lights is the most satisfied factor (0.67) but the RII value is less than other highest values. Free of obstructions is the least satisfied factor (0.32) and it is also less than other lowest values. According to the above results among all four locations Shade had the least satisfaction while street lights are the most satisfied factor. Although four different urban spaces had four different improved walkability conditions and people coming from different socio-demographic and economic conditions the people's perception on walkability is common. It is not depend on the socio-economic groups. Only depend on the physical condition of the area. All pedestrians wanted to have shade while walking. By this urban planners can identify which factors should be more important to consider for improving the walkability in each area.

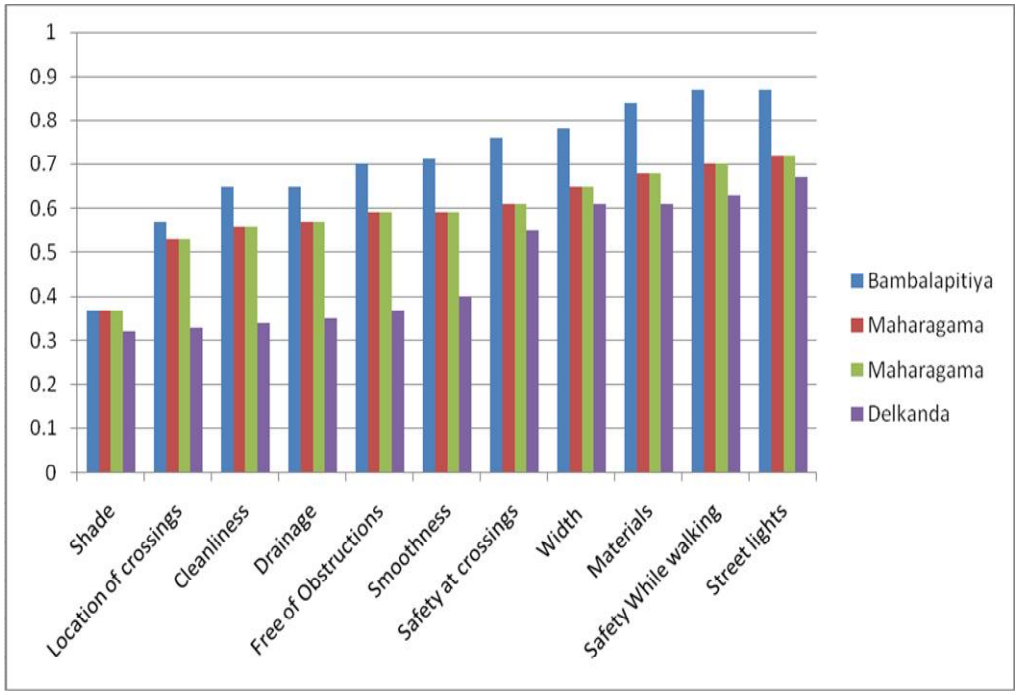


Figure 4.2: Satisfaction on different walkability attributes in different urban spaces

4.3.6 Relationship between socio-economic characteristics of pedestrians and the perceived levels of satisfaction for a specific urban space

To find this the Maharagma location was selected as explained above. According to the survey results, satisfaction levels with selected walkability attributes in Maharagma area over the different socio-demographic factors was analyzed by using simple descriptive analysis method in SPSS software.

According to the results (Appendix IX) for safety at crossings, cleanliness, street lights, shade,width of the sidewalk, location of crossings, surface material, drainage and age groups most respondents were dissatisfied and there is a relationship between the age and the above attributes. With increasing the age the dissatisfaction on above attributes also high. With the age the experience of people also go up. So people may compare with the other areas.

Among the female (Appendix X) 75% were dissatisfied for the shade while 25% is neither dissatisfied nor satisfied. In the male group also 77.3% were dissatisfied with the shade. Out of the total 100%, 76.7% were dissatisfied (both male and female). So

it can be concluded that among the males and females and within the males and females perceptions are the same.

When considering the ethnicity groups (Appendix XI) Tamil's are except Safety while walking and Drainage all other attributes are perceived same. With regard to the Shade 72.7% of Sinhala respondents, 100% of Tamil respondents and 75% of Muslim respondents were dissatisfied while rest of the respondents in these ethnic groups were neither dissatisfied nor satisfied. Therefore the majority of respondents in all the ethnic groups had same perception on the Shade.

In terms of how the respondents from different educational level groups felt about safety while walking (Appendix XII), 75% of respondents with G.C.E.O/L education were satisfied while 88.2% of those with G.C.E.A/L were satisfied. 88.9% of tertiary educated respondents were also reported that they were satisfied on safety while walking. These results suggest that with the increasing level of education satisfaction on safety while walking goes up.

With regard to how the respondents from different educational levels felt about their satisfaction on Surface material 100% of the respondents with G.C.E.O/L education 93.1% of those with G.C.E.A/L, and 77.8% with tertiary education reported that they were satisfied. These results suggest that with the increase of education level the satisfaction for the surface material tend to decrease. Regarding the shade too, the results show that with the increase of education level, the percentage reporting dissatisfaction goes up. The reason for this might be that with the increase of education level, level of exposure to walking conditions and expectation goes up. Therefore the satisfaction with the current conditions can go down.

Finally data on the levels of satisfaction for different walkability attributes across the levels of income in Maharagama area also show some interesting results (Appendix XIII). On the aspect of safety, only 9.1% of the respondents from income group 25,000-50,000 said that they were dissatisfied. The percentages of respondents who have reported that they were 'satisfied' were as follows: 88.8% from the income group 0-25,000; 81.8% from the group 25,000-50,000; 83.3% from group 50,000-75,000 and 100% from the income group earning above 75,000. With the increase of income level the satisfaction for the safety while walking is also increasing. With regards to the street lights only 9.1% respondents in 25000-50000 income group

were dissatisfied while 36.40% were neither dissatisfied nor satisfied and 54.6% were satisfied. 100% of respondents from all other income groups were satisfied about street lights. With regards to the shade the percentages of respondents who have reported that they were dissatisfied were 66.7%, 63.6%, 50%, 75% from the income groups 0-25000, 25000-50000, 50000-75000 and over 75000 respectively. The results do not suggest any relationship between the income level and the level of satisfaction on the shade.

