UNDERSTANDING THE RELATIONSHIP BETWEEN WALKABILITY AND QUALITY OF LIFE OF WOMEN GARMENTS WORKERS IN DHAKA, BANGLADESH

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March, 2013

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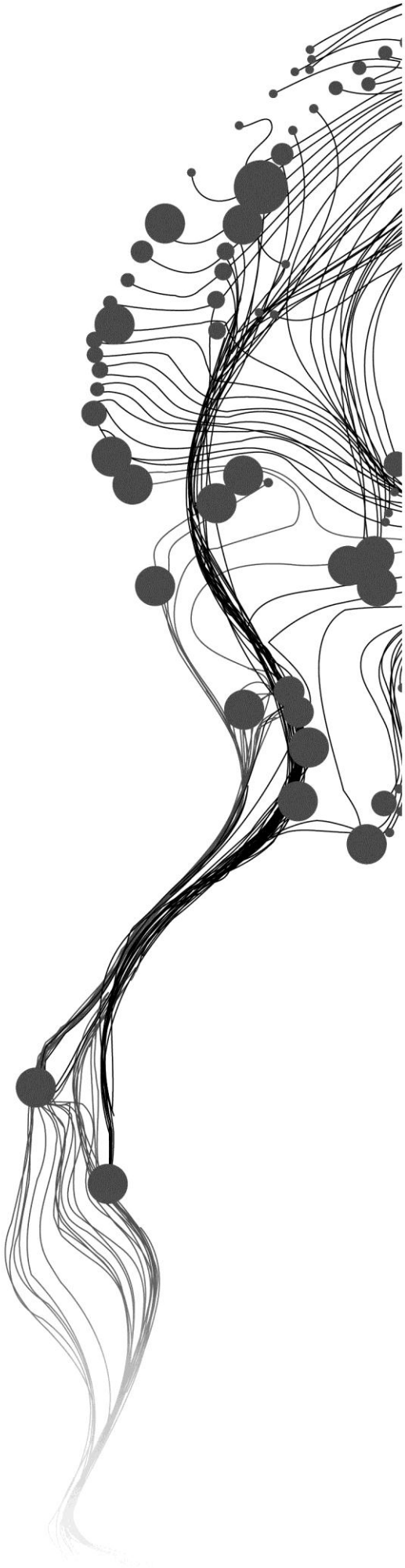

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ABSTRACT

Keywords: Walkability, Quality of Life, Subjective and Objective measures

Women garments workers in Dhaka, Bangladesh are captive users of walking due to financial constraints. The routes they use to get access to their job locations (i.e. garments factories) by walking are not very supportive for their mobility, which turns out to create social problem. The walking environment on these routes possesses problems concerning issues of safety, security, convenience, comfort and visual interests, which indicate that walkability problems of the routes are related to different aspects of their personal (individual) well-being. Individual well-being emerges from the quality of life concept, which deals with objective conditions and subjective perceptions of an individual. The objective condition describes the status of the particular geographical unit with which the individual interacts, while the subjective perception of that individual about that same geographical unit describes how they feel. Based on this approach, walkability of particular routes used by women garments workers have been measured first looking at the objective condition of the routes based on predefined objective indicators. The subjective perceptions of the women garments workers were next measured based on their satisfaction level about the previously measured objective conditions of the routes bearing in mind that they have different perceptions about walkability while going to their job locations in the morning as compared to coming back home at night. The subjective and objective measures have been evaluated as different levels of objective and subjective walkability. Besides, the subjective and objective levels of walkability issues related to their personal well-being have been evaluated. Individual well-being (i.e. Quality of Life) comprises of five life domains, i.e., physical, material, social, productive and emotional well-being along with several aspects under each domain. As objective and subjective levels of walkability of women garments workers are related to their personal well-being, it has been recognized from this research that issues related to different level of walkability are grounding impacts (both positive and negative)to the different aspects of above mentioned life domains of quality of life. This allows establishing the relationship between walkability and quality of life of women garments workers. This relationship appeared to be very significant due to its context. As women garments workers are vulnerable captive users of walking, the levels of walkability are clearly affecting their quality of life domains. Thus, improved walkability is able to improve their overall quality of life.

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1. INTRODUCTION

1.1. Background of the study

Walking is probably the most important form of mobility since every trip starts and ends on foot. Especially in developing countries walking is a major transport mode providing mobility to a high percentage of the urban population. For example in Dhaka, Bangladesh about 62% of daily trips are conducted by walking (Jönson, Tengström, & Tiwari, 2005). Especially the urban poor population makes their daily trips by walking as they have only few or no alternatives. Despite the hostile environment and unsupportive infrastructure provision these "captive users", i.e. the users who walk because they cannot use other mode of transport or have no choice (Jönson et al., 2005) due to affordability, seem ignored in most policy and planning for transport.

In Dhaka, a large number of people migrate from rural areas seeking for employment opportunities. Most of these migrated people involve themselves into the garments sector as unskilled labour where about 80% workers are women (Brooks, 2007). Either as a pushing factor (poverty) or pulling factor (opportunities) women are encouraged to work in this sector. As women garments workers are contributing their income to their family expenditure, their free movement, participation in household decision making is increasing (Salway, Rahman, & Jesmin, 2003). Their personal perception about their life quality and social well-being are much better compared to their earlier situation as they have a job and income now to sustain their livelihood (Mahmud, 2003). However, the condition of life of the women garments workers is not always adequate. As most of the women migrate from the rural areas, low paid, unskilled wage work is the common scenario followed by poor health, feeling of unsafe, unaffordable travel costs which are issues of concern that still require to be revealed (Salway et al., 2003).

Women garments workers also face various challenges within urban environment that come up with poor housing, poor communication support and social insecurity. In a survey study (Ali, Begum, Salehin, & Farid, 2008) 98.9% of the total respondents reported that transport/communication is the main problem for female garments workers. It is also reported that women garments workers feel unsafe due to the inhospitable environment in the street (Ali et al., 2008). In a focus group survey (Efroymson, 2012), it was told by the women garments worker that the way they pass everyday becomes blocked by construction materials, garbage and parking vehicles along with a rough surface which is not suitable for walk. Most of the time women have to walk on the road as there are no footpaths or sidewalks at all and are occupied by street hawkers and food vendors that reduce walking speed as well as comfort ability, even if some walk ways do not have man-holes and street light at night, which is indisputably an issue of safety and security (Efroymson, 2012). Working in garments for long time and coming back home by walking a long way late at night, they face problems like harassments, criminal activities etc. Despite of facing those problems most of the women garments workers have to walk for 4 to 5 km (Efroymson, 2012) every day because they have to save daily commuting costs to keep pace with their low wage and as they have no other options so far, they are "captive users" of the walk ways. These situations on the other hand grounds impact to their day to day life followed by their personal well-being. To elucidate their problems, it is essential to understand the surroundings of the walking routes they use to reach their job locations and also the linkage between walking route and personal well-being of users. Therefore, through this research an investigation has been conducted to understand whether the walking route they are using every day for going to the job locations is user friendly or not according to existing physical environment and their

feelings regarding personal perception. At this point, the concept of "walkability" emerges which characterize how a particular walking route is responsive to its' users considering not only the physical environment of the route but also how the person feel or perceive the surrounding environment while walking towards a destination. Personal perception reflects the personal well-being that expresses the level of satisfaction to individual level on a particular issue which relates the 'Quality of Life' concept. While walking, women garments workers perceive their own feelings about the surrounding environment in their own way based on which perceived walkability level can differ. If the level of walkability of walking routes changes based on their perceptions and objective conditions of walking environment considering time and space, an indication of connection between walkability and quality of life emerges. As a consequence of the fact, this research gave an insight on the different level of walkability based on time and space followed by an understanding as regards the relation between walkability and quality of life.

The different level of walkability of walking routes is troubling the smooth ease of access which as an important societal problem, deserves to be investigated. Walkability influences personal well being followed by the overall quality of life which in turn support the importance of establishing a relationship between walkability and quality of life. This research tries to find the relationship between different walkability levels and quality of life so that the policy implication regarding walkability level as well as the quality of life of women garments workers in Dhaka can be enhanced.

1.2. Research Problem

Though walking is an important mode of transport for captive users like women garments workers in Dhaka, Bangladesh, they are confronted with an unsupportive walking environment to go to their job locations and for coming back home. Problems regarding the walking environment are not only affecting the easiness and comfort of walking but also conveying impacts on their individual well-being. As different attributes of the walking environment have influences on the journey quality of women garments workers, this is also expected to have some consequences on their overall quality of life. Therefore, how the different states of walking environment are affecting the different aspects of their quality of life is an important issue to be examined. In this regards, the objective attributes of the walking routes used by women garments workers are essential to be examined but the satisfaction level of workers about their route is of equal importance to be understood. The condition of the walking environment (objective measures) and perceptions of the users (subjective measures) regarding walking environment assess the level of walkability of a particular route. The assessment is not only based on route observation but also on the users' feelings about it which in turn supports the quality of life concept. Using the quality of life concept to measure the level of walkability is a holistic way to understand the transport quality of life of women garments workers as well as its impacts on their overall quality of life. Women garments workers in Dhaka do not use other modes except walking due to financial constraints; therefore, the level of walkability of specific route is important to be investigated for being able to ultimately improve the walking environment to a more advanced level of walkability, hence, increasing their quality of life. Several researches have been done on women garments workers of Dhaka city but the level of walkability and the relation with quality of life has not been explored yet. Particularly, the route specific walkability has not been measured yet using quality of life concept based on time and space of a particular route. Therefore, this research will investigate both objective measures as well as subjective perceptions to analyse levels of route walkability for establishing a relationship with the perceived quality of life of women garments workers in Dhaka, Bangladesh.

1.3. Research aims and objectives

1.3.1. Aims

The overall aim of this research is to determine the relationship between walkability and quality of life of women garments workers

1.3.2. Objectives

a) To investigate the route specific walkability situation of women garments workers to reach to job locations
   - To identify the different walking routes used by women garments workers to reach to job location.
   - To investigate the physical environment of walking routes women garments workers are using for going to and coming back from job locations.
   - To query the personal perception of women garments workers about walkability in relation to quality of life.

b) To analyze the level of walkability of different walking routes used by women garments workers to reach to their job locations.
   - To analyze the subjective measures of walkability of the walking routes.
   - To analyze the objective measures of walkability of the walking routes.
   - To analyze the perceived impression of women garments worker about walkability and quality of life.

c) To understand the relation between walkability and quality of life by comparing variations in walkability
   - To analyze and explain the variation of subjective and objective walkability of different routes
   - To distinguish the variation of walkability level based on day time and night time.
   - To analyze relation between walkability and quality of life of women garments workers based on subjective and objective measures and life domains.

1.4. Specific objectives and questions

Table 1-1 Research objectives and question

Specific objectives	Research questions
a. To identify the different walking routes using by women garments workers to reach to job location	Which are the existing routes women garments workers using from home to job location and from job to home at day and night time?
	What is the spatial distribution pattern of the existing routes?
b. To investigate the physical environment of walking routes	What are the objective indicators of investigating walking environment of walking routes?
	What is the status of walking environment along walking routes according to indicators?
c. To query the personal perception of women garments worker about walkability in relation to quality of life	What are the subjective indicators regarding personal perception about walkability?
	What is the personal opinion about walking environment of different walking routes based on time (day and night)?
	What is the significance of good walkability in their quality

Specific objectives	Research questions
	of life?
d. To analyze the route based walkability	What are the reasons behind choosing existing/alternative routes in different time (day and night)?
e. To analyze the objective measures of walkability	What are the segment scores of objective walkability of different routes?
	What are the levels of walkability per segment according to objective measurement?
f. To analyze the perceived impression of women garments worker about walkability and quality of life.	What are the differences of walkability during day and night time?
	What are the subjective and objective dimensions of QoL related to walkability of women garments workers?
	Which life domain aspects of quality of life are related to different level of walkability?
g. To analyze and explain the variation of walkability score among different routes	What are the impacts on walkability levels for choosing different routes by workers?
h. To distinguish the variation of walkability scores based on time (day and night)	What is the impact of different time (Day and Night) on walkability level of different routes?
i. To analyze relation between walkability and quality of life	Which life domains of overall quality of life are related to the different level of walkability?
	Is the relationship between walkability and quality of life really significant?

1.5. Conceptual framework

The conceptual framework has two main concepts. One is 'walkability' and the other one is 'quality of life'. The conceptual framework (Figure 1-1) is representing the main idea of the research where walkability of the routes of the women garments workers from their home to job location and coming back to home has been measured following principles of the concept of quality of life. Quality of life reveals individual well-being which combines both subjective and objective measures. Women garments workers are a captive group who do not use other modes of transport except walking to their job location, therefore, the status of walking environment or walkability determines how supportive the walking routes to get access to their destinations. However, from the background of the study it is found that, walkability of walking routes to job locations of workers are not satisfactory; therefore, the level of walkability of walking routes needs to be analyzed from the perspective of women and also from the status of walking environment.

Objective walkability attributes (i.e. quality, access, affordability, safety, choice of routes etc.) and subjective walkability attributes (i.e. level of satisfaction regarding safety, security, pleasant and unpleasant experiences etc.) are employed to investigate the walking routes women garments workers used while going to job location at day time and coming back from job places to home at night. They sometime preferred different routes during day and night. Therefore, alternative route choice in some cases has been considered as well to understand the level of walkability. It is anticipated that different levels of walkability have an influence on the quality of life of garments workers and diversified level of walkability affects some life domains which consecutively establishes relationship between walkability and quality of life.

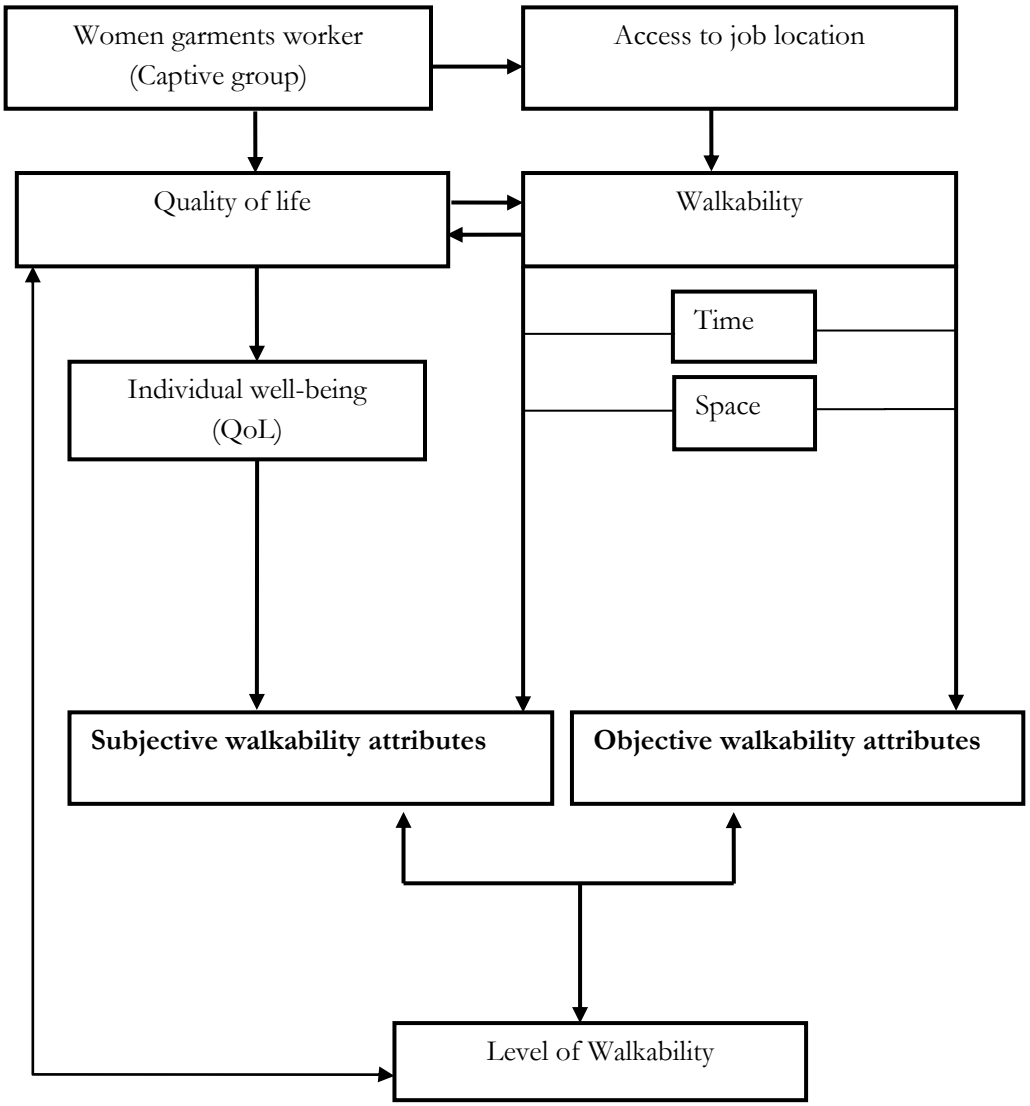


Figure 1-1 Conceptual framework of the research

Source: Adapted from Marans (2003) and modified by author

In the following report, the entire procedure of investigating level of walkability and establishing relationship between walkability and quality of life has been conveyed. In the first chapter background of the study has been demonstrated to classify the research problem and conceptual framework has been outlined. In the second chapter, conceptualization of the terminologies along with main themes of the research has been discussed. The third chapter contains the explanation of methodological approaches along with case study description. The fourth chapter represents the investigation of level of walkability based on space and time. The fifth chapter articulates the communication with outputs from methodological approaches to establish the relation between walkability and quality of life. The sixth chapter establishes the contextual significance of the relationship. In the final chapter policy implications, limitations and future direction of the research has been discussed.

2. CONCEPTUALIZING QUALITY OF LIFE AND WALKABILITY

2.1. Quality of life

The concept 'Quality of Life' (QoL) has widely explored in several disciplines, i.e. Medicine, Psychology, Behavioural Science, Social Science, Environmental Science, Political Science and so on (Costanza et al., 2007). However, each discipline has provided some different context to explore quality of life concept, for example, in social and political science the quality of life is concerned at society, people or environment whereas in medical or behavioural science the quality of life concept is more concerned at individual level (Rapley, 2003).

The term 'Quality of Life' generally assesses the overall experiences of human life (Costanza et al., 2007) and it can be expressed through a certain situation where individual or collective life preferences and priorities can be dealt with (Higgins & Campanera, 2011). The first definition has described the overall life experience where the second one mentioned about preference and priorities that comprises quality of life.

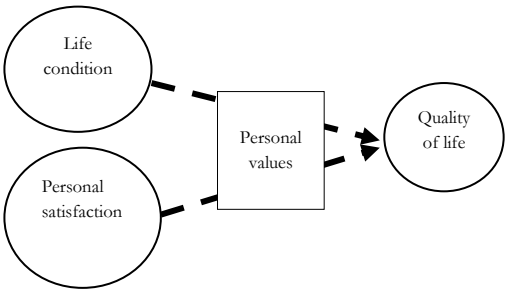


Figure 2-1 Concept of defining Quality of Life

Source: David Felce and Perry (1995) P:55

A bit more specific definition was given by David Felce and Perry (1995). According to David Felce and Perry (1995) P:55, "Quality of Life can be defined as a combination of Life Conditions and Satisfaction weighted by Scale of Importance" (Figure 2-1). A conceptual and operational definition about quality of life has been proposed by Church (2004) P: 20, "Quality of Life is a measure of an individual's ability to function physically, emotionally and socially within their environment at a level consistent with his/her own expectations." This definition has outlined the link of quality of life with life domains, and subjective and measures. There have many definitions about quality of life which are not widely accepted, however, most of the scholars have agreed upon that quality of life is multidimensional having subjective and objective attributes (Rapley, 2003; M.J. Sirgy, Efraty, Siegel, & Lee, 2001).