5. Conclusion

This chapter has the result of the survey. Content analysis method and crosstabs in SPSS in descriptive analysis method were used to get the results.

The research question one how the respondents accepted levels of quality of walkability in all three domains (safety, comfort and convenience) in four areas surveyed. In Bambalapiiya and Maharagama all three domains were not perceived commonly. But in Baththaramulla most of all convenience and comfort both not accept the existing walkability condition while safety perceived commonly. In Delkanda safety, convenience and comfort all three domains were not accepted. That means the safety; convenience and comfort were perceived differently by different socio, economic and physical groups. Walkability is a quality that is not commonly accepted by all. It is depend on the physical variables of the area. Since Delkanda does not have any walkability facilities the pedestrian's perception on this was same. But in other areas may be due to different levels of quality of the sidewalks, the respondents perceived it differently.

When considering the Acceptation of respondents on Safety, Convenience and Comfort in Maharagama over the different socio –cultural groups, the results suggest the acceptance level on safety tends to be higher among the respondents with higher age groups. The reason may be with the age their experience also increases and they know about how a safety in the area should be and the level of safety on sidewalks in other area of the country. Since Maharagama having somewhat better walkability comparing with other areas then they may think comparatively and decide there is safety, comfort and convenience. The acceptation on safety, comfort and

convenience of Sinhala and Muslim respondents were different. Tamil respondents' acceptation on safety, comfort and convenience was the same. Among the two gender groups the perception on safety, comfort and convenience was different. With increasing level of education acceptation in all safety, convenience and comfort was becoming low. This suggests that with the level of education their expectations also go up. So they won't accept the existing walkability attributes. The results show that respondents with primary and G.C.E.O/L education accepted the three domains commonly. But with increasing the level of education acceptation in all three domains was becoming low. That means with the education their expectations also go up. So they won't accept the existing walkability attributes. The people who are in different income group's safety, convenience and comfort perceived differently. With the increase of income the acceptation on safety, comfort and convenience was going down. Over the employment groups they perceived the walkability conditions differently. This is clearly linked to the income level as well.

Analysed to find out whether the walkability can be achieved with a set of universally accepted parameters or is it a quality perceived depending upon the age, gender, ethnicity, education level, income level and employment. According to the content analysis the acceptation of walkability conditions on safety, comfort and convenience attributes over the different socio-cultural and economic individuals did not differ and almost all the accepted attributes were the same as those found in the literature. But several parameters were found that was not in literature were: not feeling safe due to the absence of bus bays, due to venders pedestrian have to walk on the street, not having signalized crossings and always under constructions. No convenient due to, not having drinking water facilities, toilet facilities, dustbins, having damaged drains and cover slabs.

To find whether the perceived level of walkability have any relationship with the socio- demographic and economic state of individuals and groups, the satisfaction on 11 different walkability attributes were checked. According to the results there is a negative relationship between the age and the safety at crossings, Cleanliness, street lights, shade, width of the sidewalk, location of crossings, surface material, and drainage. It was found that with the increase of age of the respondents, the dissatisfaction also goes up. With the age the experience of people going up.

Therefore, people may compare with the rest of other areas. In the condition of shade both male and female had same level of perception. Both groups were dissatisfied.

According to the ethnicity, among Sinhala, Tamil and Muslims satisfaction percentages were different. According to the above results with the increase of the level of education the satisfaction on safety while walking, Safety at crossings also increased. That means there is a positive relationship. With regard to smoothness, street lights, surface material and width of the sidewalk, with the increase of level of education, level of satisfaction gone down. Dissatisfaction level was increased, suggesting negative relationship between the education level and satisfaction. The reason may be with the increase of education level, level of exposure and expectation go up. Therefore the satisfaction goes down. With regard to free of obstruction drainage and location of crossings there were no relationships. There are both satisfied and dissatisfied respondents.

CHAPTER FIVE- CONCLUSION

5.1 Conclusion

Physical activity is an important, modifiable behavior for the prevention of non-communicable chronic diseases (WHO). Epidemiological studies have shown that physical activity is associated with reduced risks of obesity, diabetes, cardiovascular disease, and other chronic diseases (Bize et al., 2007; Warburton et al., 2006). Therefore people like to walk to their offices, for shopping and other day today activities. But if one walks through the streets of a Sri Lankan town today the journey is too often blighted by noise, conflict with vehicles and a variety of obstacles such as lamp-posts and sign-posts in addition to other crowded pedestrians and vendors on pavements amidst garbage and squalor. Areas that are water clogged, heaped with garbage and left-over building materials, unused furniture and other deterring junk are scattered around urban areas where people struggle to walk. In fact, the fear of being mugged or run down by a vehicle has begun to rise alarmingly that walking is seen to be not safe at all in most crowded streets (Dayarathna,2010). Therefore one of the responsibility of government is to improve the walkability. But for that governments should spend lot. Therefore urban planners should have a clear idea about the expectations and satisfaction of pedestrians. If expectations are not met, pedestrians may not use them. But it is very rear to find the researches on this and it is not done so far in Sri Lankan context.

The expectation and satisfaction are two concepts that are used to measure the perception of pedestrians. The results show that respondents in different socio-economic situations accept the safety, comfort and convenience differently. It is dependent on the physical variables of the area. When considering the acceptation of respondents on Safety, Convenience and Comfort for a given urban space over the different socio –cultural groups with the age the accepted level of safety was becoming high. The reason may be that with the age their experience also increase and they know about how a safety in the area should be and about the level of safety on sidewalks in other areas of country. Since Maharagama having somewhat better walkability conditions compare with other areas they may think comparatively and decide there is safety, comfort and convenience. With increasing level of education

acceptation in all safety, convenience and comfort is becoming low. That means with the education their expectations also go up. So they will not accept the existing walkability attributes. As far as the people who are in different income groups concerned safety, convenience and comfort differently. With the increase of income the acceptation on safety, comfort and convenience going down. Over the employment groups they perceive the walkability conditions differently. This is clearly attached to the income level as well.

The data were also analyzed to find out whether the walkability can be achieved with a set of universally accepted parameters or is it a quality perceived depending upon the socio-cultural and economic groups. Attributes were not different among socio-cultural and economic groups and most of the attributes identified by the respondents were same as those found in the literature. But several parameters were found that was not in literature. To find out whether the perceived level of walkability have any relationship with the socio- demographic and economic state of individuals and groups, the satisfaction on 11 different walkability attributes were checked. According to the results several relationships could be found. All are dissatisfied with the available shade. By using this results urban planners can understand what factors are the most important for the pedestrians and what factors are they mostly concerned about. Those factors should be improved in order to get the maximum satisfaction of pedestrians and use of the sidewalks.

5.2 Limitations and Recommendations

In this research although there were 120 respondents who took part, in different urban spaces the sample size was 30 for a location. According to the time and other resource limitations this sample size was achievable for this research. However, large sample size and more locations will give more reliable and generalized results. There is another important demographic factor called level of exposure. This was not taken into account because of the limitation of time and resources. The results would be more reliable if it was possible to follow stratified sampling method to collect data. In this analysis numbers of respondents were very low in some categories such as age and ethnic groups. Therefore the reliability of the results and conclusions became

low. So there are opportunities to carry out further research improving the research approach and increasing the sample size to obtain more generalized and reliable results.

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APPENDICES

Appendix – 1

Questionnaire

An examination of the contextual differences of the Walkability

Date:

Sheet No:

A. Personal Information : (Please Put "√" on the relevant cage)		
1.Age	Below 15 ☐ 15-30 ☐ 31-45 ☐	46-60 ☐ Above 60 ☐
2. Sex	Male ☐	Female ☐
3. Ethnicity	Sinhala ☐	Muslim ☐
	Tamil ☐	Other ☐
4.Education level	Primary education ☐	G.C.E. A/L ☐
	G.C.E. O/L ☐	Tertiary education ☐
5.Income level (monthly)	0 – 25,000 ☐	25,000-50,000 ☐
	50,000 – 75,000 ☐	Over 75,000 ☐
6. Employment:	Professionals ☐	Labor ☐
	Administrative ☐	Private Business ☐

B. **People's Expectation:** (Please Put "√" on yes / no and give reasons)

1. Do you feel safe while walking on the streets in this area? (yes / no)
What are the reasons?

2. Do you feel comfortable while walking on the streets in this area? (yes / no)
What are the reasons?
3. Do you feel convenience while walking on the streets in this area? (yes / no)
4. What are the reasons?

C. People's Satisfaction:

C_1. Satisfaction on Safety:-

01. How would you rate your satisfaction for **Safety while walking on the sidewalk**?

1	Dissatisfied	**3**	Neither satisfied nor Dissatisfied	**5**	Satisfied
2	Somewhat dissatisfied	**4**	Somewhat satisfied		

02. How would you rate your satisfaction for **Safety at crossings**?

1	Dissatisfied	**3**	Neither satisfied nor Dissatisfied	**5**	Satisfied
2	Somewhat dissatisfied	**4**	Somewhat satisfied		

03. How would you rate your satisfaction for **street lights**?

1	Dissatisfied	**3**	Neither satisfied nor Dissatisfied	**5**	Satisfied
2	Somewhat dissatisfied	**4**	Somewhat satisfied		

C2. Satisfaction on Comfort:-

04. How would you rate your satisfaction for **smoothness of the surface**?

1	Dissatisfied	**3**	Neither satisfied nor Dissatisfied	**5**	Satisfied
2	Somewhat dissatisfied	**4**	Somewhat satisfied		

05. How would you rate your satisfaction for **cleanliness of the surface**?

1	Dissatisfied	**3**	Neither satisfied nor Dissatisfied	**5**	Satisfied
2	Somewhat dissatisfied	**4**	Somewhat satisfied		

06.How would you rate your satisfaction for **drainage facilities in the side walk**?

1	Dissatisfied	**3**	Neither satisfied nor Dissatisfied	**5**	Satisfied
2	Somewhat dissatisfied	**4**	Somewhat satisfied		

C3. Satisfaction on Convenience:-

07How would you rate your satisfaction for **materials covered the side walk**?

1	Dissatisfied	**3**	Neither satisfied nor Dissatisfied	**5**	Satisfied
2	Somewhat dissatisfied	**4**	Somewhat satisfied		

08. How would you rate your satisfaction for **enough width of the sidewalk**?

1	Dissatisfied	**3**	Neither satisfied nor Dissatisfied	**5**	Satisfied
2	Somewhat dissatisfied	**4**	Somewhat satisfied		

09. Do you think the **crossings are located at proper places**?

1	Dissatisfied	**3**	Neither satisfied nor Dissatisfied	**5**	Satisfied
2	Somewhat dissatisfied	**4**	Somewhat satisfied		

10. How would you rate your satisfaction for **free of obstructions on the sidewalk**?

1	Dissatisfied	**3**	Neither satisfied nor Dissatisfied	**5**	Satisfied
2	Somewhat dissatisfied	**4**	Somewhat satisfied		

11. How would you rate your satisfaction for **shade**?

1	Dissatisfied	**3**	Neither satisfied nor Dissatisfied	**5**	Satisfied
2	Somewhat dissatisfied	**4**	Somewhat satisfied		

Appendix II

Perceived attributes regarding walkability on different urban spaces

Domain	Bambalapitiya	Maharagama	Baththaramulla	Delkanda
Safety	Lot of vehicles on the road	Not safe crossing	Undulate surface	No street lights
	Crossing signals not working properly	No bus bays	Darkness-Thieves	More crowed
	Due to crowdedness can happen accidents	Due to crowdedness can happen accidents	No guard rails	Not safe crossings
	Due to always Under constructions	Due to venders pedestrian have to walk on street	No Safe crossings	Can damage by obstructions
	Due to vehicles parked on sidewalks pedestrian have to walk on roads	Due to always Under constructions		Since not having a pavement can met with vehicles
	Branches of trees can fall	No proper sidewalk		Damage by obstructions
Comfortable	Not Clean	Not smooth surface	Damaged drainage	Goods are on the road
			cover	
	Time allocated for pedestrian is not enough	Very noisy	Material not comfortable	Vehicles are parked
		Damaged drains	Obstructions	Sound
		No safety fence everywhere	No attractions	Undulate surface
		Full of sidewalk bazaars		Not safety crossings