Quality of life has also been described by three different philosophical approaches where first, second and third approaches are based on particular philosophy, preference and individual experiences respectively based on good life (Diener & Suh, 1997). According to Diener and Suh (1997) the third approach is 'subjective well-being' approach which considers factors like pleasant affect, unpleasant affect and life satisfaction where affect means pleasing or unpleasing circumstances and satisfaction means personal evaluation of both affective and cognitive circumstances on the degree of satisfaction with life. Therefore, analysing subjective well-being is an essential element to clarify the quality of life. However, only subjective well-being is not enough for a proper understanding of quality of life. Diener and Suh (1997) mentioned three reasons for which researchers came across to other approaches in associate with subjective well-being approach for conceptualizing quality of life. First reason is economic progress (which is considered as an important QoL standpoint for policy makers) does not consider safety or absence of crime aspect; second reason is people always might not be happy with what they want and the third reason is that market analysis overlooks important elements like love, self-development which are important to

influence the quality of life (Diener & Suh, 1997). Therefore, another approach called 'social indicators' has added with subjective well-being to define and measure overall quality of life. Social indicators are evolved as the measurements of people's objective conditions in a specific geographical entity considerably based on objective quantifiable information in a wide range of social domains, for example, health or crime (Diener & Suh, 1997). However, Schneider (1975) indicated that cumulative social indicators cannot always provide the whole picture of the society. According to Diener and Suh (1997), P:207, "Social indicators and subjective well-being measures are complementary" therefore, effective to measure together. However, Campbell et al. (1976) identified that the correlation between social indicators and subjective well-being is not very strong. But, using the both measures in parallel is effective methodologically as because both measures provide optional views in different aspects of well-being of different domains (Diener & Suh, 1997). Consecutively, 'subjective well-being' and 'social indicators' measurements are subjective indicators and objective indicators respectively.

According to M. J. Sirgy et al. (2006), personal feelings, opinions, beliefs, attitudes etc define subjective indicators whereas things which can be observed and measured comparatively in a straightforward way are identified as objective indicators. For example, satisfaction with one's safety is subjective measures but number of crimes happens in the area one lives in is objective measure. In the case of subjective indicators, Campbell et al. (1976) emphasized satisfaction level to assess subjective quality of life as it is more expressive to present 'life as a whole'. Moreover, Life satisfaction considers reflective experiences and realistic views for policy makers, therefore, seems to be more accepted concept to more researchers (Marans, 2003). Besides, person himself is the expert evaluator of his own quality of life based on subjective well-being by measuring degree of satisfaction (Noll, 2002). Regarding objective indicators, objective characteristics or condition of the place has been taken into account which in turn considered as evaluator (Kahneman, Diener, & Schwarz, 2003). Subjective indicators are also demonstrated to some scholars as people's 'want' whereas objective indicators were considered as 'need' and sometime as 'want' (Diener & Suh, 1997). Both measures have some shortcomings to provide the full picture of the situation. Diener and Suh (1997) pointed out the strength and weakness of objective and subjective indicators (Table 2-1) and made an argument that the combined use of subjective and objective indicators can possibly give alternative statements and information which is useful in methodological aspect but policy makers might find the provided information little diverged. Policy makers rely on objective indicators mostly, therefore, adding people's perception measure such as measure of satisfaction with overall life or life domains help to understand them what people really want which in turn accomplish the overall quality of life assessment (Diener & Suh, 1997).

Table 2-1 Strength and Weakness of Subjective and Objective indicators

	Strength	Weakness
Objective indicators	Does not rely on perceptions therefore, easily definable	Does not give any idea about subjective issues like crime or safety
	Comparable in a big scale like nations, regions etc.	Influenced by subjective assumptions
	Confines such societal qualities not addressed in subjective well being	Does not reflect individual well being
Subjective indicators	Define perception that influence individual well being	Dynamic responses of individuals
	Valid measurement instruments	Does not have reflection on objective condition
	Modifiable and comparable across domains	Problems regarding scale of importance

Source: Diener and Suh (1997)

Campbell et al. (1976) also mentioned about the importance of context regarding quality of life as context is the real condition of the particular phenomena which depends on one's own perception. For example, urban quality of life shows the urban liveability which in other way indicates the exact condition or objective attributes related to urban living environment and perception of urban citizen on their liveability (Marans, 2003; Pacione, 2003). As quality of life also comprises different life domains, overall quality of life assessment, therefore, requires domain satisfactions as well. In this regard, Campbell et al. (1976) showed that subjective attributes, in other word people's perceptions can be reflected into specific domain satisfaction as it has influence of objective attributes (Fig 2-2). However, the concept does not necessarily give any strong empirical evidence of objective and subjective indicators measurements (Schwarz & Strack, 1999) but represent an evidence to explore relationships between subjective and objective indicators with the domains and overall life satisfaction to understand the context and meaning of quality of life.

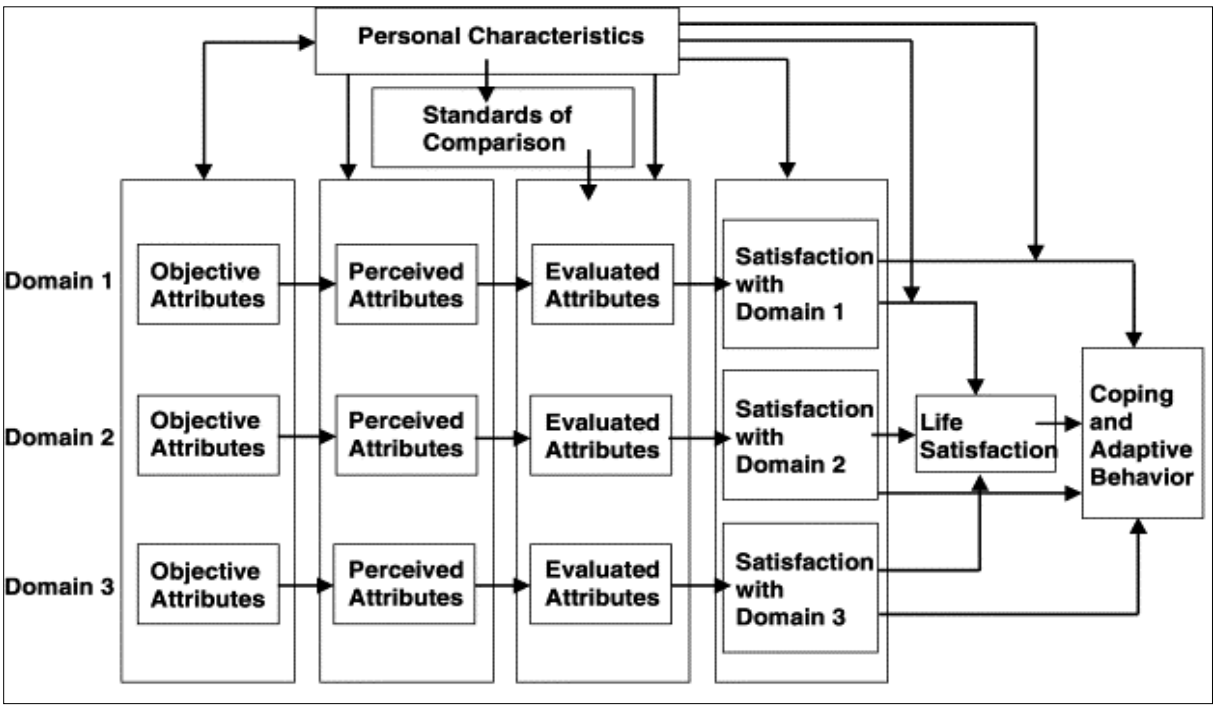


Figure 2-2 Relation between subjective and objective attribute and domains

Source: Campbell, Converse, and Rodgers (1976), P: 16

Quality of life has several domains to understand different aspects of overall life satisfaction that focused on several literatures. Community safety, Health/social well-being, Environment, Economic well-being, Community cohesion, Housing, Education/Life-long learning, Culture & leisure, Transport, People & Place have been selected some major domains for sustainable quality of life (Higgins & Campanera, 2011). There are seven core domains in quality of life: Material well-being, Health, productivity, Intimacy, Safety, Community and Emotional well-being (Cummins, 1996). David Felce and Perry (1995) did a literature review of several articles of social science, psychology, urban studies and medical science about quality of life domains and came out with a quality of life core domains model along with several aspects (Table 2-2).

Table 2-2 Quality of life domains and major aspects

Core Quality of Life domains	Major aspects
1. Physical well being Effective physical response related to particular activities which sometime overlaps to productive well-being and neighbourhood quality.	• Health • Fitness • Mobility

Core Quality of Life domains	Major aspects
	• Personal safety
2. Material well being Material well-being relates everything associated with income and includes living environment quality to economic security along with access to transportation as transportation ensures the connection of person to social, work, leisure etc. pursuits of well being	• Finance/income • Housing quality • Privacy • Possessions • Meals/foods • Stability/tenure • Security • Neighbourhood • Transport
3. Social well being Social well-being concerns about person's relation with people in home and outside home and also relation with community where person's response level reflects about the services or infrastructures or other aspects that community offers.	a) Interpersonal relationships • Family/household life • Friends and social life • Relatives b) Community involvement • Activities and events • Acceptance and support
4. Productive well being Productive well-being reflects person's ability, competence on skill and experience and independence to choice or control in different aspects.	• Competence/independence • Job • Home life/housework • Leisure/hobbies • Education • Choice/control • Productivity/contribution
5. Emotional well being Emotional well-being mainly concerns about the mental state of affairs which includes degree of satisfaction in different aspects of social, environmental activities.	• Positive affect • Status/respect • Satisfaction • Fulfilment • Self esteem • Faith/belief

Source: D. Felce and Perry (1997), P: 57 David Felce and Perry (1995), P: 61

The Table 2-2 is based on overlapping of different journal sources and pragmatically classified by the literature contents which showed considerable agreements between different literatures about multidimensional concept of quality of life (David Felce & Perry, 1995). In this table, the quality of life core domains are five in number; Physical, Material, Social, Productive and Emotional Well Being which have been considered for individual well-being (David Felce & Perry, 1995).

The quality of life research and approach have been evolving recently to examine different phenomena such as Neighbourhood Quality of Life (Reisig & Parks, 2000), Urban Quality of Life (Das, 2008; Pacione, 2003; Schneider, 1975; Van Kamp, Leidelmeijer, Marsman, & de Hollander, 2003), Work Quality of Life(M. Joseph Sirgy, 1991; M.J. Sirgy et al., 2001), Transport Quality of Life (Carse, 2011) and so on. Therefore, Quality of Life can be referred to as individual well-being to a particular attribute or phenomena considering aspects of life domains (well beings).

Transport Quality of Life concept is based on the principles of quality of life research where experience of journey on public transport evaluates in a form of user's experience during travel (Carse, 2011). Walk is an important mode of transport whereas walkability considers the status of walking environment that is

physical environmental condition and also how a user perceives it regarding level of satisfaction which consecutively part of Transport Quality of Life concept. As Transport Quality of Life analyses user's travel experience and perceived issues of a person's trip (Carse, 2011), walkability has the same concern. Besides, walkability can be evaluated by measuring objective indicators of walking environment too where perception of its user about the walking environment has to be taken into account.

In this study, the level of walkability has been measured for specific route used by women garments workers of Dhaka city where objective indicators have been measured to evaluate the walking environment of specific route and subjective indicators have been evaluated considering the perceptions of women about particular walking route. The context of women garments workers and their level of walkability in different walking routes are highlighted based on time (Day and Night), space and alternative route choice. Combination of subjective and objective indicators requires the use of mixed methodology considering context and location of specific group or individuals. Therefore, in this regard, conceptualization regarding subjective and objective measures needs to be explored bearing in mind that walkability regarding quality of life concept is comparatively new aspect for any specific group in any specific context. Quality of life measurement is essential for taking rational decisions regarding any context specific social problem specially where people and environment mutually interact (Bergsma & Engel, 1988). Therefore, this study intended to reflect the quality of life measurement concept to measure different level of walkability.

2.1.1. Transport Quality of Life

Transport quality of life quantifies the experience of travellers during their travel by a specific travel mode (Carse, 2011). The idea of linking transport with quality of life is not new. Previous studies have been done on transportation contribution to quality of life (Carruthers, Lawson, & Inst Civil, 1995) and how transportation patterns are related to quality of life (Kouchi & Lever, 2000). Quality of life and transport has been associated together to understand the travel pattern of traveller and also the details of the journey.

Carse (2011) has presented a Transport Quality of Life model where several factors of transport are combined with Quality of Life in a holistic way. However, Transport Quality of life in Carse (2011) study is entirely a subjective evaluation on three transport mode i.e. Light rail transit, bus and train (Carse, 2011). Being an important transport mode, it is necessary to evaluate walking as well. Transport quality of Life provides a basic conceptualization considering basic dimensions of Quality of Life where access and availability, environment, safety, transport cost and sustainable transport are important factors (Carse, 2011). Considering these factors, sustainable transport includes walking quality, (Carse, 2011) therefore, walkability of walking environment as an important performance measure which combining with quality of life concept can develop the walkability aspects in overall life satisfaction.

2.2. Walkability

Walking is an interactive mode of transport for experiencing an adjacent environment and interacting with society, which is not possible for other transport modes (Wey & Chiu, 2012). According to Wey and Chiu (2012), traffic congestion, environmental pollutions are emerging problems in many areas, which in turn reasons of increasing urban sprawl. Therefore, it was found that walking as a means of transport has positive implication towards solving these problems (Wey & Chiu, 2012).

Walkability is emerging a concept of new urbanism in planning as many communities are becoming less walk-able due to increasing dependence on other transport modes except walking (Azmi & Karim, 2012). As an active transport mode, walking is an effective alternative mode which can be merged with life style and also can do a lot of benefits by reducing traffic congestion, pollution, noise, transport cost,

infrastructure cost, space requirements etc.(Moniruzzaman & Páez, 2012). Walkability as a concept explores the extent of conduciveness of the built environment for walking (Lwin & Murayama, 2011). Walkability can be expressed as a dimension of built environment that influence walking behaviour where the characteristics of the environment may have a positive or negative impacts to its users during a journey (Eva Leslie et al., 2007). Walkability is a suitable situation, a road environment can offer so that pedestrian will be able to walk in the entire urban road network to reach their destinations (Galanis & Eliou, 2011). Many macro level non-design determinants based on urban form like residential density, land use diversity or pedestrian friendly design of neighbourhoods (Gallimore, Brown, & Werner, 2011) are playing a significant role next to design attributes and factors of the pedestrian path itself. Many studies (Dyck, Cardon, Deforche, & De Bourdeaudhuij, 2011; Hoehner, Handy, Yan, Blair, & Berrigan, 2011; Eva Leslie et al., 2007; Eva Leslie et al., 2005) have been done about neighbourhood walkability in social science, health and environmental studies. On the contrary, little attention is given to street level walking environment though policy makers, planner, engineers are concerned to encourage people to walk more (Gallimore et al., 2011). Accordingly, to understand pedestrian's travel behaviour and street level experience, a micro level audit is more clear-cut than macro level determinants of neighbourhood level (Gallimore et al., 2011).

Walkability can also be defined as the combination of factors like presence of walking facilities along with safety, feeling comfortable while walking and convenience comprises significant issues of walking environment (Litman, 2003). In this case, walking facilities refer pedestrian facilities like sidewalks, street lights, safety refers to personal safety or traffic safety, comfort refers trees or benches and convenience means connectivity and accessibility (Shay, Spoon, Khattak, & Center, 2003). The key factors of walkability demonstrate that walking activity considers walking environment and walking behaviour of users. Walking activity can be divided into two areas; one is opportunity and the other one is motivation (Table 2-3) where opportunity as an external factor consists the built and natural environment providing safety, comfort, convenience of walking and motivation, which is based on motivations of person of different age, profession, life style and so on along with behaviour, attitudes and preferences (Shay et al., 2003).

Table 2-3 Factors influencing walking activity

Opportunity (external)	• Distance • Weather • Topography • Cost—time and money to travel • Traffic volume and speed • Other factors (e.g., dogs, crime)	• Infrastructure o Pedestrian facilities (presence, condition) o Access—proximity to destinations o Access—connectivity o Transportation alternatives o Street lighting
Motivation (personal)	• Physical condition (age, health) • Family circumstances (life cycle) • Cultural (ethnic, social, peer group) • Education (formal and informal) • Profession	• Habits, attitudes and values o Personal value of time o Personal value of money o Personal value of exercise and health o Personal value of independence o Personal appreciation of nature

Source: Shay et al. (2003), P:4-5

Proper design of a pedestrian environment is an important aspect to increase the quality and quantity of walking, therefore, walkability (Kelly, Tight, Hodgson, & Page, 2011), which in turn, stresses the importance of understanding the level of walkability of specific route. Walkability levels differ within and between urban areas and cities. The level of walkability differs due to design attributes of the street environment; however, some other factors like economic, cultural, topological factors are also responsible for making differences (Galanis & Eliou, 2011). Walkability can be measured objectively by measuring the difference between standard service provision and existing service provided and can also be measured subjectively by asking people's perception about design attributes of street environment. Besides, personal perception as subjective measures considering degree of satisfaction needs to be examined because satisfaction level of users helps to understand the performance of the walking environment in turns how walk able the street or walking route is. Besides, it also indicates to what extent user of the route is satisfied with the provided objective conditions.

For walkability measurement, global walkability index has been developed which describes five components and 14 variables where indicators have been evolved from different variables (Krambeck, 2006). Global walkability index mainly focuses issues related to walking environment where safety, security, convenience, visual interest and comfort level take into account (Krambeck, 2006; James Leather, Herbert Fabian, Sudhir Gota, & Alvin Mejia, 2011). However, these indicators are mostly about objective condition of the walking environment, therefore, efforts mostly has been contributed to the design based path walkability measurements (Park, 2008). Subjective perception addition to global walkability index would be useful and effective to accomplish the walkability measurement in a quality of life perspective which has been tried through this research.

In this study, the measurement of walkability has been designed on an individual perspective following the principles of Quality of Life where subjective measures and objective measures are investigated to clarify individual's walking experience considering perception, feelings, response about physical environment of walking route itself. In addition, this research has considered the global walkability index indicators and component to determine the objective conditions of the walking environment where subjective indicators have been developed following these indicators followed by other issues evolved from literature review.

2.2.1. Domains of quality of life and walkability

Improved walkability enhances to mitigate congestion, increase physical activity, reduce obesity and other health related diseases, develop community living quality and encourage to conserve green environment (Blanco et al., 2009). Core domains and aspects of quality of life have been discussed previously. The impacts of walkability on different life domains and aspects (see Table 2-2 in section 2.1) have been indicated below:

- **Impacts of walkability on physical well being**

Study shows that changes in urban environment influence travel behaviour of individuals (Krizek, 2003), specially walking activity can be directly influenced by changing environment (Sallis, Bauman, & Pratt, 1998). Walkability is increasing its essentiality in sustainable mobility (Leyden, 2003) by signifying walking an active transport mode for individuals. Beside, walkability impacts in personal safety based on pedestrian perceptions assessments (Emo, Funke, & Matthews, 2011). Also, low quality of walking environment increases personal health risk but improved walking environment decreases it (Frank & Engelke, 2005). The major aspects of physical well-being is personal health and fitness, safety and mobility, above statements are verifying those issues related to walkability.