		No safe crossings		Traffic
		Pavement vendors	Undulate surface	Obstructions
		Not clean		No guard rails
		Vehicles are parked on sidewalk	Not proper drainage	Not proper drainage
		No Dustbins		Not Clean
Convenience	High pedestrian traffic	No smooth surface	No source of water	No disable infrastructure
	Colour lights are not working properly	crossings are not at proper places	Damaged drainage cover	No drinking water facilities
	Obstructions	High noise	No disable infrastructure	No shade
	No shade	Not proper drainage	Finishing is not comfortable	Side walk covered by vehicles vehicles
		No disable infrastructure	No boards contain next bus halt and	No toilet facilities
			No relaxing places- Bench, trees	Width is not enough to walk walk
		Narrow side walks	Not enough width	Goods in the sidewalk
		No shade	No shade	No drainage facilities
		Damaged sidewalk	No toilet facilities	Not paved
		No source of water		No shade

Appendix III

Perceived attributes regarding walkability by age on safety, comfort and convenience in Maharagama .

Age	Safety		Comfortable		Convenience	
	Yes	No	Yes	No	Yes	No
15-30	Street lights	No proper sidewalk	Have a pavement	Not clean	Crossings are located at proper places	Narrow side walks
	crowdedness	Not safe crossings	Sidewalks are clean	Dusty	Have drainage facilities	No smooth surface
	Safety fence	Susseptibity to accidents due to venders	Some areas have guard rails	Full of sidewalk bazaars	No any damages on the sidewalk	Damaged drains and cover slabs
		Due to always under constructions		Not smooth surface	Enough shops, cafes, transport services	Under constructions
			Fresh air	Very noisy	Well paved	No shade
			Have street lights	Vehicles are parked	Enough width	
			Having a pavement			

31-45	No thieves	Many vehicles and venders may lead to accidents	Less obstructions	Block by venders	Have crossings	No adequate width
	No crime		Having a pavement	Damaged drains	Crossings are located at proper places	No shade
	Crowded		Sidewalks are clean			No drainage facilities
	Easy accessible		Smooth sidewalks			No dustbins
46-60		Due to venders		Not smooth surface		Not proper drainage
		Due to crowdedness can		No safety fence		Not enough space to walk
		happen accidents		Not safety crossings		No drinking water facilities
						No dustbins
>60		No bus bays		Pavement vendors		Not enough width
				Vehicles are parked		No disable infrastructure
				Not clean		No drainage

						facilities
						crossings are not located at proper places

Apendix IV.

Perceived attributes regarding walkability by Gender on safety, comfort and convenience in Maharagama .

Gender	Safety		Comfortable		Convenience	
	Yes	No	Yes	No	Yes	No
Male	Street lights	No bus bays	Have a pavement	Block by venders	Crossings are located	Narrow side walks
	crowdedness	No proper sidewalk	Sidewalks are clean	No safe crossings	Have drainage facilities	No disable infrastructure
	No thieves	Susseptibity to accidents due to venders		Full of sidewalk bazaars	Enough shops, cafes, transport service	No drinking water facilities
	Easy accessible	Not safe crossings	Fresh air	Not smooth surface	Well paved	No drainage facilities
	Safety fence		Have street lights	Very noisy	Enough width	No dustbins
			Toilet facilities	Vehicles are parked		No shade
				Damaged drains		Branches of trees can fall
				Not clean	No any damages on	No smooth surface

					the sidewalk	
				Dusty		
Female	No thieves	Many vehicles and venders may lead to accidents	Have street lights	Not smooth surface	Have crossings	Not proper drainage
	No crime	Due to crowdedness can happen accidents	Having a pavement	Vehicles are parked on the sidewalk	Crossings are located at proper places	No shade
		Due to always Under constructions	Sidewalks are clean	Not safety crossings	Good drainage system	No dustbins
				Not Clean		

Appendix V

Perceived attributes regarding walkability by Ethnicity on safety, comfortable and convenience in Maharagama .

Ethnicity	Safety		Comfortable		Convenience	
	Yes	No	Yes	No	Yes	No
Sinhala	Street lights	No bus bays	Toilet facilities	Block by venders	Crossings are located at proper places	Narrow side walks
	crowdedness	Susseptibity to accidents due to venders		No safe crossings	Have drainage facilities	No disable infrastructure
	No thieves	No proper sidewalk	Some areas have guard rails	Not clean	Have crossings	No drinking water facilities
	No crime	Not safe crossings	Have street lights	Not smooth surface	No any damages on the sidewalk	Damaged drains and cover slabs
		Due to crowdedness can happen accidents	Fresh air	Very noisy	Good drainage system	Not proper drainage
			Smooth sidewalks	Vehicles are parked	Enough shops, cafes, transport services	No dustbins
				Damaged drains	Well paved	
				Dusty	Enough width	No shade

Tamil	Safety fence				Well paved	No dustbins
	Crowded		Having a pavement		Enough width	
Muslim	Crowded	Due to venders pedestrian have to walk in roads	Less obstructions	Vehicles are parked		No shade
	Easy accessible			Not Clean		Not enough width
				Not safety crossings		
						No drainage facilities

Appendix VI

Perceived attributes regarding walkability by Level of Education on safety, comfort and convenience in Maharagama .

Level of education	Safety		Comfortable		Convenience	
	Yes	No	Yes	No	Yes	No
Primary	Street lights		Toilet facilities		Enough width	No drinking water failities
	crowdedness		Having a Pavement		Covered drainage	
G.C.E.O/L	Having Policeman		Having a Pavement		Enough width	
	Have crossings		Guard rails		Well paved	
G.C.E.A/L	No thieves	Due to venders pedestrian have to walk on the streets	Having a pavement	No safe crossings	Have crossings	Not enough width
	No crime	No bus bays	Some areas have guard rails	Full of sidewalk bazaars	Crossings are located at proper places	Not proper drainage
	Have street lights	Due to crowdedness can	Sidewalks are clean	Not smooth surface	Have drainage facilities	crossings are not located at

		happen accidents				proper places
			Fresh air	Not clean	No any damages on the sidewalk	No shade
				Vehicles are parked	Well paved	
				Block by venders	Enough width	
				Dusty		
				No safety fence		
Tertiary	Huge population	No proper sidewalk	Sidewalks are clean	Full of sidewalk bazaars	Good drainage system	Damaged drains
Education	Safety fence	Not safe crossings	Smooth sidewalks	Not smooth surface	Enough shops, cafes, transport services	No adequate width
	Easy accesssible	Many vehicles and venders may lead to accidents	Have street lights	Very noisy	Well paved	No shade
		Due to always	Having a pavement	Block by venders	Enough width	No drainage

						facilities
		Under constructions				
			Less obstructions	Damaged drains		No dustbins
				Not Clean		
				Not safety crossings		

Appendix VII

Perceived attributes regarding walkability by Level of Income on safety, comfort and convenience in Maharagama .

Level of Income	Safety		Comfortable		Convenience	
	Yes	No	Yes	No	Yes	No
0-25000	Street lights	No bus bays	Have a pavement	Pavement vendors	Have crossings	No drinking water facilities
	crowdedness	Susseptibity to accidents due to venders	Sidewalks are clean	Not safety crossings	No any damages	No disable infrastructure
	No crime	Due to always Under constructions	Fresh air	Not Clean		No dustbins
	No thieves					
25000-50000	No thieves	Many vehicles and venders may lead to accidents	Having a pavement	No safe crossings	Crossings are located at proper places	Not enough width
	No crime	Due to crowdedness can happen accidents	Separated area to walk	Not clean	Have drainage facilities	No smooth surface
	Huge population		Sidewalks are clean	Full of sidewalk bazaars	Enough shops, cafes,	No shade

					transport services	
			Smooth sidewalks	Not smooth surface		
			Some areas have guard rails	Very noisy		
				Block by venders		
				No safety fence		
50000-75000	Safety fence	No proper sidewalk	Less obstructions	Full of sidewalk bazaars	Well paved	Damaged drains
	Crowded	Not safe crossings	Having a pavement	Not smooth surface	Enough width	Very narrow sidewalks
	Easy accesssible	Due to venders pedestrian have to walk on roads		Vehicles are parked		Not proper drainage
		No bus bays		Block by venders		crossings are not located at proper places
				Damaged drains		No shade
				Not safety crossings		No dustbins
				Dusty		
>75000	No crime	Due to	Separated	Not clean	Have	No smooth

		crowdedness can	area to walk		drainage facilities	surface
		happen accidents				
	Crowded	Not safe crossings	Toilet facilities	Not smooth surface	Enough width	Very narrow sidewalks
	Street lights	No bus bays		Pavement vendors	Have crossings	Narrow side walk

Appendix VIII

Perceived attributes regarding walkability by Employment on safety, comfortable and convenience in Maharagama .

Employment	Safety		Comfortable		Convenience	
	Yes	**No**	**Yes**	**No**	**Yes**	**No**
Professionals	Street lights	No proper sidewalk	Have a pavement	Full of sidewalk bazaars	No any damages on the sidewalk	Narrow side walks
	crowdedness	Not safe crossings	Sidewalks are clean	Not smooth surface	Enough shops, cafes, transport services	Damaged drains and cover slabs
	No thieves	Susseptibity to accidents due to venders	Less obstructions	Very noisy	Crossings are located at proper places	No drainage facilities
	No crime	Due to crowdedness can happen accidents	Some areas have guard rails	Dusty	Have drainage facilities	
	Easy accessible	happen accidents	Separated area to walk	No safety fence	Well paved	
		Due to always	Fresh air	Not safety crossings	Enough width	
		Under		Not		

		constructions		Clean		
Admin	No thieves	Due to venders pedestrian have to walk on the streets	Have street lights	No safe crossings	Have crossings	Not enough width
	No crime		Having a pavement	Not clean	Well paved	No smooth surface
	Safety fence			Full of sidewalk bazaars	Enough width	No shade
	Crowded			Block by venders		
Labour	No crime	Due to crowdedness can	Have guard rails	Dusty	Have drainage facilities	No drinking water facilities
	Easy accessible	happen accidents	Separated area to walk	No safety fence	Well paved	High noise
	Safety fence	Many vehicles and venders		Full of sidewalk bazaars	Enough width	No shade
	No thieves		Sidewalks are clean	Pavement vendors	Good drainage system	Not enough width
				Not smooth surface		No disable infrastructure

Private						
	No thieves	No bus bays	Sidewalks are clean	Not clean	Good drainage system	Not enough width
Business		Many vehicles and venders	Smooth sidewalks	Not smooth surface		No drinking water facilities
		may lead to accidents	Toilet facilities	Not safety crossings		Not proper drainage
						No dustbins
						No shade

Appendix IX

Levels of satisfaction for different walkability attributes across the age groups in Maharagama Area