- **Impacts of walkability on material well being**

Walkability has various benefits economically including accessibility, cost savings of consumers and economic cost savings of publics (Litman, 2003). Van Kamp et al. (2003) emphasizes that physical mobility and transport has strong relation with material well-being based on space and time context, for example, physical mobility by walking is saving money and also socio economically deprived people cannot bear transport cost; which in turn supports the arguments related to walkability impacts on material well-being. Advance level of walkability concerned on personal security in streets whereas poor walk-able streets increase the issues of feeling unsecured for losing valuable belongings. Major aspects of material well-being are related to financial related issues along with personal security and transport which are affected by different state of walkability.

- **Impacts of walkability on social well being**

City officials think neighbourhood will be safe and popular by improving walking environment where social equity advocates think improve walking environment can provide environmental equity to all kinds of people with different social economic condition (Brown, Werner, Amburgey, & Szalay, 2007). Again, environmentalists think improved walking environment will discourage unnecessary built environment alternatives and new planners require improved walking environment to fabricate a sense of community (Brown et al., 2007). All these social groups indicate that how walkability is important for interrelationship and community development, the two major aspect of social well-being which establishes the argument.

- **Impacts of walkability on productive well being**

Study has found that pedestrian friendly walking environment enhances accessibility to job location (Zhang, Shen, & Sussman, 1999). Moreover, being in a good walk-able environment, the user (here children) perceives it as a place of enjoyment which has good effects on her working life (O'Brien & Tranter, 2006). Productive well-being has several aspects among which walkability has impacts on job accessibility, job productivity and leisure.

- **Impacts of walkability on emotional well being**

Perception influences level of satisfaction so that it effects on mental well-being like stress, anxiety etc as well (E. Leslie & Cerin, 2008). In relation, if people get stressed every day, mental well-being can be seriously affected and which happens to users of walking routes too. Psychological or emotional well-being is related to positive effects of lightings, parks, road crossings, traffic safety etc. of the street (E. Leslie & Cerin, 2008). Moreover, access to different places enhances good mental health and socialization but traffic, crime on street generates stress, fear, anxiety, therefore, poor mental health. (Sullivan & Chang, 2011). Therefore, emotional well-being is closely related to walkability.

2.3. Relation betwenn walkability and quality of life

Transport is an essential domain of quality of life (Higgins & Campanera, 2011) which is also considered as a major aspect of material well-being (core domain) (David Felce & Perry, 1995) therefore, is associated with Quality of life. Again, quality of life is correlated with subjective well-being, which can be influenced by transport. Delbosc (2012) has developed a conceptual model where subjective well-being is influenced by three major components of transport, i.e. accessibility to activities, mobility and physical infrastructure as shown in the Figure 2-3. Walking is a means of access to other transport modes, consecutively, the main means of mode for some population segment for whom walking is compulsory (Bostock, 2001). As a means of transport, walking is supported by dedicated infrastructure which ensures mobility and accessibility (Delbosc, 2012). Being a means of transport mode and also being a transport mode itself, walking can help to link transport and land use for enhancing walkability of the walking environment. Therefore, walkability constitutes an important part of sustainable transportation which in turn have influence on subjective well-being based on the theoretical model (Figure 2-3).

According to Galanis and Eliou (2011), walkability has impact on quality of life in a positive way where they pointed out that the built environment is enabling walking. Some built environment is walking friendly, others are not because of neighbourhood characteristics or physical environment of walking routes. Walkability is an important performance measure to determine the state of frequent movement to get access to activities and services. In this research, ease access to job locations for women garments workers would save their time, money and physical stress which in other way can make their life trouble-free and comfortable towards improving their transport quality of life. Transport quality of life in other way supports the possibility that it has link to overall quality of life. In several 'quality of life' related journals and health journals (Forjaz et al., 2011; Friedman, Parikh, Giunta, Fahs, & Gallo, 2012; Eva Leslie et al., 2007) represented the association between walkability and quality of life, specifically considering health and environmental issues at the neighbourhood scale have been revealed.

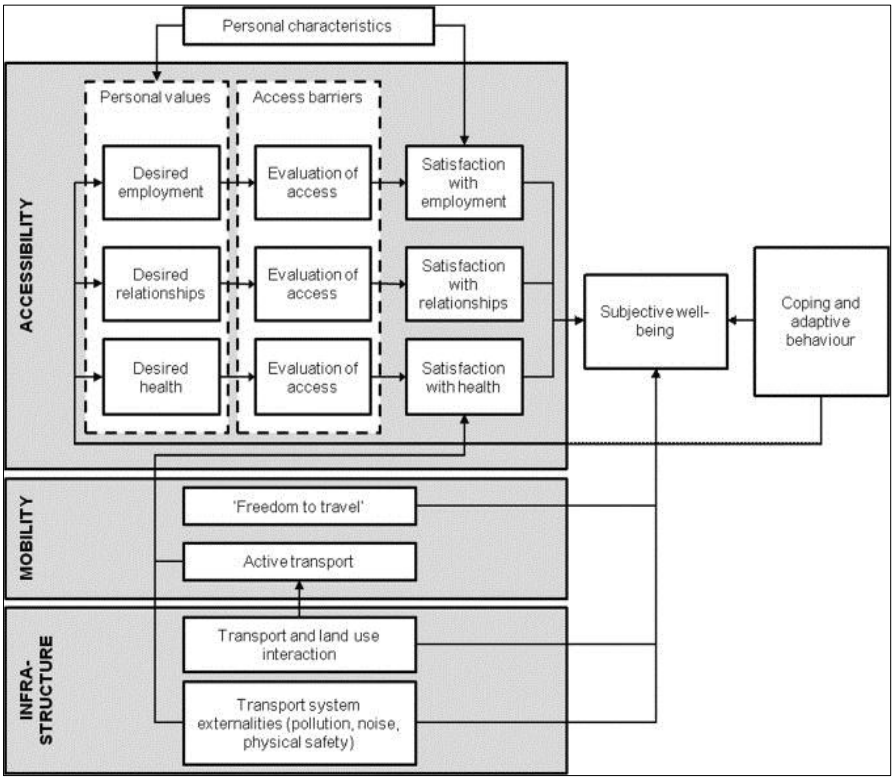


Figure 2-3 Theoretical model of transport's influence on subjective well being
Source: Delbosc (2012), P:29

According to Rogers, Halstead, Gardner, and Carlson (2011), walkability enhance the social capital which is a key component of quality of life. Walkability is relevant to increase mobility and to get access to opportunities where mobility has connection with individual's independence, well-being (Spinney, Scott, & Newbold, 2009). Accordingly walkability increases accessibility to enhance social interactions that in turn is useful for one's need and also social and emotional well-being (Spinney et al., 2009). Accessibility as a dimension is a vital element to assess quality of life phenomena, however, subjective and objective approach regarding interpretation of places are still facing scale of measurement problems (Lotfi & Koohsari, 2009).

As improved walkability enhances mobility as well as accessibility to destination as a part of sustainable transport and transport quality of life (Carse, 2011), shifting to environmental pollution free modal share like walking, along with some policy measures like combining trips and route choice can help to improve the quality of life and accessibility to destination (Steg & Gifford, 2005). It is also found that the relation between walkability and quality of life is identified for general people (Efroymson, 2012), but not for a specific focus group (in this case women garments workers), however, study reveals that travel behaviour is closely related to socio economic situation of people where socio economic condition defines the choice

of transport mode according to trip purpose (Pucher & Renne, 2003). Besides, Pucher and Renne (2003) in their study showed that regarding walking mode there have differences between man and woman based on their trip purpose where women are more likely concerned about travel time, therefore, comparatively unwilling to take walking mode. According to Bostock (2001), in addition to positive effect of walking, walking mode is compulsory for a certain group of population and source of mental and physical stress as well such as poor woman. Therefore, improve walkability have good possibilities to help them recover those kind of stresses and improve their mental, physical and social well-being which in turn reflects the domain satisfaction in overall quality of life experience.

A specific trip can influence a traveller's sense of well-being as the experiences of travel has negative and positive effects considering different domains like work life, safety and health life, financial life etc. (M. Sirgy, Kruger, Lee, & Yu, 2011). According to M. Sirgy et al. (2011), travel behaviours influence life domains so as individual sense of well-being. Accordingly, they mentioned:

"Affective responses to events related to any major activity are stored in a life domain reflecting that activity. For example, people react emotionally to many events related to driving their vehicles (major activity) and store the positive and negative effect in a life domain reflecting personal transportation. Within each life domain, positive affect is enhanced (and negative affect is reduced) with satisfaction of the full spectrum of human developmental needs. ...." (M. Sirgy, Lee, & Kressmann, 2006), P: 339

The statement above is directly describing the travel behaviour that reflects to life domains of quality of life regarding personal transportation and considers satisfaction level as need for human development which also give an impression that different state of walkability has impacts to particular life domains (transport domain) and therefore, in the overall quality of life. From the previous section (see 2.2.1 section for more details), it has also been explored that walkability has impacts to different life domains of overall quality of life.

Therefore, this research has extended the quality of life indicators particularly for route walkability and established relationship by linking those indicators with life satisfaction domains. In this research walking is considered as means of transportation for women garments workers in Dhaka city where walkability is considered as the performance measure of satisfaction level about walking routes followed by life domains of individuals. The relationship between walkability and quality of life is not explored yet for specific means of transport within a specific group in a particular context which deserves to be investigated because subjective and objective measures differ according to personal perception or satisfaction level and the impacts and relationship scenario must be different to different focus groups of different contexts.

2.4. Captive users, gender perspective and vulnerability of women garments workers in Dhaka

"Captive users" are those who only walk instead of using other modes of transport as they have no choice (Jönson et al., 2005) due to affordability. They can be considered as captive pedestrians as well include four categories of people: young, old, poor and handicapped (Russell, 2010). Some pedestrian have choices to choose alternative transport mode but captive pedestrian does not have choice as they cannot afford the alternative mode cost or do not have any access to alternative transport modes (J. Leather, H. Fabian, S. Gota, & A. Mejia, 2011). Bostock (2001) demonstrates that there have a segment of population, she specifically mentioned about poor women, for whom walking is a compulsory transport mode as they are under low income socio economic group and unable to afford other transport mode costs. In this statement, the definition of captive user has also been revealed based on socio economic condition.

Bostock (2001) also documented that parting from getting benefits, walking is a source of mental and physical stress as well for the poor women group.

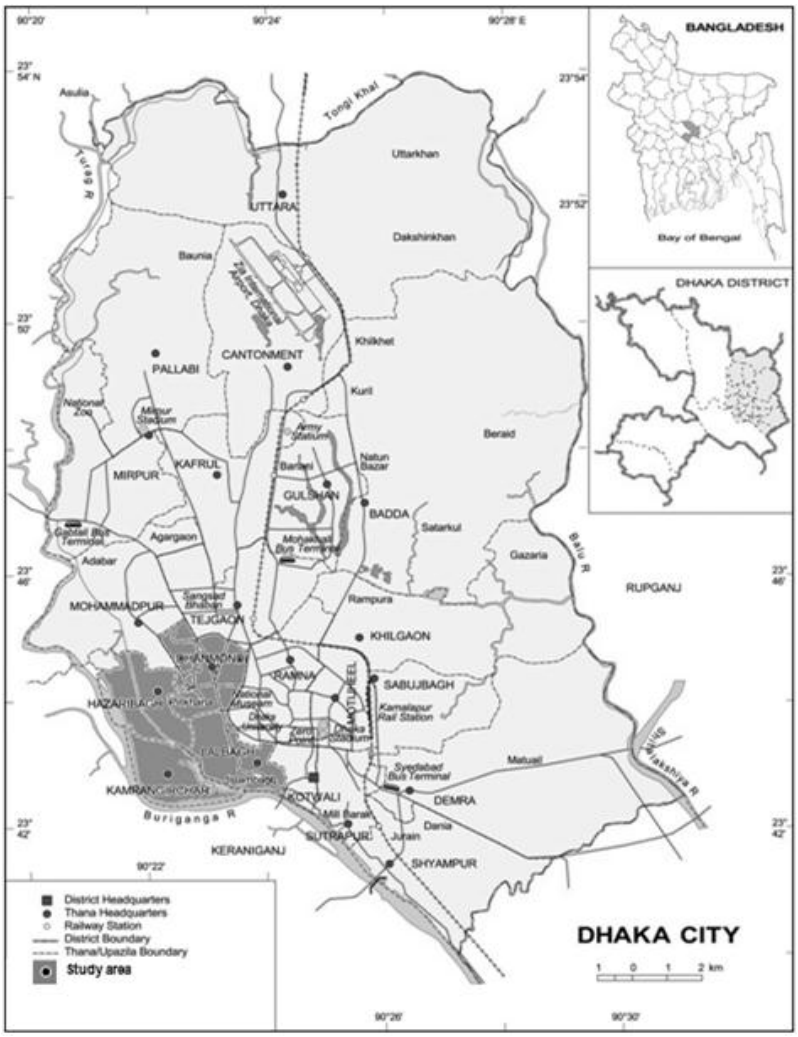
According to Sham, Soltani, Sham, and Mohamed (2012), there are differences in travel behaviour between men and women where women are considered as vulnerable group due to their high risk of becoming victim while travelling. They also studied that younger women is more vulnerable on the issue of safety and security while travelling. Women while travelling is more concerned about personal safety which has been found a significant transport issue (Abraham, 1998). According to Abraham (1998), working women get less time to do their activities therefore, convenience is the important factor for them as well. Therefore, Root and Schintler (1999) argued that travel related modelling and forecasts should be initiated focusing on women travel pattern due to increasing mobility of working women which is also an important part in urban transport planning. In previous section (section 2.3) it was stated by Pucher and Renne (2003) that women due to time factor are unwilling to walk but the choice of transport mode depends on socioeconomic condition. Therefore, it can be concluded that poor women, though are unwilling to travel by walking (considering exceptions), are a segment of population who has to walk compulsorily are a captive vulnerable group based on economic, physical and their perceptual point of view.

Based on above statement, women garment workers in Dhaka, Bangladesh also falls under this group who are vulnerable captive users of walking mode use their particular routes towards their job locations. The livelihood studies (Ali et al., 2008; Kibria, 1995; Mahmud, 2003) about women garments workers of Dhaka showed that women garments workers are vulnerable in respect to their mobility, living standard, physical and mental assault and poor economic condition. Efroymson (2012) mentioned this captive group as vulnerable in respect to their walkability. However, route walkability assessment of this particular group has not been explored yet, therefore, this research has intended to investigate their walkability of particular routes they used to get access to their job locations followed by establishing a relationship between their walkability and their overall quality of life.

3. HOW TO MEASURE WALKABILITY

3.1. Case study area

The field work of the research has been conducted in the capital city of Bangladesh named Dhaka. Dhaka is a densely populated megacity with 16 million people on 360 square kilometres (latitude 23°43′N and longitude 90°24′E). Dhaka is facing various kinds of problems related to megacities due to its rapid growth (Salam, Mamoon, Ullah, & Ullah, 2012). Therefore, environmental sustainability as well as socio economic sustainability have failed to keep pace with rapid urbanization to date (Dewan & Yamaguchi, 2009). The surveys were done in four areas of the city, i.e. the four Thana's named Hazaribagh, Dhanmondi, Lalbagh and Kamrangir Char.



Map 3-1 Case study area in Dhaka city

Hazaribagh Thana: This is a 1.5 sq km urbanized area (another portion is rural area) with a population of 55,338 where 57.12% male and 42.88% female mainly working in agriculture, wage labour, service, construction and land use consists residential and agricultural land (Banglapedia, 2010). This area has 28 garments industries, 5 ice cream factories, 17 bakeries and 56 tanneries (Banglapedia, 2010)[1].

Dhanmondi Thana: Dhanmondi thana is an area of 7.74 sq km with 162,088 population where male is 54.87% and female is 45.13% (Banglapedia, 2010). The main occupations here are industry, commerce, service, construction, transport, house renting and land use consists residential 70%, commercial 8%, office 2%, public use 10%, low lying land 10% along with 100% urbanization and 42 km of roads (Banglapedia, 2010).

Lalbagh Thana: Lalbagh Thana is a 5.74 sq km area with 365,323 population of which 59.09% male and 40.91% female with main occupations related to wage labour, industries, commerce, hawker, construction, transport and so on (Banglapedia, 2010). It has a significant number of plastic factories, garments industries, foot ware industries etc (Banglapedia, 2010).

[1] Banglapedia is a national Encyclopaedia in Bangladesh. For more information please see the references of Chowdhury and Islam (2003), Islam (2003), Siddiqi (2010)

Kamrangir Char Thana: Kamrangir Char town is 0.48 sq km area having population of 10178 mainly working in agriculture, wage labour, commerce etc with 48 garments industries and significant number of other industries, another portion of this thana belongs to rural area where agricultural land remained as dominant land use(Banglapedia, 2010).

3.2. Methodology

3.2.1. Sampling strategy

During the sampling the following criteria were included in the selection of respondents:

- Sex: all the respondents should be woman,
- Occupation: all the respondents should be garment worker,
- Mobility: all the respondents should be 'captive walkers', i.e. they do not use other transport modes except walking for their daily commuting.

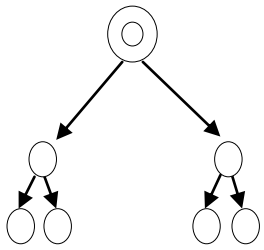


Figure 3-1 Exponential non discriminative snowball sampling

As women start their journey in the morning from their residence to garments factory, one woman was selected initially from a residential place (approximately forty feet by forty feet place with 20-25 individual dwellings where mostly women garments workers live). Correspondingly, women garments worker start their journey from garments factory to their home at night, therefore, one woman was selected initially from one of the garments factories. This means the women who started journey in the morning from their residences, the origins were residences and destinations were garments factories and for those who started their journey at night, the factories were the origins and the destinations were their residences. The selection of samples accordingly followed a non-probability snowball sampling technique where one garments worker referred two other respondents like her following the exponential non-discriminative way of snowball sampling (Figure 3-1). It was difficult to get access into the garments and also it was not easy to find out the residences of these workers, therefore, this sampling technique helped to get the information about respondents that fits with the criteria. The survey was conducted both day time and night time to understand the walking route pattern of women garments workers in different time. The day time survey started mostly at 7:00 o' clock in the morning (sometime it changed considering the starting time of factory) and night survey started between 6:00 pm and 8:00 pm at night (it changes according to overtime shift of the garments factory).

3.2.2. Survey methods

Walking Interview: Total 28 (twenty eight) walking interviews were conducted which is relatively small but significant in number as the survey on each sample was intensive during walking interview. Moreover, as this is a qualitative research and considering perspective of a captive group, diversity due to large sample during investigation could create difficulty to get common pattern of the research problem. In this research, interviews were conducted using semi structured questionnaire with open and close questions (see appendix 1). Walking interviews was taken both day and night time when women garments workers were going to factories in the morning and coming back from factories at night. During the walking interviews, the respondents answered[2] the questions and put their opinions on different open structured

[2] Walking interviews of women garments workers were taken according to their permission and also they had no objection to use this data for academic purpose following the rules of ethical conduct. This has also been considered that their personal information will be kept undisclosed.

questions. Besides, they showed the pleasant and unpleasant places on their walking routes. They also expressed their personal perceptions including satisfaction level about walking environment of walking route, and also choice of routes. This method was chosen to combine both personal perceptions and spatial information which are relatively important to fulfil the objectives of the research. Main concern of this method was to gather data of subjective measurement indicators.