Attribute	Age	Dissatisfied	Somewhat Dissatisfied	Neither satisfied nor Dissatisfied	Somewhat satisfied	Satisfied
Safety While walking	15-30	5.90%	29.40%	35.30%	23.50%	5.90%
	31-45	10.00%	30.00%	30.00%	30.00%	
	46-60		100.00%			
	Above 60		50.00%	50.00%		
	Total	6.70%	33.30%	33.30%	23.30%	3.30%
Safety at crossings	15-30	29.40%	5.90%	29.40%	11.80%	23.50%
	31-45	10.00%	40.00%	30.00%	20.00%	
	46-60	100.00%				
	Above 60	100.00%				
	Total	30.00%	16.70%	26.70%	13.30%	13.30%
Smoothness	15-30	5.90%	11.80%	17.60%	41.20%	23.50%
	31-45	20.00%		10.00%	50.00%	20.00%
	46-60	100.00%				
	Above 60		100.00%			
	Total	13.30%	13.30%	13.30%	40.00%	20.00%
Free of Obstructions	15-30	17.60%	11.80%	29.40%	23.50%	17.60%
	31-45	30.00%		10.00%	20.00%	40.00%
	46-60	100.00%				
	Above 60		100.00%			

	Total	23.30%	13.30%	20.00%	20.00%	23.30%
Cleanliness	15-30	29.40%		17.60%	41.20%	11.80%
	31-45	30.00%		20.00%	50.00%	
	46-60	100.00%				
	Above 60	100.00%				
	Total	36.70%		16.70%	40.00%	6.70%
Street lights	15-30	23.50%		29.40%	47.10%	
	31-45		30.00%	30.00%	40.00%	
	46-60	100.00%				
	Above 60	100.00%				
	Total	23.30%	10.00%	26.70%	40.00%	
Shade	15-30	52.90%	35.30%	11.80%		
	31-45	20.00%	30.00%	50.00%		
	46-60		100.00%			
	Above 60		100.00%			
	Total	36.70%	40.00%	23.30%		
Surface	15-30		11.80%	17.60%	35.30%	35.30%
Material	31-45	20.00%			60.00%	20.00%
	46-60	100.00%				
	Above 60		100.00%			
	Total	10.00%	13.30%	10.00%	40.00%	26.70%
Drainage	15-30	11.80%		23.50%	35.30%	29.40%
	31-45	20.00%	20.00%	20.00%	20.00%	20.00%
	46-60	100.00%				
	Above 60		100.00%			
	Total	16.70%	13.30%	20.00%	26.70%	23.30%

Width of the	15-30	29.40%		5.90%	41.20%	23.50%
sidewalk	31-45	40.00%	10.00%		30.00%	20.00%
	46-60	100.00%				
	Above 60		100.00%			
	Total	33.30%	10.00%	3.30%	33.30%	20.00%
Location of	15-30	23.50%	11.80%		11.80%	52.90%
crossings	31-45	30.00%	20.00%	30.00%	20.00%	
	46-60	100.00%				
	Above 60	100.00%				
	Total	33.30%	13.30%	10.00%	13.30%	30.00%

Appendix X

Levels of satisfaction for different walkability attributes across the Gender in Maharagama area

Attribute	Gender	Dissatisfied	Somewhat dissatisfied	Neither satisfied nor Dissatisfied	Somewhat satisfied	Satisfied
Safety While walking	Female		50.00%	37.50%	12.50%	
	Male	9.10%	27.30%	31.80%	27.30%	4.50%
	Total	6.70%	33.30%	33.30%	23.30%	3.30%
Safety at crossings	Female	12.50%	12.50%	50.00%	25.00%	
	Male	36.40%	18.20%	18.20%	9.10%	18.20%
	Total	30.00%	16.70%	26.70%	13.30%	13.30%
Smoothness	Female	12.50%		25.00%	37.50%	25.00%
	Male	13.60%	18.20%	9.10%	40.90%	18.20%
	Total	13.30%	13.30%	13.30%	40.00%	20.00%
Free of Obstructions	Female	25.00%		25.00%		50.00%
	Male	22.70%	18.20%	18.20%	27.30%	13.60%
	Total	23.30%	13.30%	20.00%	20.00%	23.30%
Cleanliness	Female	23.10%	15.40%		53.80%	7.70%
	Male		17.60%	41.20%	23.50%	17.60%
	Total	10.00%	16.70%	23.30%	36.70%	13.30%
Street lights	Female	12.50%			50.00%	37.50%

	Male	27.30%	13.60%		18.20%	40.90%
	Total	23.30%	10.00%		26.70%	40.00%
Shade	Female	50.00%	25.00%	25.00%		
	Male	31.80%	45.50%	22.70%		
	Total	36.70%	40.00%	23.30%		
Surface Material	Female	12.50%		12.50%	50.00%	25.00%
	Male	9.10%	18.20%	9.10%	36.40%	27.30%
	Total	10.00%	13.30%	10.00%	40.00%	26.70%
Drainage	Female	12.50%		25.00%	25.00%	37.50%
	Male	18.20%	18.20%	18.20%	27.30%	18.20%
	Total	16.70%	13.30%	20.00%	26.70%	23.30%
Width of the sidewalk	Female	25.00%		12.50%	37.50%	25.00%
	Male	36.40%	13.60%		31.80%	18.20%
	Total	33.30%	10.00%	3.30%	33.30%	20.00%
Location of crossings	Female	37.50%		37.50%	25.00%	
	Male	31.80%	18.20%		9.10%	40.90%
	Total	33.30%	13.30%	10.00%	13.30%	30.00%

Appendix XI

Levels of satisfaction for different walkability attributes across the Ethnicity in Maharagama

Attributes	Ethnicity	Dissatisfied	Somewhat dissatisfied	Neither satisfied nor Dissatisfied	Somewhat satisfied	Satisfied
Safety While walking	Sinhala	4.50%	27.30%	40.90%	22.70%	4.50%
	Tamil	50.00%			50.00%	
	Muslim		75.00%		25.00%	
	Total	6.70%	33.30%	33.30%	23.30%	3.30%
Safety at crossings	Sinhala	31.80%	9.10%	22.70%	18.20%	18.20%
	Tamil	100.00%				
	Muslim		75.00%	25.00%		
	Total	30.00%	16.70%	26.70%	13.30%	13.30%
Smoothness	Sinhala	18.20%	18.20%	4.50%	31.80%	27.30%
	Tamil				100.00%	
	Muslim			25.00%	75.00%	
	Total	13.30%	13.30%	13.30%	40.00%	20.00%
Free of Obstructions	Sinhala	27.30%	9.10%	13.60%	18.20%	31.80%
	Tamil		100.00%			
	Muslim	25.00%		25.00%	50.00%	
	Total	23.30%	13.30%	20.00%	20.00%	23.30%

Cleanliness	Sinhala	36.40%		18.20%	36.40%	9.10%
	Tamil				100.00%	
	Muslim	25.00%		25.00%	50.00%	
	Total	36.70%		16.70%	40.00%	6.70%
Street lights	Sinhala	22.70%	13.60%		31.80%	31.80%
	Tamil					100.00%
	Muslim				25.00%	75.00%
	Total	23.30%	10.00%		26.70%	40.00%
Shade	Sinhala	22.70%	50.00%	27.30%		
	Tamil	100.00%				
	Muslim	50.00%	25.00%	25.00%		
	Total	36.70%	40.00%	23.30%		
Surface Material	Sinhala	13.60%	18.20%		31.80%	36.40%
	Tamil				100.00%	
	Muslim			25.00%	75.00%	
	Total	10.00%	13.30%	10.00%	40.00%	26.70%
Drainage	Sinhala	22.70%	9.10%	18.20%	31.80%	18.20%
	Tamil		50.00%		25.00%	25.00%
	Muslim	16.70%	13.30%	20.00%	26.70%	23.30%
	Total	16.70%	13.30%	20.00%	26.70%	23.30%
Width of the sidewalk	Sinhala	22.70%	13.60%		36.40%	27.30%
	Tamil				100.00%	
	Muslim	75.00%		25.00%		
	Total	33.30%	10.00%	3.30%	33.30%	20.00%

Location of crossings	Sinhala	27.30%		13.60%	18.20%	40.90%
	Tamil	100.00%				
	Muslim	50.00%	50.00%			
	Total	33.30%	13.30%	10.00%	13.30%	30.00%

Appendix XII

Levels of satisfaction for different walkability attributes across the Level of Education in Maharagama Area

Attributes	Level of Education	Dissatisfied	Somewhat dissatisfied	Neither satisfied nor Dissatisfied	Somewhat satisfied	Satisfied
Safety While walking	Primary					
	G.C.E.O/L			25.00%	50.00%	25.00%
	G.C.E.A/L		5.90%	5.90%	35.30%	52.90%
	Tertiary			11.10%	33.30%	55.60%
	Total		3.30%	10.00%	36.70%	50.00%
Safety at crossings	Primary					
	G.C.E.O/L			50.00%		50.00%
	G.C.E.A/L	17.60%		11.80%	52.90%	17.60%
	Tertiary	11.10%			33.30%	55.60%
	Total	13.30%		13.30%	40.00%	33.30%
Smoothness	Primary					
	G.C.E.O/L		50.00%	50.00%		
	G.C.E.A/L		17.60%	5.90%	52.90%	23.50%
	Tertiary	22.20%	11.10%	11.10%		55.60%
	Total	6.70%	20.00%	13.30%	30.00%	30.00%
Free of Obstructions	Primary					

	G.C.E.O/L		50.00%		50.00%	
	G.C.E.A/L		17.60%	11.80%	35.30%	35.30%
	Tertiary	33.30%	11.10%	11.10%	11.10%	33.30%
	Total	10.00%	20.00%	10.00%	30.00%	30.00%
Cleanliness	Primary					
	G.C.E.O/L		50.00%	50.00%		
	G.C.E.A/L		11.80%	23.50%	47.10%	17.60%
	Tertiary	33.30%	11.10%	11.10%	33.30%	11.10%
	Total	10.00%	16.70%	23.30%	36.70%	13.30%
Street lights	Primary					
	G.C.E.O/L					100.00%
	G.C.E.A/L			17.60%	47.10%	35.30%
	Tertiary	11.10%		11.10%		77.80%
	Total	3.30%		13.30%	26.70%	56.70%
Shade	Primary					
	G.C.E.O/L		25.00%	75.00%		
	G.C.E.A/L	23.50%	35.30%	41.20%		
	Tertiary	22.20%	66.70%	11.10%		
	Total	20.00%	43.30%	36.70%		
Surface Material	Primary					
	G.C.E.O/L				50.00%	50.00%
	G.C.E.A/L			5.90%	58.80%	35.30%
	Tertiary	22.20%			22.20%	55.60%
	Total	6.70%		3.30%	46.70%	43.30%
Drainage	Primary					

	G.C.E.O/L			50.00%		50.00%
	G.C.E.A/L	11.80%	11.80%	23.50%	41.20%	11.80%
	Tertiary	33.30%		22.20%	33.30%	11.10%
	Total	16.70%	6.70%	26.70%	33.30%	16.70%
Width of the sidewalk	Primary					
	G.C.E.O/L				50.00%	50.00%
	G.C.E.A/L		17.60%		35.30%	47.10%
	Tertiary	33.30%		22.20%		44.40%
	Total	10.00%	10.00%	6.70%	26.70%	46.70%
Location of crossings	Primary					
	G.C.E.O/L	50.00%	50.00%			
	G.C.E.A/L	23.50%		23.50%	35.30%	17.60%
	Tertiary	22.20%	22.20%	22.20%	22.20%	11.10%
	Total	26.70%	13.30%	20.00%	26.70%	13.30%

Appendix XIII

Levels of satisfaction for different walkability attributes across the Level of income in Maharagama

Attrbutes	Level of Income	Dissatisfied	Somewhat dissatisfied	Neither satisfied nor Dissatisfied	Somewhat satisfied	Satisfied
Safety While walking	0-25000			11.10%	44.40%	44.40%
	25000-50000		9.10%	9.10%	27.30%	54.50%
	50000-75000			16.70%	33.30%	50.00%
	Over 75000				50.00%	50.00%
	Total		3.30%	10.00%	36.70%	50.00%
Safety at crossings	0-25000			33.30%	44.40%	22.20%
	25000-50000	27.30%			36.40%	36.40%
	50000-75000	16.70%			33.30%	50.00%
	Over 75000			25.00%	50.00%	25.00%
	Total	13.30%		13.30%	40.00%	33.30%
Smoothness	0-25000		33.30%		33.30%	33.30%
	25000-50000		27.30%	36.40%	18.20%	18.20%
	50000-75000	33.30%			33.30%	33.30%
	Over 75000				50.00%	50.00%