Tracking route: After completing walking interview of a respondent, the routes they (respondents) followed from their origin to destination were tracked using IPAQ device containing CyberTracker geo tagging application and mobile GPS (see appendix 2) to gather objective measurement information 28 (twenty eight) routes of twenty eight respondents were tracked (for sample view, see Figure 3-2), however, some of these tracking routes overlapped with each other as many respondent were following same routes. In this research, the objective measurement (see appendix 3) database was prepared in the form of geo tagging application and was installed into IPAQ beforehand. During tracking objective indicators were taken into account in the form of point element and segment elements. The segment elements like traffic volume, pedestrian volume were counted by visual observation (see appendix 3) Recorders, camera, survey devices, GPS, survey forms etc. were used as supporting tool for walking interviews and route tracking.

Figure 3-2 Tracking route output – sample view

Focus Group Discussion: The participants of the focus group were selected mostly from the walking interview respondents. Two participants of the focus group discussion did not give walking interviews as they didn't come from any of the case study areas. Focus group discussion was conducted to get in depth knowledge about walkability and its relation to quality of life of women garments workers in Dhaka city. About 10 women garments workers participated in the discussion session to answer the open questions and discussed on issues related to walkability of walking routes and also impacts of walkability on their quality of life. In the focus group discussion, walkability problems, pleasant and unpleasant things, preferences, experiences and relation between walkability and Quality of life were discussed in group where participants responded by discussing with each other. Open questions as well as pictures were shown in the discussion to make the group understand the walkability concept. Besides, the impacts of walkability in daily life as well as in their Quality of Life were also discussed elaborately. In the discussion, the relation of walkability with different domains of Quality of life was pointed out.

3.2.3. Data collection and organization

The tracked routes of 28 respondents were assembled in GIS software from where Google earth supporting files were prepared to visualize the tracking routes in Google earth map. Two types of data: qualitative and quantitative data were assembled from walking interviews and semi structured questionnaires. Quantitative data were assembled using Microsoft excel and qualitative data were assembled by transcribing them. Twenty eight interviews and notes of focus group discussion were transcribed to accumulate the data and information. Objective walkability measurements data from the tracking routes have been organized in excel sheet where segment data are homogeneous in 100 meter segments and point data under those segments have been intersected. CyberTracker software produces Google earth map for each route which was assembled into ArcGIS to visualize the calculated score.

3.2.4. Data analysis

Objective walkability

Objective walkability has been investigated based on pre-defined objective indicators. With the help of geo tagging application of CyberTracker software, indicators were measured for every route. The measurements were point and segment based. Some indicators were tagged as points, for example: street lights, dustbins etc. and some indicators were measured as segments, for example, path condition, traffic volume etc.

For analysing the field data every route has been divided into 100 (hundred) meters segments. After investigating field data thoroughly, it becomes rational to split every route into 100 meters segment as a unit where the value of the segment data like walking path modal conflicts, path conditions, traffic volume and pedestrian volume are considered homogenous.

After completing the segmentation, indicators have been measured per segment where indicators are weighted (see appendix 4) using Boolean logic and a numeric classification as well as standardization has been done using a spread sheet based MCE (multi-criteria evaluation) which included standardization for positive and negative values, for example: if there has dustbin in a segment of the route, it increases its walkability but if there has unclean path in a route, it decreases the walkability. Therefore, indicators which are weighted using Boolean logic would have same value as they are not considering positive and constraints of the indicators. For avoiding this confusion, spread sheet based MCE has been used to standardize the indicator values which consider positive factors and negative constraints of the indicator values. After weighting and standardizing, objective walkability scores have been generated for each route segments (see appendix 5).

For visualization of the objective level of walkability in Aerial map using ArcGIS, the scores have been classified into three categories using equal interval classification named high, medium and low walkability.

Subjective walkability

The qualitative data of questionnaires were analysed and graphs were prepared using Microsoft excel. 28 walking interviews were transcribed in word document and analysed using Atlas.Ti, a Computer Assisted Qualitative Data Analysis package (CAQDAS). The transcription document of Focus Group Discussion was also coded and analysed using Atlas.Ti (see appendix 6). Likert scale was used to rate subjective walkability measurements where subjective walkability scores were obtained from Microsoft excel.

In the walking interview questionnaire a 1 to 5 Likert scale was set for each indicators based on their satisfaction level to quantify the perceptions of interviewees (see appendix 1). 1 has been considered as worst and consecutively 5 has been considered as best. Also, the scale considered 1 as negative effect and 5 as positive effect. For example, if respondent perceives that the walking route she uses has medium safety, then the score in respondent's perception on safety is 3. The interpretation of Likert scale (1-5) for each indicator differs a little from each other and can be found in walking interview questionnaire. The value of perception has indicated the satisfaction level of the respondents. High value indicates that the satisfaction level is high and low value indicates the satisfaction level is low. An average value considering all indicators has been estimated additional to estimation of every specific indicator perception. Average value has been measured so that an overall perception regarding specific route walkability can be obtained additional to indicator specific perceptions.

Comparison

Overlapping of objective walkability score and subjective perception of particular space was conducted in ArcGIS to get a visual idea about where those two measures merged. As a result similarities and dissimilarities between them can be identified based on space and time.

4. INVESTIGATION OF THE LEVEL OF WALKABILITY

Following the objectives, this section has been represented the spatial distribution of all the routes used by women garments workers which have been taken into account for investigation. Five routes have been selected for further discussion by measuring objective walkability, subjective walkability, walkability based on time (day and night) and comparing objective and subjective walkability respectively.

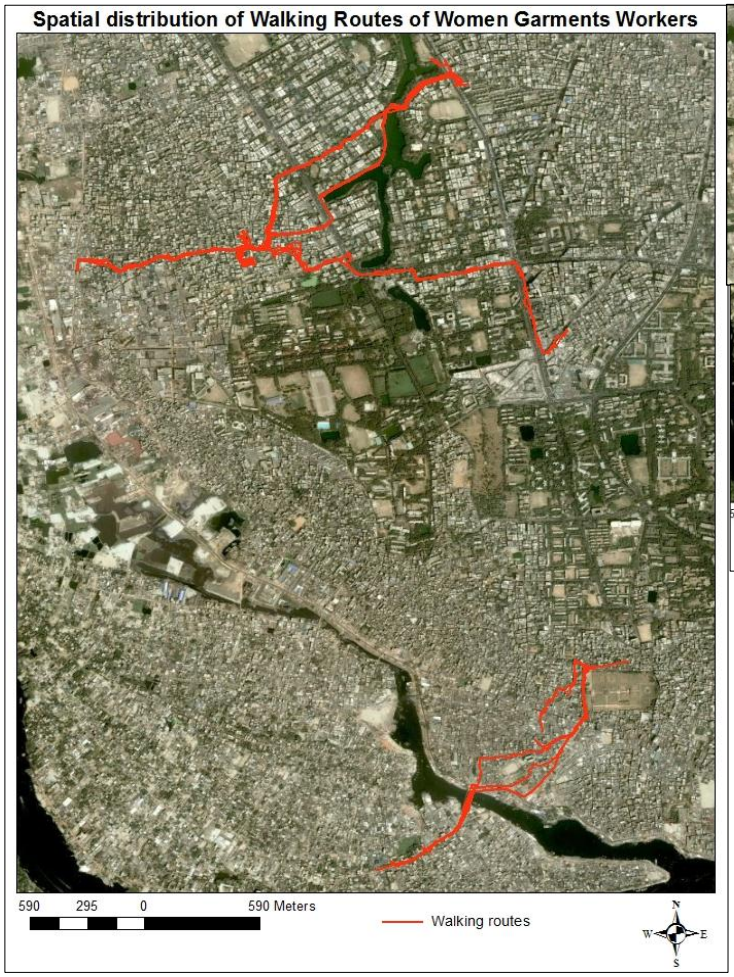
4.1. Spatial distribution of walking routes used by women garments workers

According to the objective, the first task is to identify the walking routes women garment workers are using to go to their job locations and come back home. These routes are spatially distributed within the areas of Hazaribag, Dhanmondi, Lalbag and Kamrangir Char areas in Dhaka city. Twenty eight walking tracks of 28 respondents were tracked along with taking individual interviews. The origin-destination table of the twenty eight walking tracks is given below:

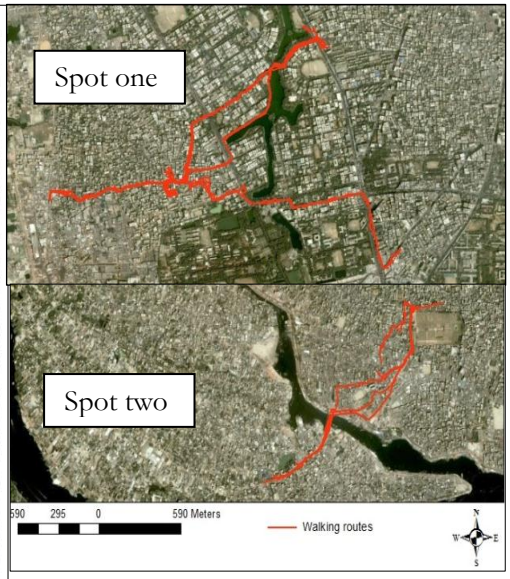
Table 4-1 All walking routes of women garments workers

ID	Origin	Destination	Day/ Night	Tracking Time
C1	Gabtola residence, Jigatola	Boshundhora garments, kolabagan	Day	7:00 am– 8:00 am
B1	Gabtola residence, Jigatola	Newmarket garments area	Day	8:00am -9:15am
B2	New market garments area	Gabtola residence, Jigatola	Night	9:00 pm – 10:15 pm
C2	Salek garden garments	Leather collage area	Night	7:00 pm – 7:45 pm
A1	Boubazar area, Hazaribag	Boshundhora garments, Kolabagan	Day	7:00 am– 8:00 am
D1	Mohammadia garments, Lalbag	RND road	Night	8:00 pm – 8:20 pm
B3	Gabtola residence, Jigatola	New market garments area	Day	8:00am -9:15am
C3	Gabtola residence, Jigatola	Boshundhora garments, Kolabagan	Day	7:00 am– 8:00 am
C4	Boshundhora garments, kolabagan	Gabtola residence, Jigatola	Night	7:00 pm– 8:00 pm
A2	Boshundhora garments, kolabagan	Boubazar area, Hazaribag	Night	7:00 pm– 8:30 pm
A3	Boshundhora garments, kolabagan	Boubazar area, Hazaribag	Night	7:00 pm– 8:30 pm
C5	Gabtola residence, Jigatola	Boshundhora garments, Kolabagan	Day	7:00 am– 8:00 am
B4	Gabtola residence, Jigatola	Giringi garments	Day	7:30 am– 8:00 am
D2	Madhpur, Kamrangir char	Mohammadia garments, Lalbag	Day	7:00 am– 8:00 am
A4	Boubazar area, Hazaribag	Boshundhora garments, kolabagan	Day	7:00 am– 8:00 am
D3	Mohammadia garments, Lalbag	Madhpur, Kamragirchor	Night	8:00 pm– 9:15 pm
A5	Boubazar area, Hazaribag	Boshundhora garments,	Day	7:00 am– 8:00 am

ID	Origin	Destination	Day/ Night	Tracking Time
		Kolabagan		
B5	Gabtola residence, Jigatola	Giringi garments	Day	7:30 am– 8:00 am
E1	Mohammadia garments, Lalbag	10 no. lane, JN shaha road	Night	8:00 pm– 8:30 pm
D4	Madhpur, Kamrangir char	Mohammadia garments, Lalbag	Day	7:00 am– 8:00 am
D5	Mohammadia garments, Lalbag	RND road	Night	8:00 pm – 8:20 pm
C6	Salek garden garments	Gabtola residence, Jigatola	Night	7:00 pm- 7:15 pm
A6	Boubazar area, Hazaribag	Boshundhora garments, Kolabagan	Day	7:00 am– 8:00 am
C7	Salek garden garments	Gabtola residence, Jigatola	Night	7:00 pm- 7:15 pm
E2	Mohammadia garments, Lalbag	Hindu Road	Night	7:00 pm- 7:40 pm
E3	Mohammadia garments, Lalbag	Hindu Road	Night	7:00 pm- 7:40 pm
D6	Madhpur, Kamrangir char	Mohammadia garments, Lalbag	Day	7:00 am– 8:00 am
E4	Mohammadia garments, Lalbag	10 no. lane, JN shaha road	Night	8:00 pm– 8:30 pm



Map 4-2 Spatial Distribution of Walking routes



Map 4-1 Walking routes in Spot One and Spot Two

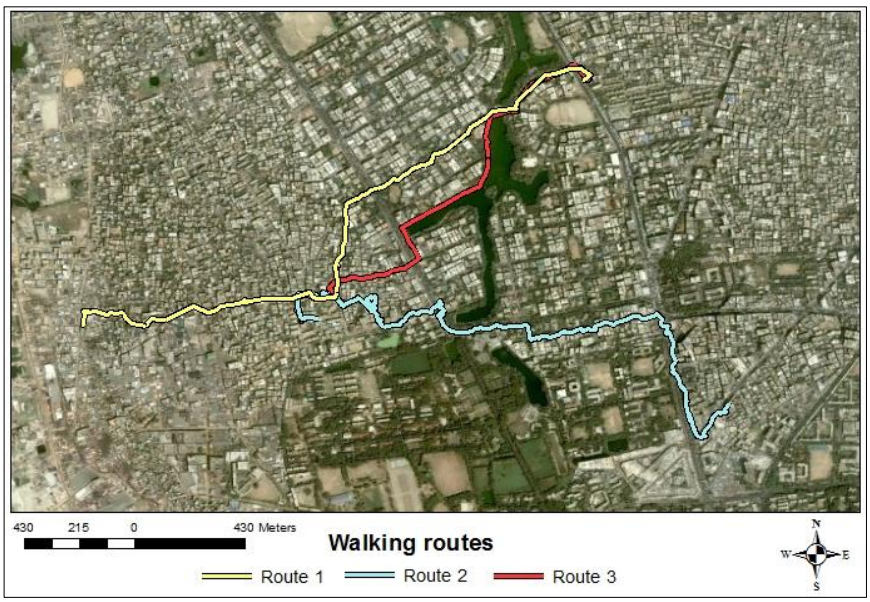
The spatial distribution of the walking, routes (Map 4-1), it can be identified that the distribution has been concentrated spatially in two locations of the study area. For the ease of analysis of the routes, these two locations have been named as spot one and spot two (Map 4-2). Spot one has

18 route tracks of 18 respondents and Spot two has 10 route tracks of 10 respondents, however, most of these routes have been overlapped. Therefore, to avoid repetition of route investigation several times, common routes have been compiled into five main routes (Table 4-2). Here, spatial distribution and overlapping of several tracks into one route track have been taken into consideration. Compilation of 28 individual route tracks into five main routes is represented followed by maps:

Table 4-2 Selected main routes from spot one and spot two

Route no.	Main routes		Interviewees' ID
	Origin	Destination	
Route 1	Boubazar area, Hazaribag	Boshundhora garments, Kolabagan	A1, A2, A3, A4, A6
Route 2	Gabtola residence, Jigatola	Newmarket garments area	B1, B2, B3, B4, B5
Route 3	Gabtola residence, Jigatola	Boshundhora garments, kolabagan	C1, C2, C3, C4, C5, C6, C7
Route 4	Mohammadia garments, Lalbag	Madhpur, Kamragirchor	D1, D2, D3, D4, D5, D6
Route 5	Mohammadia garments, Lalbag	10 no. lane, JN shaha road	E1, E2, E3, E4

Route 1 is the combination of six individual respondents' route tracks from Boubazar area to Kolabagan area. All the six respondents chose the same routes during day and night. Route 2 is the combination of 5 route tracks among which three individual respondents' route tracks from Gabtola to Newmarket area are same and 2 route tracks of two respondents from Gabtola to Giringi garments area are included in Route 2 because those route tracks entirely overlapped Gabtola – Newmarket route track.



Map 4-3 Main Routes of spot one

Route 3 is compiled of four of the same route tracks by four respondents from Gabtola to Kolabgan area and two more tracks (Gabtola – Salek garden garments) which mostly overlap with the Gabtola – Kolabagan route. Therefore, overall 7

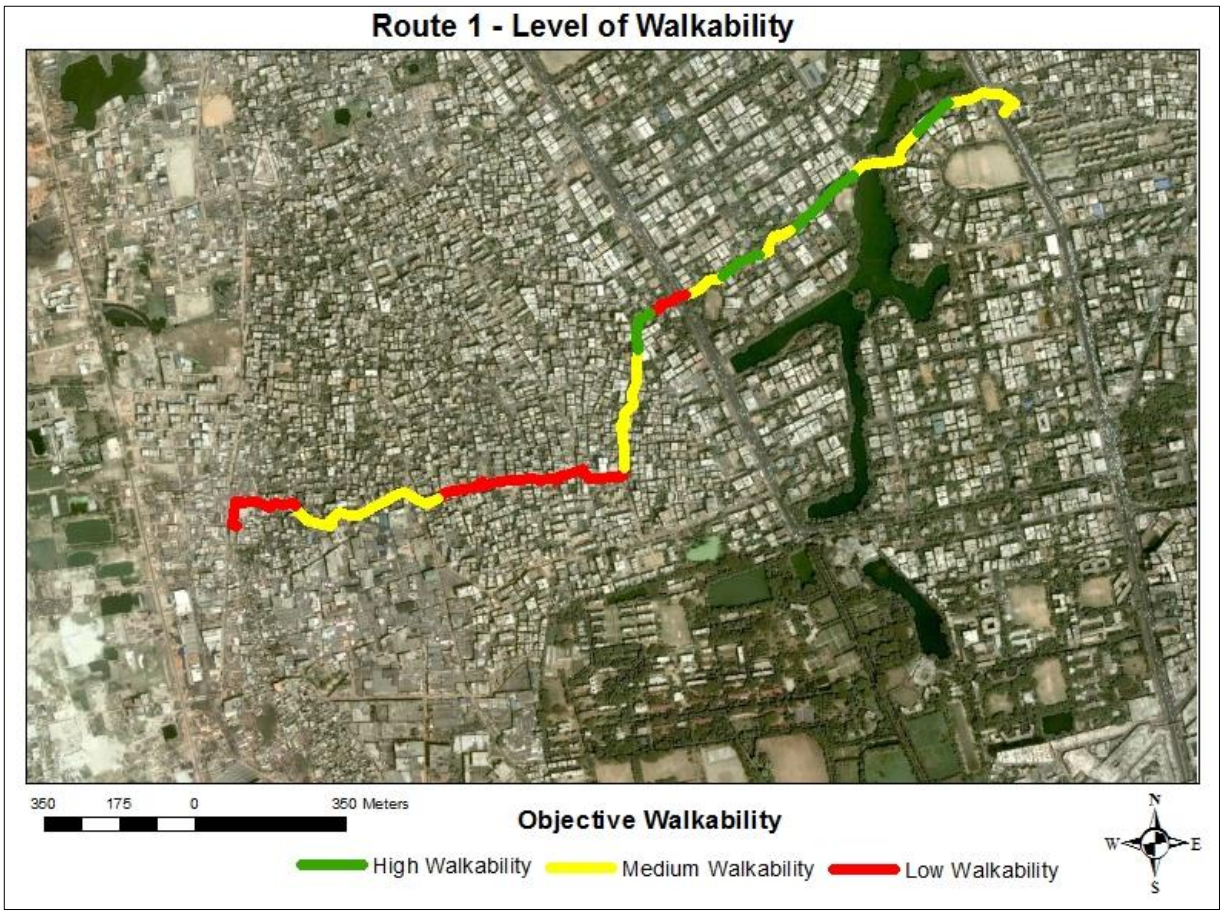
Map 4-4 Main Routes of spot two

individual respondents followed route 3 or part of this route for their daily trip. Route 4 combines six route tracks of six individual respondents from Lalbag area to Kamrangi Char area where four route tracks follow entirely the same route direction from origin to destination among which two route tracks change in some parts of the route at night and also based on their preference on route choice which will be discussed in the level of walkability based on time section. This route also includes Lalbag- RND route tracks. Route 5 combines' 4 routes two same route tracks of two respondents from Lalbag to Hindu Road and two other route tracks of another two respondents from Lalbag to 10 number Lane Shaha road which actually the extension of Lalbag-Hindu road tracks. Therefore, Route 5 combines four tracks together.