	Total	6.70%	20.00%	13.30%	30.00%	30.00%
Free of Obstructions	0-25000		44.40%		22.20%	33.30%
	25000-50000	9.10%	18.20%	9.10%	54.50%	9.10%
	50000-75000	33.30%				66.70%
	Over 75000			50.00%	25.00%	25.00%
	Total	10.00%	20.00%	10.00%	30.00%	30.00%
Cleanliness	0-25000		44.40%		55.60%	
	25000-50000	9.10%	9.10%	27.30%	27.30%	27.30%
	50000-75000	33.30%		33.30%	33.30%	
	Over 75000			50.00%	25.00%	25.00%
	Total	10.00%	16.70%	23.30%	36.70%	13.30%
Street lights	0-25000				33.30%	66.70%
	25000-50000	9.10%		36.40%	9.10%	45.50%
	50000-75000				33.30%	66.70%
	Over 75000				50.00%	50.00%
	Total	3.30%		13.30%	26.70%	56.70%
Shade	0-25000	55.60%	11.10%	33.30%		
	25000-50000	54.50%	9.10%	36.40%		
	50000-75000	16.70%	33.30%	50.00%		

	Over 75000	25.00%	50.00%	25.00%		
	Total	43.30%	20.00%	36.70%		
Surface Material	0-25000				66.70%	33.30%
	25000-50000				45.50%	54.50%
	50000-75000	33.30%			50.00%	16.70%
	Over 75000			25.00%		75.00%
	Total	6.70%		3.30%	46.70%	43.30%
Drainage	0-25000		11.10%		33.30%	55.60%
	25000-50000	27.30%	9.10%	45.50%	18.20%	
	50000-75000	33.30%		16.70%	50.00%	
	Over 75000			50.00%	50.00%	
	Total	16.70%	6.70%	26.70%	33.30%	16.70%
Width of the sidewalk	0-25000		11.10%		44.40%	44.40%
	25000-50000	9.10%	18.20%	9.10%	18.20%	45.50%
	50000-75000	33.30%				66.70%
	Over 75000			25.00%	50.00%	25.00%
	Total	10.00%	10.00%	6.70%	26.70%	46.70%
Location of crossings	0-25000	33.30%			44.40%	22.20%
	25000-50000	18.20%	27.30%	27.30%	9.10%	18.20%
	50000-	50.00%		33.30%	16.70%	

	75000					
	Over 75000		25.00%	25.00%	50.00%	
	Total	26.70%	13.30%	20.00%	26.70%	13.30%

Appendix XIV

Table 4.23 Levels of satisfaction for different walkability attributes across the Level of employment in Maharagama Area

Attrbutes	Employment	Dissatisfied	Somewhat dissatisfied	Neither satisfied nor Dissatisfied	Somewhat satisfied	Satisfied
Safety While walking	Professionals			27.30%	72.70%	
	Administration		14.30%	28.60%	57.10%	
	Labor					
	Business	8.30%	16.70%	50.00%	25.00%	
	Total	3.30%	10.00%	36.70%	50.00%	
Safety at crossings	Professionals				72.70%	27.30%
	Administration	14.30%			28.60%	57.10%
	Labor					
	Business	25.00%		33.30%	16.70%	25.00%
	Total	13.30%		13.30%	40.00%	33.30%
Smoothness	Professionals	18.20%	9.10%	18.20%	27.30%	27.30%
	Administration			28.60%	42.90%	28.60%
	Labor					
	Business		41.70%		25.00%	33.30%
	Total	6.70%	20.00%	13.30%	30.00%	30.00%
Free of Obstructions	Professionals	27.30%	9.10%	9.10%	27.30%	27.30%
	Administration		14.30%		42.90%	42.90%
	Labor					

	Business		33.30%	16.70%	25.00%	25.00%
	Total	10.00%	20.00%	10.00%	30.00%	30.00%
Cleanliness	Professionals	27.30%	9.10%	9.10%	45.50%	9.10%
	Administration		14.30%	42.90%	28.60%	14.30%
	Labor					
	Business		25.00%	25.00%	33.30%	16.70%
	Total	10.00%	16.70%	23.30%	36.70%	13.30%
Street lights	Professionals	9.10%		9.10%	27.30%	54.50%
	Administration			14.30%	28.60%	57.10%
	Labor					
	Business			16.70%	25.00%	58.30%
	Total	3.30%		13.30%	26.70%	56.70%
Shade	Professionals	27.30%	36.40%	36.40%		
	Administration	57.10%	42.90%			
	Labor					
	Business	33.30%	50.00%	16.70%		
	Total	36.70%	43.30%	20.00%		
Surface Material	Professionals	18.20%			45.50%	36.40%
	Administration				42.90%	57.10%
	Labor					
	Business			8.30%	50.00%	41.70%
	Total	6.70%		3.30%	46.70%	43.30%
Drainage	Professionals	36.40%		9.10%	36.40%	18.20%
	Administration	14.30%	28.60%	42.90%	14.30%	
	Labor					

	Business			33.30%	41.70%	25.00%
	Total	16.70%	6.70%	26.70%	33.30%	16.70%
Width of the sidewalk	Professionals	27.30%			27.30%	45.50%
	Administration				42.90%	57.10%
	Labor					
	Business		25.00%	16.70%	16.70%	41.70%
	Total	10.00%	10.00%	6.70%	26.70%	46.70%
Location of crossings	Professionals	18.20%	9.10%	18.20%	54.50%	
	Administration	14.30%	28.60%	14.30%		42.90%
	Labor					
	Business	41.70%	8.30%	25.00%	16.70%	8.30%
	Total	26.70%	13.30%	20.00%	26.70%	13.30%