4.2. Level of Walkability of Route one

4.2.1. Objective Walkability

Route 1 map is representing the level of walkability in different segments where green colour is representing high walkability, yellow colour is representing medium walkability and red colour is representing low walkability.



Map 4-5 Level of Objective Walkability of Route 1

Route 1 is 2.56 km in length and has been divided into twenty five (25) segments where each segment is scored considering the objective indicators of the route. After giving weights and making standardization of the indicators using spread sheet based MCE (multi criteria evaluation), each segment gets a particular score which ranges from 0.421670 to 0.925110 where 0 (zero) is considered as no walkability and 1 is considered high walkability. Total 25 scores of 25 segments have been calculated and classified into three groups: High, Medium and Low Walkability showing in the Map 4-5. The High Walkability group includes

segments having scores ranging from 0.925110 to 0.757298; Medium Walkability group includes segments having scores ranging from 0.757297 to .589484 and Low Walkability group segments scored from 0.589483 to .421670. (For more details see appendix 3, 5, 6)

Those segments having high walkability have available walking paths, adequate street lights, trees, continuous path without blockings and most importantly good path conditions. Moreover, these segments are mostly free from crowded means low gathering of general, hawkers and young people and according to objective indicators these segments of the route are comfortable and convenient to walk. However, traffic volume is still high in most of these segments. As these segments have available footpath, modal conflicts do not occur. Therefore, a high volume of traffic does not hamper walkability level of those segments of the route.

Those segments having medium walkability mostly have medium path conditions, inadequate streetlights, and high pedestrian volume. Some segments have unclean path and open sewer drain but free from pathway blocked by car or rickshaw. Some segments which do not have unclean path and open sewer drain have paths that are blocked either by car or rickshaw and bike.

Low walkability segments have modal conflicts on the walking path, poor path conditions, pathway blocked by infrastructure, high volume of traffic, vendors and most of these segments do not have walking path. These segments mainly scored lower because of unavailability of walking path in most segments which in turn causes modal conflicts. Some segments which have walking path blocked by infrastructures like electric pole, tea stalls etc. also hamper the level of walkability.

4.2.2. Subjective Walkability

Subjective measures have considered the Likert scale (1 to 5) for the measurement of perceptions of 6 women garments workers of Route 1 where low to high values are considered as negative to positive respectively.

4.2.2.1. Time and distance

Figure 4-1 is representing the perception of time and distance of six respondents of Route 1 from their home to job location. Regarding time, two interviewees of this route perceive that walking time from home to job location is medium (not so long or short) and three interviewees think that it takes relatively long time. Regarding distance, three interviewees think that the job location is far from home and two interviewees think that it is very far. Only one interviewee (A5) thinks that distance is medium (not so far/close). According to interviewee A5, "As I walk with others, the distance does not seem very long, when I walk alone, it feels so long." This route is 2.7 kilometres long and walking time is 45-55 minutes.

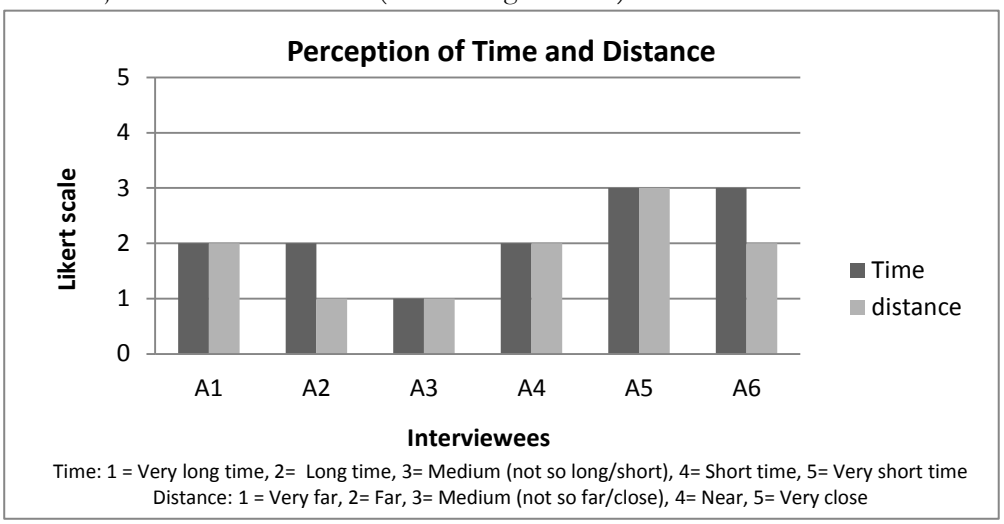


Figure 4-1 Perception of time and distance

One interviewee (A3) thinks the distance and time is very long. According to interviewee A3, "I think my job location is too far and it takes a lot of time. Many garments workers work nearby but I did not get job nearby, therefore, I have to walk a long way by spending a lot of time which is miserable." It seems, other interviewees adapted the consequences of distance and time of this route whereas interviewee A3 did not adapt it and have different perception than others.

4.2.2.2. Transport cost

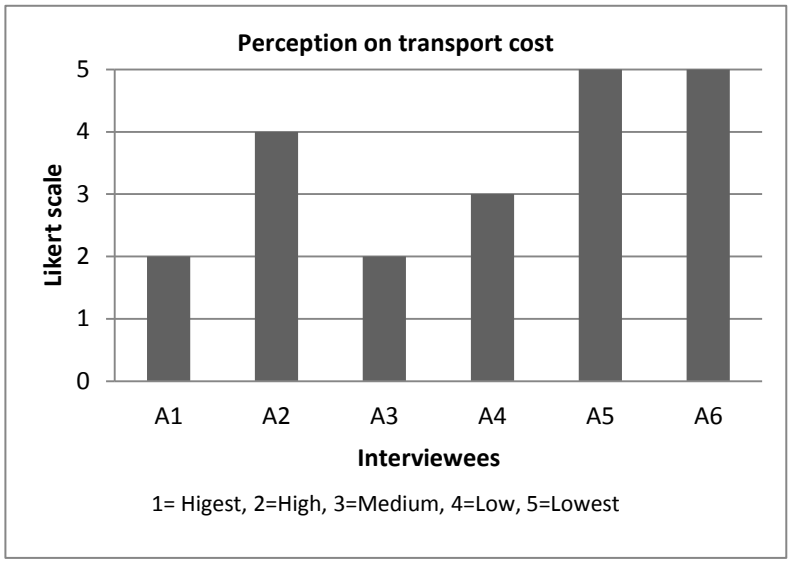


Figure 4-2 Perception on transport cost

Figure 4.2 is the perception of transport cost of the interviewees which they perceived either by personal experience or in general sense. The graph is presenting that two of the interviewees (A5, A6) perceive the transport cost lowest as they never use other transport modes except walking; and only walking requires no money. Two interviewees (A2, A3) have personal experience of using other transport mode which made them to perceive that transport cost is really high especially during rainy season when the road goes under water and walking becomes impossible. One interviewee (A1) uses it during rainy season only if she forgets to carry umbrella. However, the main constraint seems to be financial in this case. One respondent mentioned that transport cost is 60 BDT[3] every day which is really high as their salary is 5000 BDT per month only. "There are many alternative modes like bus, tempo, etc but I don't use those alternative routes because of money", said by interviewee A4 where it is mentioned and agreed by other respondents that alternative modes cost a lot of money which they are unable to afford with their limited salary. As the alternative mode is so expensive, some respondents did not even try in their job life to use alternative modes which happened to interviewee A5 and A6. "I never used rickshaw, so I don't know how much does it cost to go to factory and come back from there," said by interviewee A6. However, other two interviewees use alternative transport for emergency time for example when she feels sick and also makes a monthly budget for transportation.

4.2.2.3. Walking route quality

Walking route quality concerns perceptions on road conditions. From the graph (Figure 4-3) it can be seen that three interviewees think the road condition is moderate and two of them think the condition is poor. One of the interviewees (Interviewee A2) thinks the condition is good. "The roads in Boubazar area are very bad and narrow whereas the roads in Dhanmondi area are good. Therefore, I like to walk in

[3] 1 BDT= 1 Bangladeshi Taka
Where 1 Euro = 106.32 BDT app. (exchange rate)

Dhanmondi roads rather than in Boubazar roads," said Interviewee A4. Road condition is unsatisfactory in Boubazar area (the west-southern part of spot one of study area, see Map 4-2 or 4-5) of this route where the road is flooded during the rainy season, making it muddy, unclean and broken which is not suitable for walking smoothly. However, the condition is much better in Dhanmondi area (north-eastern part of the spot one of study area) of this route. Besides, road condition is better in dry season of this route than rainy season according to interviewees.

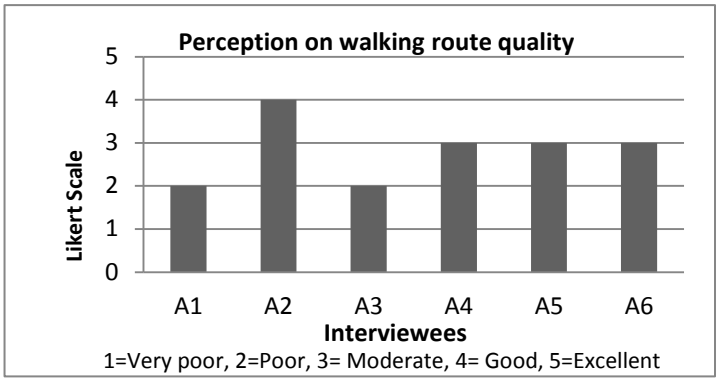


Figure 4-3 Perception on walking route quality

4.2.2.4. Accessibility

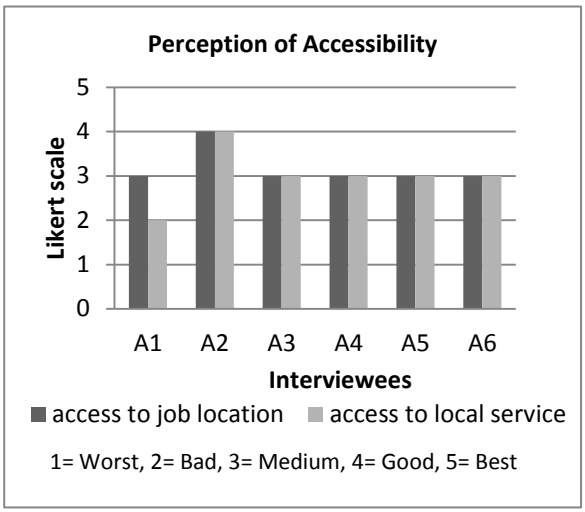


Figure 4-4 Perception on accessibility

"Public service accessibility is also good as I can go to medical centres and markets." said by Interviewee A2. According to Figure 4-4, almost all interviewees think that the route has access to all necessary things like medical service, schools, shopping centres and other public services. Therefore, they feel that this route has good accessibility. Interviewee A1 has bit different perception than others as she does not know how to get access to local services very well. She is new migrant to the city from rural area, therefore, did not get time to explore around; however, she thinks the accessibility to job location becomes hampered for traffic congestion, therefore, the accessibility is medium.

4.2.2.5. Pedestrian facilities

According to graph (Figure 4-5) more or less all the interviewees mentioned that pedestrian facilities are worse to medium in this route. They feel some more facilities like street lights, walking path and wide road could be more helpful. "There are few parts of this road which does not have light and which is very dark makes me feel scared", mentioned by interviewee A2 where she indicated about pedestrian facilities. Some parts of the route do not have walking paths, even if they have; they are occupied by vendors, hawkers and items for sale. Some parts of the route has pedestrian path, however, they are blocked by infrastructure like electric pole, telephone wire boxes etc.

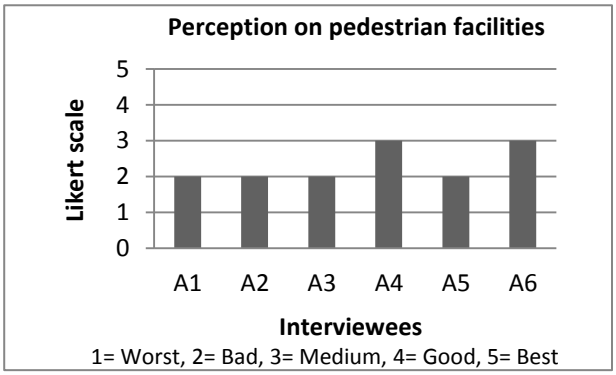


Figure 4-5 Perception on pedestrian facilities

4.2.2.6. Safety:

All the interviewees perceive, represented in Figure 4-6 that the route is unsafe except one interviewee (A2) who feels safe on the road. "In front of our office, the road is really busy and always accidents happen", said by interviewee A4. The main road crossing in front of the garments factory is very risky where most of the respondents of this route feel scared to cross the road due to high volume and high speed of traffic. Therefore, they cross the road all together just to prevent themselves from accidents. However, it is reported that many garments workers fall into accidents in this crossing almost every day. Almost all the respondents agreed that the road is not safe due to high volume of traffic. The only interviewee (Interviewee A2) who thinks the road is safe stated, "I go back to home with all girls and feel safe always as nothing happened to me till date". Women garments workers mostly go back home all together, so does she, however, she did not get any experience of being unsafe, and therefore, perceives a positive attitude towards this route.

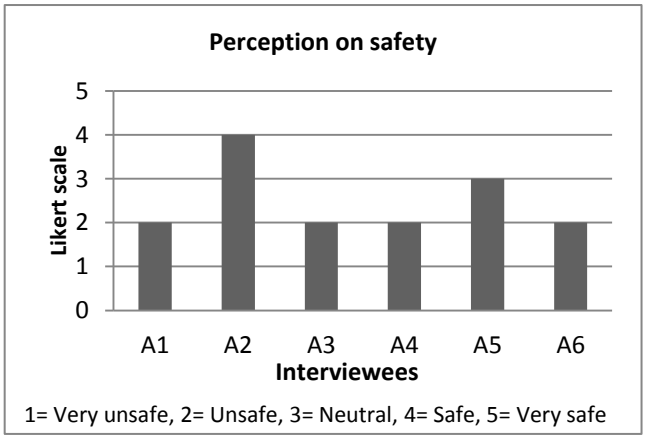


Figure 4-6 Perception on safety

4.2.2.7. Security:

"There is a narrow road where young pervert gather and comments always whenever they see us and that is very disturbing, I feel afraid of that kind of teasing," commented one respondent (A3). According to interviewees showed in Figure 4-7, road is unsecured near Boubazar portion of the route due to hijacking, crime and gathering of young perverts whereas roads are unsafe in the Dhanmondi portion due to high traffic volume and congestion. Dhanmondi portion is more secured than Boubazar area, however, less safe than Boubazar. Some respondents of this route do not feel scared of going back home at night. According to interviewee A2, the reason is that they walk all together regardless day and night so that they did not face problems regarding security yet. However, some respondents do feel scared at night going alone due to dark road and also afraid of young perverts and unknown people who make comments and tease them along the route.

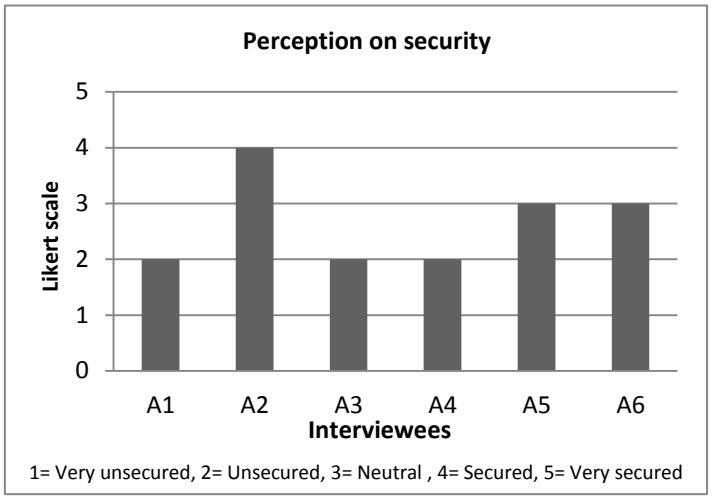


Figure 4-7 Perception on security

4.2.2.8. Congestion:

The Figure 4-8 is representing that most of the interviewees think traffic congestion affects the walkability high (more affected) to medium extent. "Road is not safe as traffic congestion is very high which makes walking miserable and uncomfortable," said by Interviewee A4. Some respondents told that rickshaw puller also make congestion and do not want to give them space for passing even. "Traffic congestion reduces my speed of walking speed...." (Interviewee A3), the statement proves that traffic congestion is related to the value of time utility and interviewees are aware of it. Respondents also think high traffic congestion of this route is responsible for lots of accidents. Also pedestrian volume is high, therefore, is responsible for reducing walking speed which in turn makes delay to go to work place on time. It is perceived that traffic congestion is responsible for making journey delay, uncomfortable, miserable and unsafe. On the contrary, interviewee A2 thinks that traffic congestion exists in this route but that does not affect her walkability that significantly as she thinks other problems are much more significant than this one.

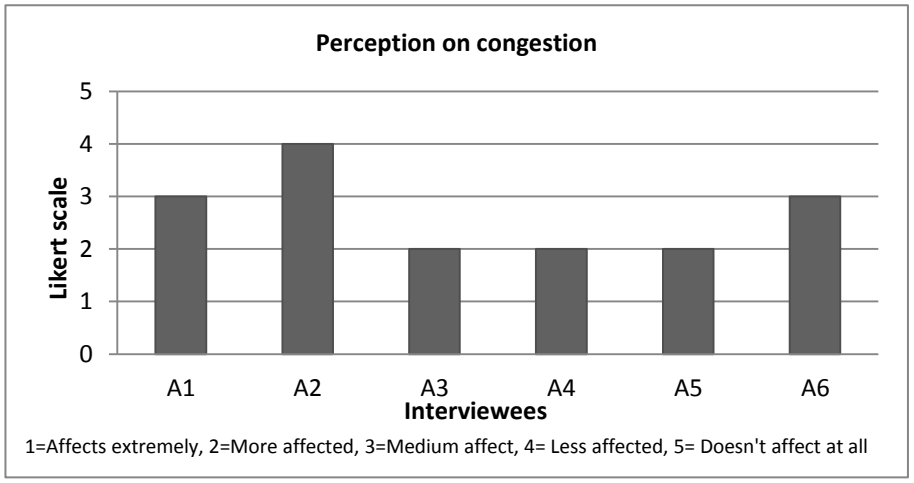


Figure 4-8 Perception on congestion

4.2.2.9. Comfort:

From the Figure 4-9, it is interestingly observed that three interviewees are neutral about comfort issue whereas two feel uncomfortable. The route seems not that comfortable to some extent to respondents as the road has traffic congestions and other facilities problem. "The road is not comfortable. I feel problem of walking where facilities are not enough," mentioned Interviewee A4. Though the route does have some facilities, pedestrians are not able to use that because of malfunction of those facilities for example, malfunctioned street light, blocked footpath. Therefore, the route became uncomfortable to walk. It is comfortable according to only one interviewee (A2) that is interesting as she enjoys walking and seems to be adapted with the situation.

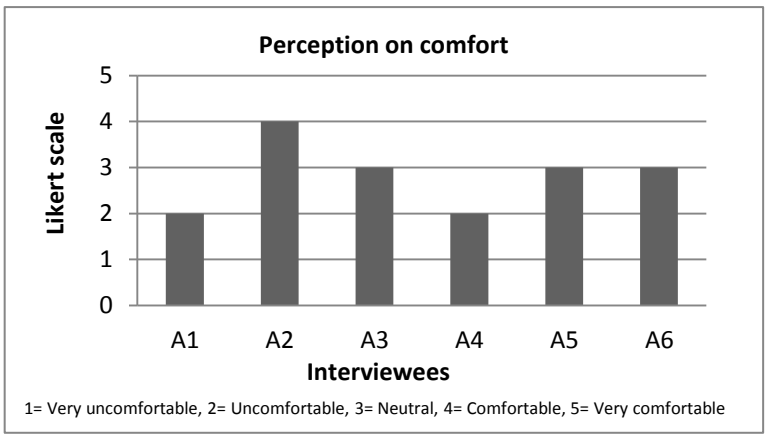


Figure 4-9 Perception on comfort

4.2.2.10. Visual attraction:

In the Figure 4-10, three interviewees found that there is nothing in the route that can attract them visually. Interestingly interviewee A6 said, "I like to walk beside lake because of good walking environment, good scenery. I like to see people over there and the environment is quite good". However, despite they mentioned that there is nothing on the way to be visually attracted on likert scale but while talking to them during walking interview every respondent mentioned the lake beside park on the way to work they like and back home of this route. As the park is beautiful for its scenery, environment and liveliness, respondents perceived it as a good environment of walking and got visually attracted. Some respondents of this route like to see people and like to walk as well. They walk for pleasure by exploring places and visual things on the way. Interviewee A1 mentioned about Jahaz bari (Picture 4-1) beside the park which she found very attractive. However, the respondents mentioned some places of the route but did not mention any likeness about the route as a whole.

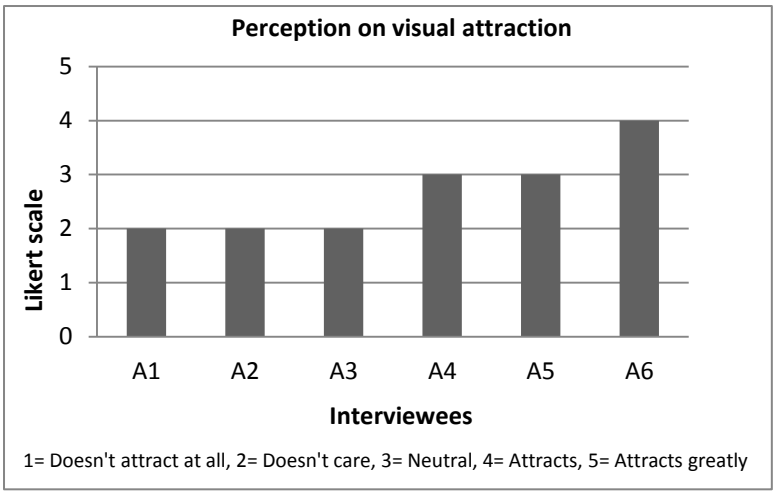


Figure 4-10 Perception on visual attraction

Picture 4-1 Jahaz bari (Boat house)

4.2.2.11. Walking environment:

"When I walk slowly, the walking environment seems good to me but when I need to walk fast, I don't like the walking environment. But I think the walking environment is okay..." said by Interviewee A2. More or less all respondents told that the walking environment of this route is medium represented in Figure 4-11. Though interviewees mentioned the route is not free from problems like traffic congestion, narrow road, and dark road and so on, the walking environment or walkability is better than many other routes. However, respondents have an impression that they have to walk in any way regardless it is good or bad. "Moreover, we have to walk in anyway; we have nothing to do with good or bad walking environment, I am bound to go to my working place. I have no other option," said by Interviewee A1. Therefore, for this captive group who does not have any other option except walking, walking environment needs to be improved.

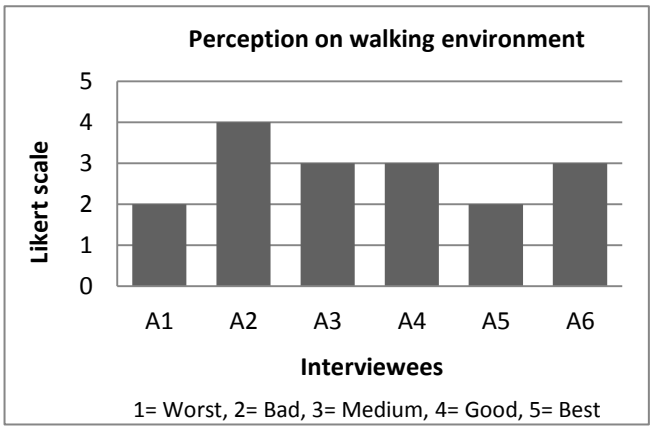


Figure 4-11 Perception on overall walking environment

4.2.2.12. Average perceived level of walkability of women garments workers of route 1

In a nutshell, considering all the indicator values in Likert scale, the average scores of perceived level of walkability of each interviewee are represented in the graph (Figure 4-12). The graph is showing the level of walkability within 1 to 5 Likert scale where 1 is indicating lowest and 5 is indicating highest walkability. According to 6 interviewees the level of walkability of route 1 is within the range of low walkability (however, the values vary) whereas only one interviewee thinks that the level of walkability of route 1 is medium.

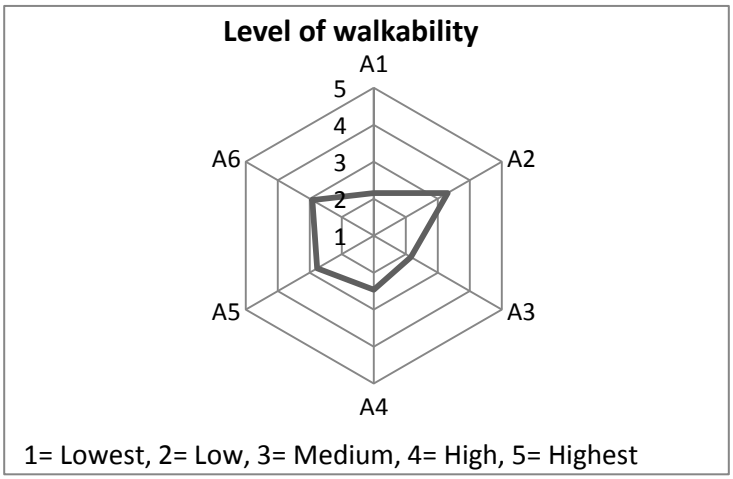
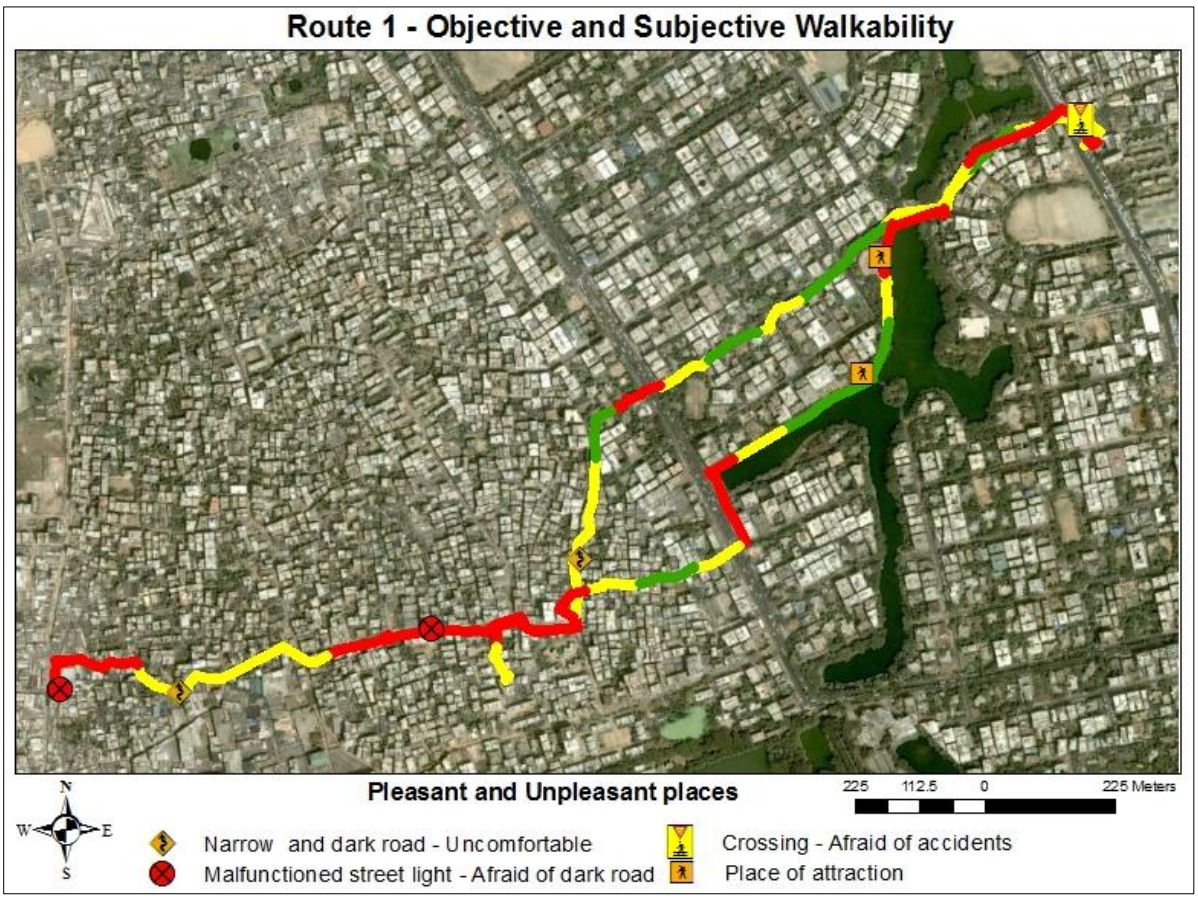


Figure 4-12 Perceived average level of walkability of Route 1

4.2.3. Objective measures and subjective perceptions based on time (day and night)

All the interviewees use the same route most of the time. Two of the respondents who sometime use a road through the park in the morning, avoid that road at night as because it becomes dark at night and



Map 4-6 Comparison between Objective and Subjective Walkability of Route 1

they are afraid of unknown people and young perverts who could do harm to them. But other interviewees who use same route have reasons to use same route like Interview A2 said, "I use same route in the morning and at night for going to factory and coming back to home. I don't feel any problem at night." According to respondent the route is safe and secured as no problem has been encountered during journey. Therefore, respondents are not afraid of using same route. One of the respondents (Interviewee A1) said, "I use same road as I don't know other way therefore I feel afraid to use other roads." Most of the garments workers migrate from rural to urban area to get work where many of the places are unknown to them. The same case happened to this respondent where she does not know other roads to go and come back from garments as she is afraid of being lost.

The map (Map 4-6) is representing the objective walkability with subjective perception of women garments workers with the alternative roads garments workers use at night. Map is showing some places they feel uncomfortable at night as because the road is narrow and dark. One of these roads is not a road actually. It is just a passage between two buildings; however, people use it quite frequently, especially women garments workers. If they don't use this passage, they have to walk from main road which is very long way to go back home. Therefore, regardless day and night or even if the walking environment is uncomfortable and scary, they use this road. Moreover, some road have street lights but do not work at night and make the road very dark which is another issue for women garments workers to become afraid in this route. There are two places named amphitheatre and the lake along this route which are visually attractive and nice to passing through. However, it becomes dark at night but according to interviewees, better than the other route which becomes more dangerous due to young people gathering, crime events at night. There has one signal crossing in this route which is a place of fear regardless day and night due to happening frequent accidents every day.

4.2.4. Walkability assessment between subjective and objective measures

Table 4-3 Comparison between subjective and objective walkability of route 1

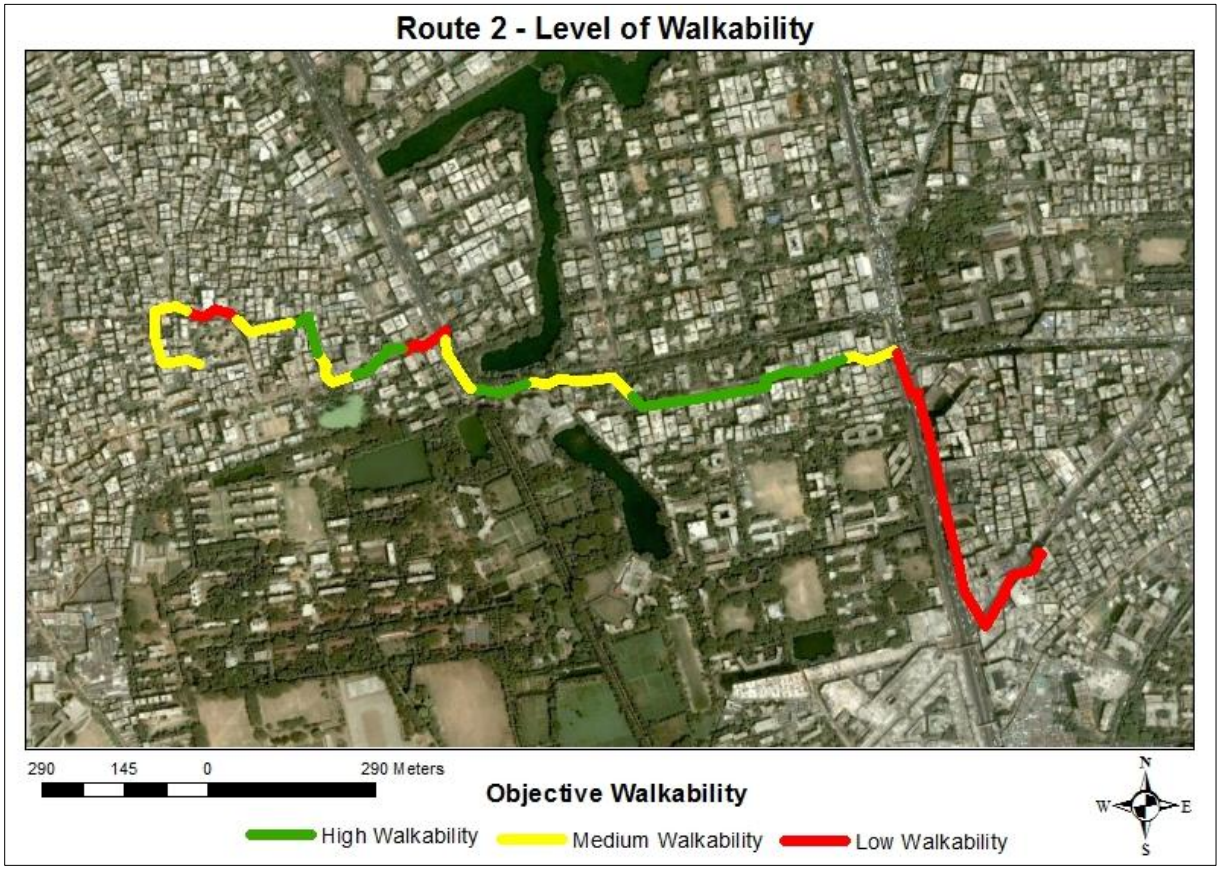
Similarities	Dissimilarities
• Objective measures and subjective perceptions have merged in most places like route segments having low walkability are dark roads with malfunctioned street light which makes the women garments workers afraid and uncomfortable. Also one segment of low walkability have a signalized crossing, however, traffic volume is high and speedy and drivers do not obey traffic rules, therefore accidents happen. • Another similarity is women garments workers mentioned some places for suitable walking like park road, beside the lake which also falls under high walkability road segment based on objective measures.	• The route segments having medium walkability are actually low walk-able to the women garments workers as they found the roads are narrow and dark at night and uncomfortable to walk. • Another difference is one place of park road women like to walk in the morning, however, feel afraid to walk inside the park road at night due to feeling unsecured.

4.3. Level of Walkability of Route two

4.3.1. Objective Walkability

Route 2 is 2.43 km long and has been divided into twenty four segments where each segment is scored considering the objective indicators of the route. After giving weights and making standardization of the indicators using spread sheet based MCE, each segment gets a particular score ranging from 0.514150 to 0.883950 where 0 means not walk-able and 1 means highly walk-able. Total 24 scores of 24 segments have been calculated and classified into three groups: High, Medium and Low Walkability. High Walkability

group includes segments having scores ranges from 0.883950 to 0.760684; Medium Walkability group includes segments having scores ranges from 0.760683 to 0.637418 and Low Walkability group segments scored from 0.637417 to 0.514150 showing in the Map 4-7.



Map 4-7 Level of Objective Walkability of Route 2

Those segments having high walkability have available walking paths, adequate street lights, and good path conditions. Moreover, these segments mostly free from young and general people gathering and according to objective indicators these segments of the route are convenient to walk. Traffic volume is low to medium which weighted to make the score high.

Those segments having medium walkability mostly have good path conditions, available walking path however, these segments scored medium because those segments are crowded by young and general people and blocked by infrastructure. Vendors and items for sale are also took place which made the walk speed lower. Some segments are blocked by car or rickshaw and bike.

Low walkability segments have modal conflicts on the walking path, poor path conditions, pathway blocked by infrastructure, high volume of traffic and pedestrians, and most importantly the walking paths are occupied by vendors and items for sale which make the road nearly unsuitable for walking. This route has road segments which are part of a really busy street of the capital Dhaka and the segments which scored low are near a market area where vendors, items for sale and traffic generate at a large amount which is actually responsible for lower score of walkability.

4.3.2. Subjective Walkability

4.3.2.1. Time and distance

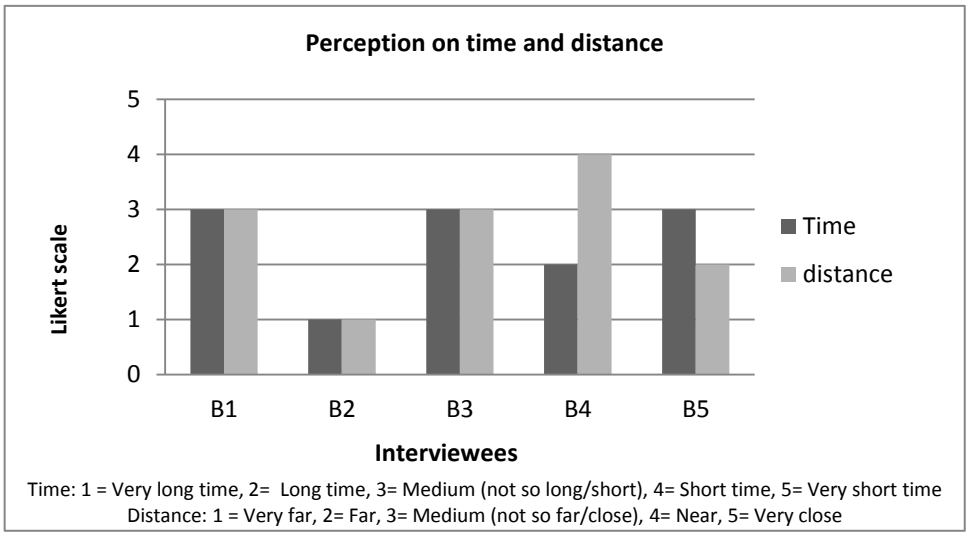


Figure 4-13 Perception on time and distance

In Figure 4-13, Respondents mostly think that the job locations are far to medium which takes medium time to go to job place. Unlikely one respondent (interviewee B4) thinks that it is not that far but takes long time to reach to job location due to unavailable footpath access and crowded road. However, one interviewee (B2) thinks that it is very far which takes very long time to reach to job location. From the graph it can be seen that the perception on time and distance of this route is quite dynamic. To predict a trend from the perceptions of the interviewees is quite tough.

4.3.2.2. Transport Cost:

Respondents of this route walk for financial problem as they cannot afford the high transport cost due to their limited salary. Therefore, instead of having alternative modes like rickshaw, tempo, bus and so on, they only walk and in any case they don't use other vehicles and walking does not require money, therefore, from personal transport cost perception they told it lowest as showed in Figure 4-14. However, in general knowledge (heard from others or gained knowledge from personal experience), all of them think that the transport cost from home to job location is very high which they are unable to afford.

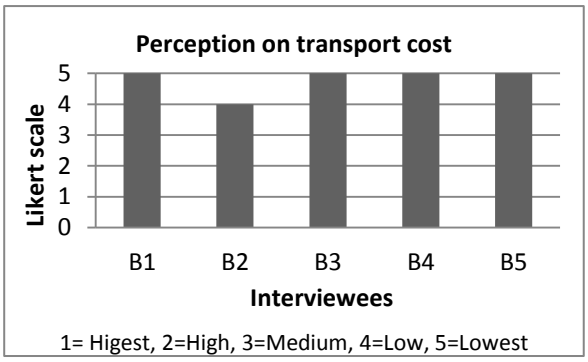


Figure 4-14 Perception on transport cost

4.3.2.3. Walking route quality:

Respondents think that the road condition is not very good as the road facilities are not enough. Moreover, the roads have problems regarding issues like safety and security. Besides, the roads are crowded so that they cannot walk smoothly and easily. The ranges of perceptions are between poor to moderate presented in Figure 4-15.

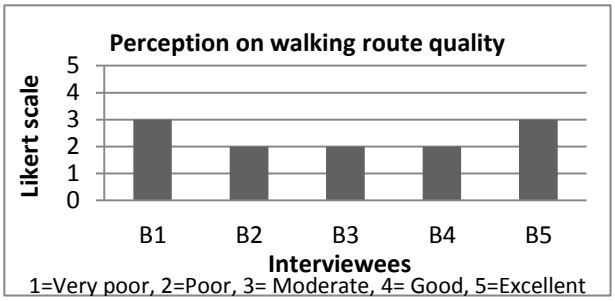


Figure 4-15 Perception on walking route quality

4.3.2.4. Accessibility:

The range of perception on accessibility to job location as presented in Figure 4-16 is medium to good whereas the accessibility to medical centres, schools, shopping centres of the route varied from bad to good. Respondents do shopping sometime on the way back home. One interviewee (B4) thinks that local services accessibility is worse in her case than job location accessibility as she does not know various places on the way she passes through. However, she feels that she works in a market place so that accessibility to shopping centres is good.

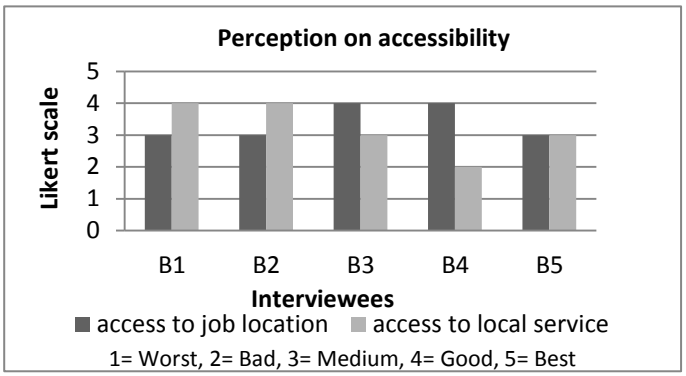


Figure 4-16 Perception on accessibility

4.3.2.5. Pedestrian facilities

According to Figure 4-17, three people think that the facilities are medium and two of them think it is bad as because they think, pedestrian facilities are available, however, they are unable to utilize it due to blocking on walking paths and sometime paths are occupied by vendors and items for sale. One interviewee (B3) told, "Walking environment has to improve for pedestrians like us who does not have any other option except walking due to unaffordable transport cost". If the walking environment will improve, it will encourage people to walk more. Providing lights, police points, adequate footpath would be good enough for this route.

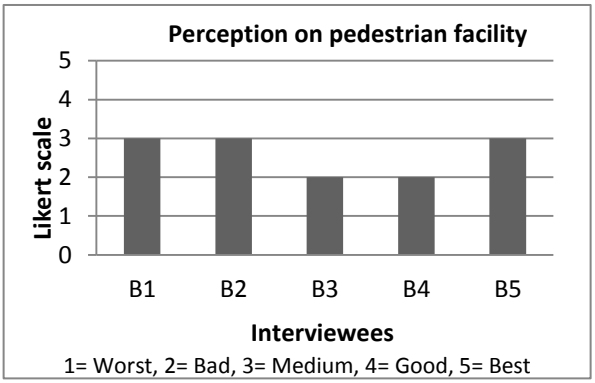


Figure 4-17 Perception on pedestrian facilities

4.3.2.6. Safety:

As presented in the Figure 4-18, except interviewee B1, according to other respondents, the roads are not that safe due to high traffic volume that causes accidents. The road condition is not very good. Accidents happen a lot and there are lots of vehicles which do not allow walking properly and smoothly. One interviewee mentioned (B3) about market area of this route where high volume of traffic and bad condition of road boosts up frequent accidents.

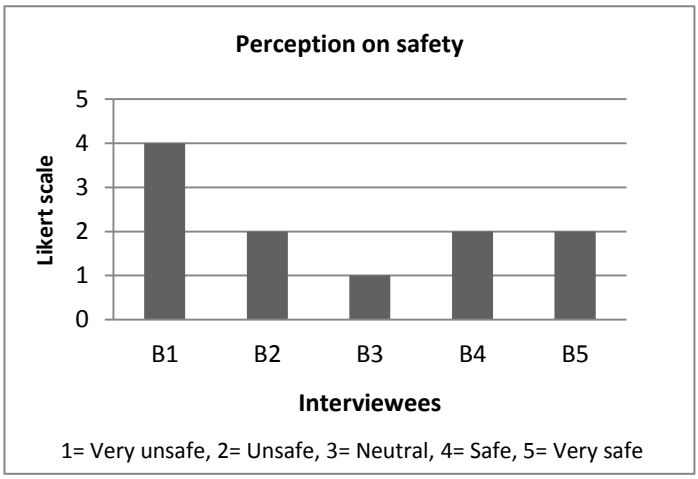


Figure 4-18 Perception on safety

4.3.2.7. Security:

The perception on security about the route has been presented in the Figure 4-19. According to one respondent (B3), walking alone at night is scary and enhances a feeling of insecurity due to bad comments of the people on the way back home. There has such kind of feeling that some people might follow them as she is alone. Another respondent (B4) is simply afraid of unknown people and feel uncomfortable as she is witness of such kind of offenses that happened to other girls. Another respondent (B2) added that she is afraid of dark roads which make her feel unsecured. However, one respondent (B1) thinks that the road is safe as she did not face such kind of crime activity before. The perception of interviewees on security is quite dynamic about this route.

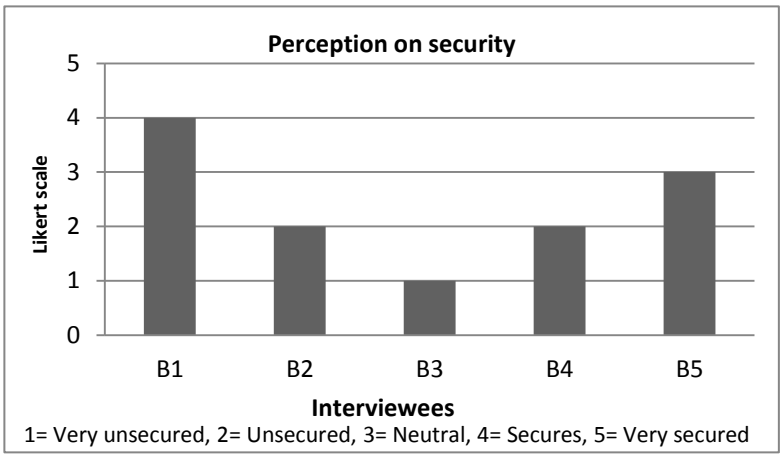


Figure 4-19 Perception on security

4.3.2.8. Congestion:

As presented in the Figure 4-20, three respondents think that traffic congestion has medium effects on their journey whereas one respondent (B2) thinks it affects greatly. Exceptionally one respondent (B1) thinks that traffic congestion does not affect her trip that much rather other thing like occupied walking path by vendors affects her smooth walking. In a general sense, traffic congestion and the pedestrian volume is really high in this route which makes delay to reach to destinations.

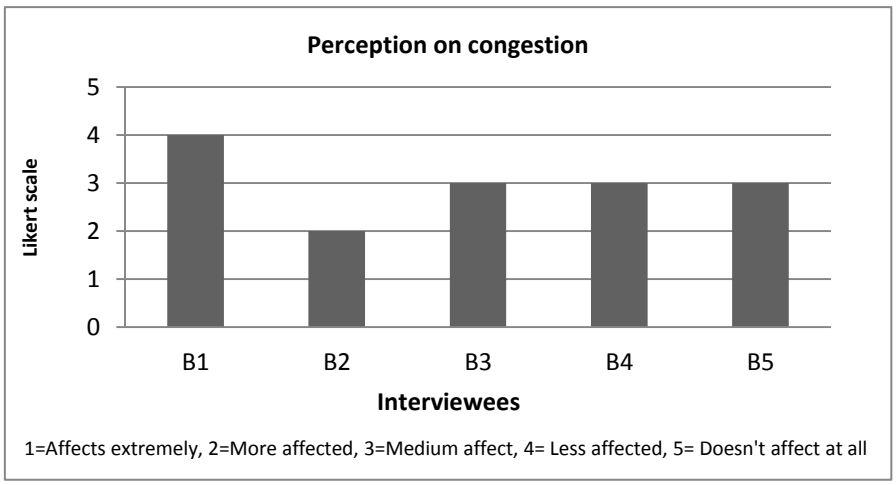


Figure 4-20 Perception on congestion

4.3.2.9. Comfort:

According to Figure 4-21, one respondent (B1) likes to walk with all other friends and also like to talk during journey, other one like to walk in some portion of the road because of its quietness. Respondents mentioned that they dislike bad comments from people on the way.

Unlikely two respondents (B3 and B4) of this route told that they do not like to walk as they do not like many things on the road. But they are poor and have to work in any way to lead their lives. Besides, they have to walk as well as they can't afford other modes which they do not like.

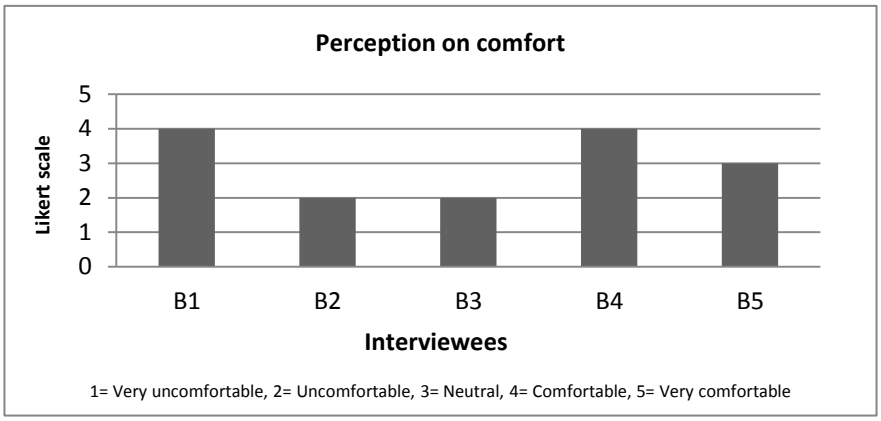
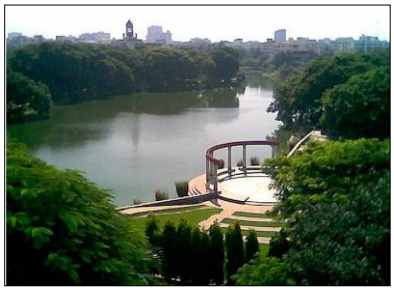


Figure 4-21 Perception on comfort

4.3.2.10. Visual attraction:

Almost all respondents followed by Figure 4-22 think that this route is visually attracted. One respondent (B5) mentioned the name of a particular road beside lake which



Picture 4-2 Dhanmondi lake

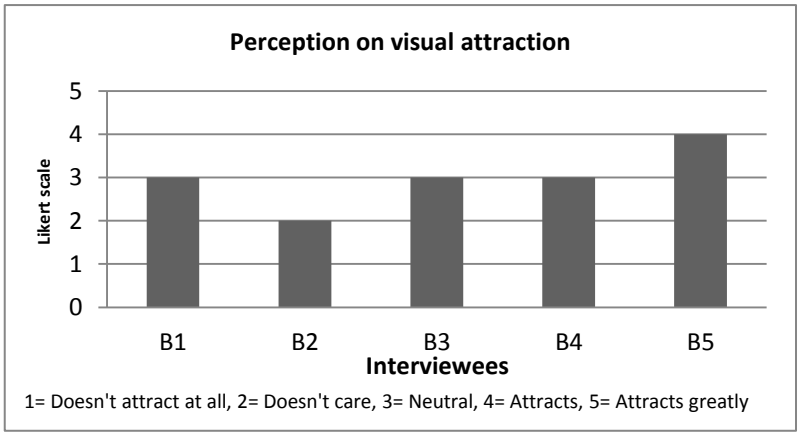


Figure 4-22 Perception on visual attraction

she likes because she likes to see the lake. It is peaceful. One respondent (B1) mentioned about a road which she liked because of having lots of trees on that road but now those trees have been cut down and she feels awful for it. Exceptionally one respondent (B2) is not visually attracted to anything, the reason might be she is mentally and physically stressed which made everything unnoticeable to her.

4.3.2.11. Walking environment:

As we can see from the Figure 4-23, about walking environment the five respondents totally responded in a dynamic way and ranges from worst to good. Two interviewees (B1, B4) think it is good, one thinks it is worst. Respondents of this route think that overall walking environment is not that bad, however, considering safety and security of the environment, the perception varied a lot from each other, however, it was understood that all

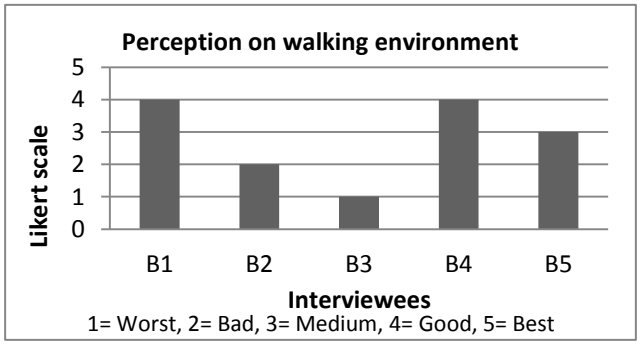


Figure 4-23 Perception on overall walking environment

of them considering different aspects (some emphasized about safety and security, some emphasized path condition and visual attraction) during giving their opinions.

4.3.2.12. Average perceived level of walkability of route 2

In a nutshell, considering all the indicator values in Likert scale, the average scores of perceived level of walkability of each interviewee are represented in the graph 4-24. The graph is showing the level of walkability within 1 to 5 Likert scale where 1 is indicating lowest and 5 is indicating highest walkability. According to 5 interviewees the level of walkability of route 2 is within the range of low to medium walkability (however, the values vary) whereas three interviewees think that the level of walkability of route 2 is close to medium and the other two think that level of walkability is low.

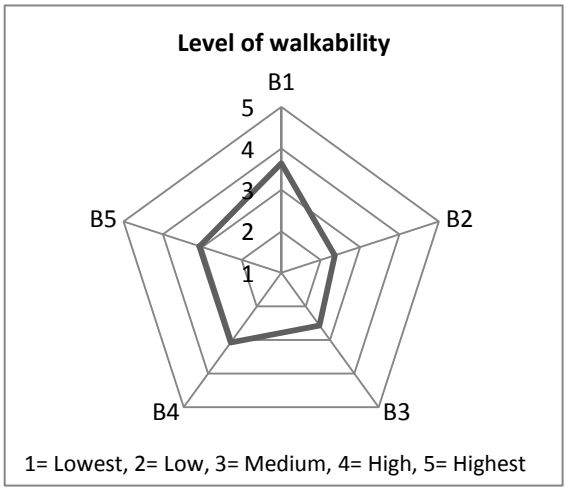
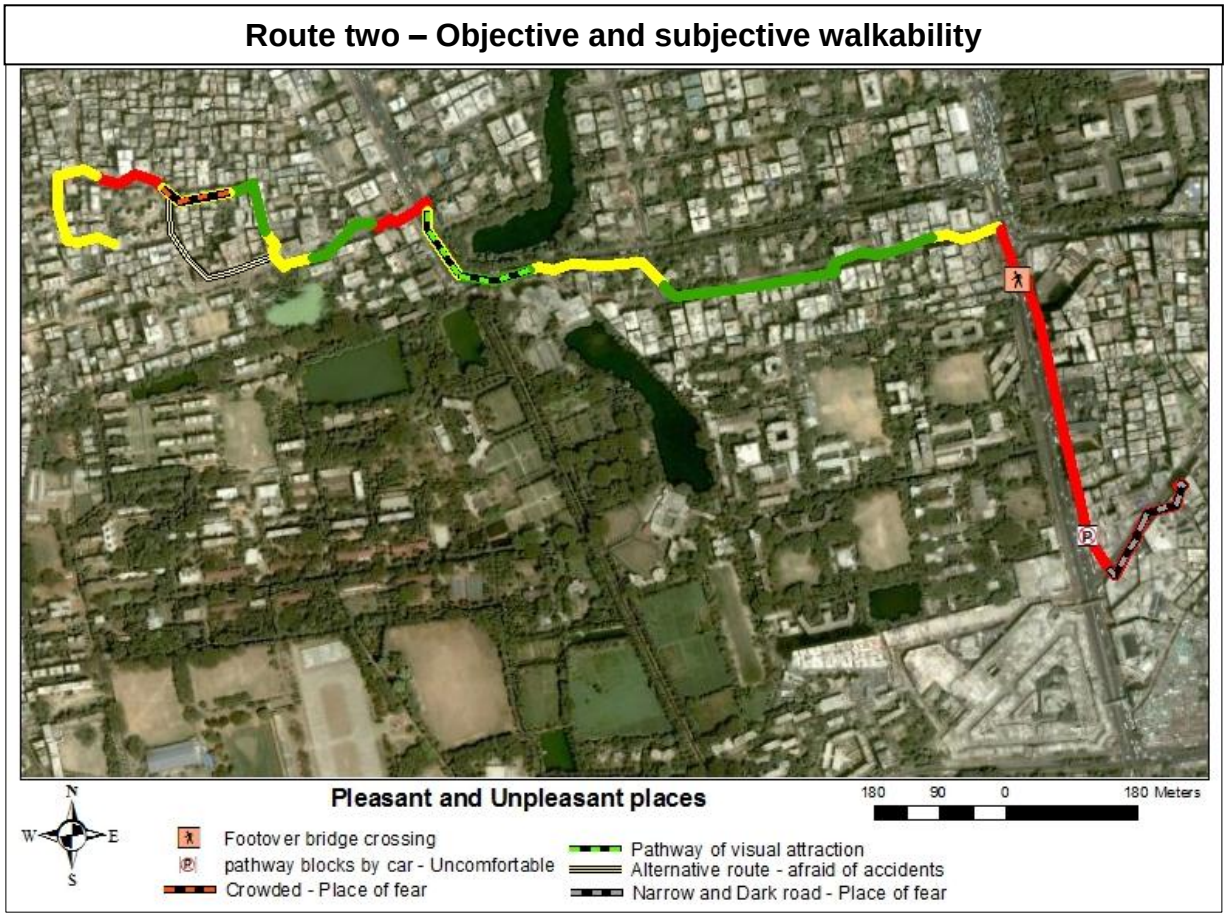


Figure 4-24 Perceived average level of walkability of Route 2

4.3.3. Objective measures and subjective perceptions based on time (day and night)



Map 4-8 Comparison between Objective and Subjective Walkability of Route 2

Respondents of this route always use the same route for going to factory and coming back only with changing few parts of the route at night. At night they do not change the total route but few parts of the

route because some roads are dark at night which is shortcut way of the route in the morning. They choose the short cut way because that road is free from congestion and walking environment seems smooth for a suitable and hazard free walk in the morning. Besides, the alternative road has problems of high speed traffic where the respondents are also afraid of accidents. The Map 4-8 is showing the alternative route at night they use and pleasant and unpleasant things along the route they feel. There has a foot over bridge on this route which they use for passing the congested road, however, they feel that foot over bridge is very far above the ground and takes physical effort to use it. There is a place which is blocked by car for most of the time and also vendors and items for sale block the footpath, therefore, respondents feel that walking through this road is quite difficult and uncomfortable. There has another portion of the route is attract respondents because this is a part of a park which has a lake and respondents like the view of it. Map 4-8 is also showing a path which is crowded by young boys who disturb the respondents at night while passing through it, therefore, respondents use the indicated alternative road to avoid this problem. There is a narrow and dark road which is place of fear at night for respondents as they experienced young group of people disturb them or crime activities happen in that place in the dark of the night.

4.3.4. Walkability assessment between subjective and objective measures

Table 4-4 Comparison between subjective and objective walkability of route 2

Similarities	Dissimilarities
• Objective and subjective measures merged in some segments of the route like foot over bridge crossing, pathway blocked by car and crowded path are the indicators of low walkability which has been merged by the roads having low walkability. • Another similarity is women garments workers mentioned the pathway of visual attraction in the portion of the route having high walkability (part of it is under medium walkability too). This indicates that places of attraction are related to influence high level of walkability.	• The segment showing crowded path by young people who disturb garments women is under medium walkability, however, garments workers think that this places is terrific at night due to its darkness and narrow characteristics. But if the route is considered regardless day and night, it has low traffic and relatively good path condition which has made it pathway with medium quality. Therefore, objective measures do not consider issues of fear or feelings of unsecure. • Pathway of visual attraction possesses high volume of traffic which turns it down to medium walk-able way; otherwise it would be walkway with high walkability based on other objective indicators.

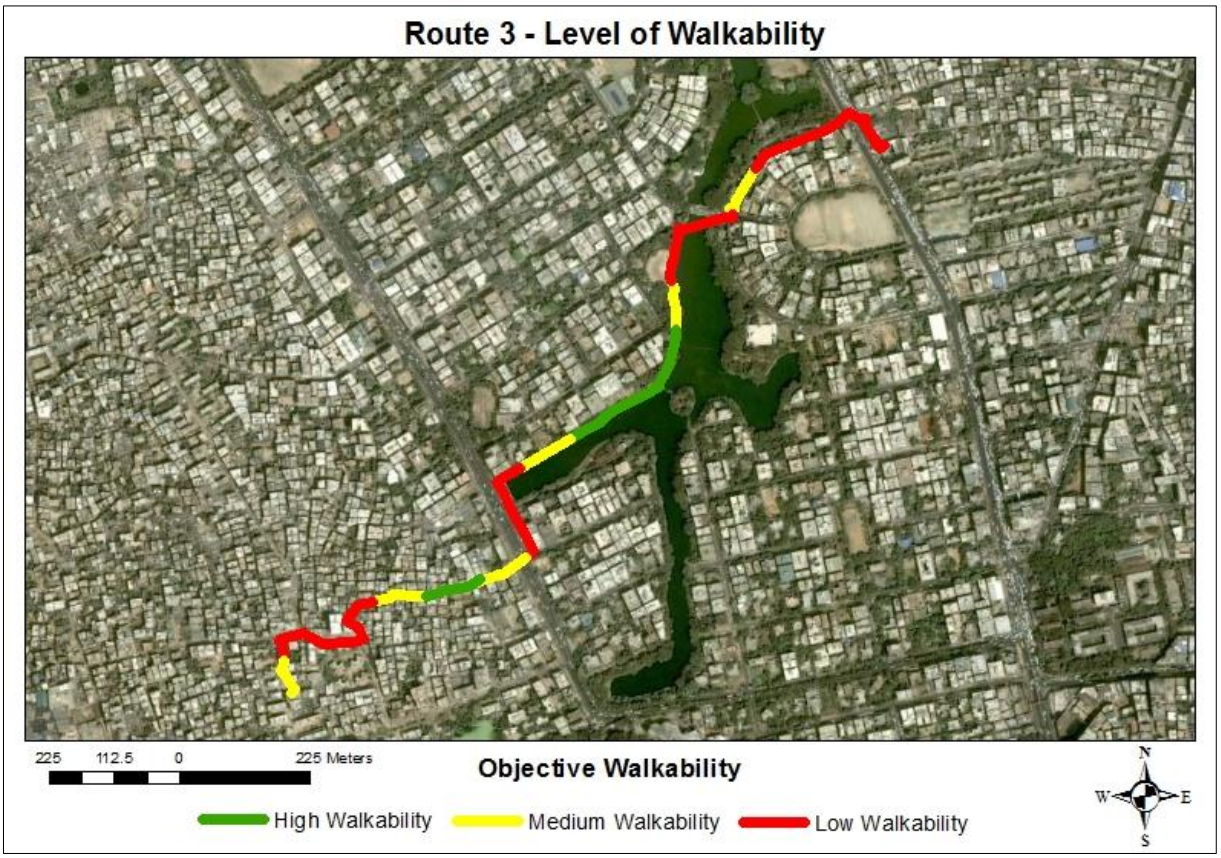
4.4. Level of Walkability of Route three

4.4.1. Objective walkability

Route 3 (length 1.95 km) has been divided into 19 segments where each segment is scored considering the objective indicators of the route. After giving weights and making standardization of the indicators using spread sheet based MCE, each segment gets a particular score ranging from 0.506870 to 0.954450 where 0 means not walk-able and 1 means highly walk-able. 19 scores of 19 segments have been calculated in total and classified into three types of groups: High, Medium and Low Walkability. High Walkability group includes segments having scores ranges from 0.954450 to 0.805258; Medium Walkability group includes

segments having scores ranges from 0.805257 to 0.656064 and Low Walkability group segments scored from 0.656063 to 0.506870 showing in the Map 4-9.

High walkability segments of the route have available walking paths, adequate street lights, and good path conditions. These paths have continuous path without having block, dustbin and trees along the road. However, the paths are crowded with high pedestrian volume and three segments have vendors.
Those segments having medium walkability mostly have medium path conditions, low to medium traffic volume, available walking path and trees however, these segments scored medium because those segments are crowded by young and general people and blocked by infrastructure. Vendors and items for sale are also taken place to make the walk speed lower. Some segments are blocked by car or rickshaw and bike.



Map 4-9 Level of Objective Walkability of Route 3

Low walkability segments have modal conflicts on the walking path, poor path conditions, pathway blocked by infrastructure, high volume of traffic and pedestrians, and most importantly the walking paths are occupied by vendors and items for sale. Besides, these segments have high speed of traffic which also contributed to make the score lower. This route has road segments which are part of a really busy street and the segments which scored low generate traffic at a large amount which is actually responsible for lower score of walkability.

4.4.2. Subjective walkability

4.4.2.1. Time and distance

Regarding distance and time the route seems far and takes long time to three respondents (C1, C3, and C4) but not very far to other respondents as presented in Figure 4-25. The journey takes about 45 minutes to reach to their destination; however, the time is medium to short to most of the respondents. The distance is about 2.5 kilometres but seems the respondents here have adapted the distance and time constraints.

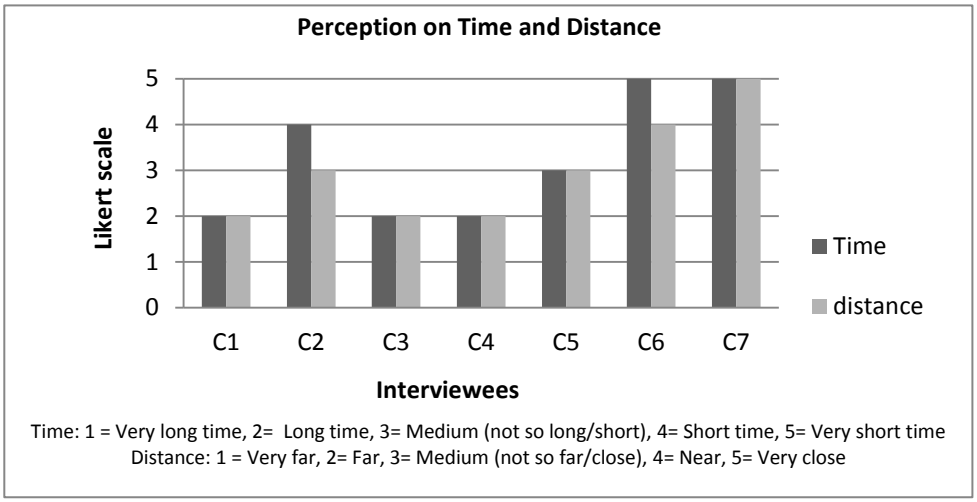


Figure 4-25 Perception on time and distance

4.4.2.2. Transport Cost

According to respondent the perception on transportation cost varied from lowest to highest range where all respondents mostly perceived the transport cost perception differently. However, every respondent agreed that transport cost is really high and they cannot afford it. Considering that interviewee C6 things that transport cost is really high where as two respondents (C3, C7) think that it is low as they never use other transport mode except walking in any condition.

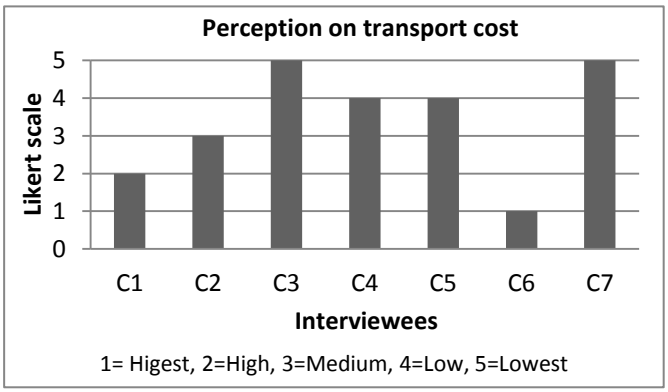


Figure 4-26 Perception on transport cost

In Figure 4-26, according to most of the respondents of this route, alternative modes are only a second option if they feel physically unstable to continue walking to cover this long distance. Otherwise most of the respondents only walk as they are unable to pay transport cost from their limited salary. Almost every respondent use only walk as a transport mode due to high transport cost that they cannot afford but some respondents still make a small budget for transport cost as they feel that they would be sick or some emergency situation may come so that they might have to use alternative transport modes. Besides, one respondent told that factory cuts down one day salary if they don't present there on time therefore she prefers to use rickshaw when she is getting really late instead of walking to reach on time.

4.4.2.3. Walking route quality:

According to Figure 4-27, perception on walking route quality ranges poor to medium; only two respondents (C2, C4) think that the quality is good. According to respondents of this route, the road condition is medium as both traffic and pedestrian volume is high. Besides some portion of this route goes under water during rainy season, becomes dark at night where street light does not function satisfactorily which made interviewee C1 and C5 think that the walking route quality is poor.

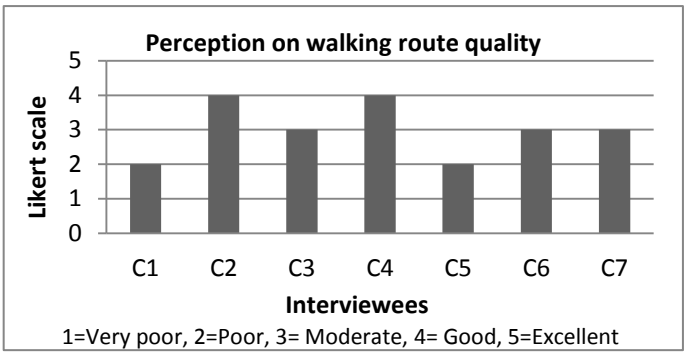


Figure 4-27 Perception on walking route quality

4.4.2.4. Accessibility:

According to Figure 4-28, about accessibility one respondent (C7) thinks that the accessibility is best, however, she did not give reason of telling it best whereas others think it's medium to good. However, according to local service accessibility, the respondents' perception ranges from bad to good. Exceptionally one respondent (C1) thinks that both accessibilities are low due to long distance and time duration. In general, respondents of this route think that the accessibility of this route is good as they get access to every public service and also to all necessities of their daily needs.

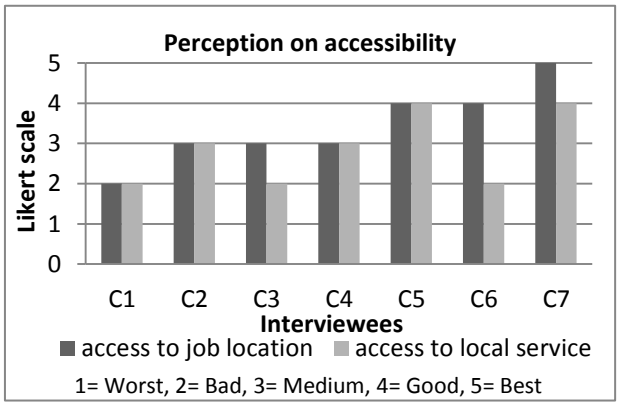


Figure 4-28 Perception on accessibility

4.4.2.5. Pedestrian facilities

As in Figure 4-29, interestingly, most of the respondents think the pedestrian facilities are bad in situation and three of respondents think that it is medium. According to respondents of this route, this route does have pedestrian facilities but they feel that the facilities of the road is underutilized, for example there have footpaths but people most of the time do not use it, there have signal crossing but people and also traffic do not obey the rule which causes accidents even. In signal crossing, traffic drivers also do strange behaviour, where in other signal crossing they obey the traffic rule, in this crossing they seems to have a tradition to break the rule and drive their vehicle in a high speed. The reasons might be the law enforcement of this place is not very strong or traffic police is not aware.

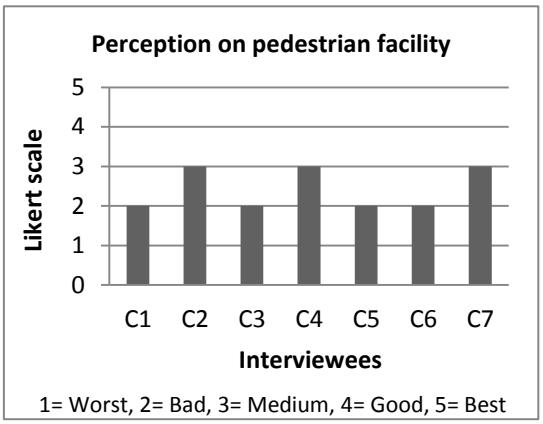


Figure 4-29 Perception on Pedestrian facility

4.4.2.6. Safety

The Figure 4-30 has represented the perception on safety of women garments workers. One respondent (C3) said, 'I feel really scared of accidents while walking. We keep our life in our hand while walking. Roads are very risky." She feels that roads are very risky to cross and traffic volume is so high and speedy as well which makes her scared of accidents. Other respondents also said the same thing which is an important safety issue for them. One respondent (C5) added dark roads too where she feels unsafe. Unlikely one respondent (C6) does not feel unsafe as she uses half of this route where accidents do not occur much and she feels safe.

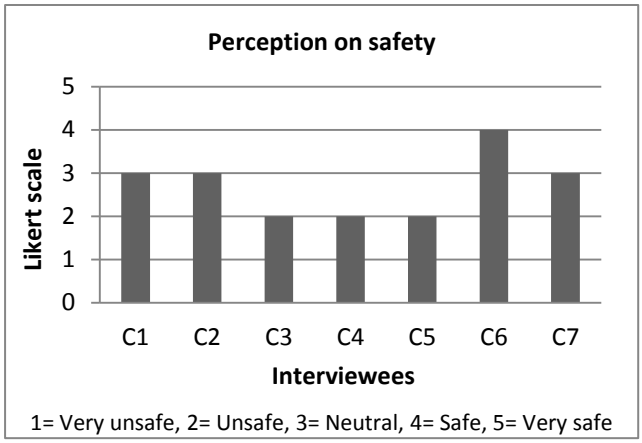


Figure 4-30 Perception on safety

4.4.2.7. Security:

In Figure 4-31, except interviewee C6 three respondents think that the environment is unsecured and the other three think security of this route is medium where interviewee C6 uses a small part of the route so that she did not consider the whole walkability situation of the route, therefore which part she uses is very secured to her. Walking environment is not secured at night in this route and roads having few people make respondents more scared. Respondents of this route also commented that hijacking, eve teasing happens at night. One respondent (C2) added that they always walk together to avoid this kind of problem. When they are many in number, they feel relatively more secured. Dark roads, humiliating comments from a group of people having bad intention make the respondents feel disgraced which they want to avoid while walking.

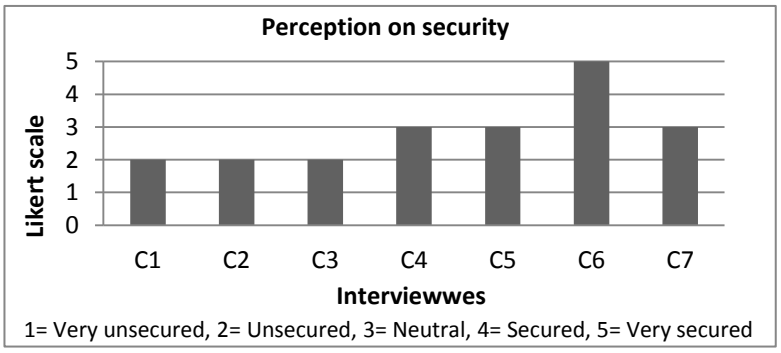


Figure 4-31 Perception on security

4.4.2.8. Congestion:

Figure 4-32 shows that all the respondents are more affected by traffic congestion only one respondent (C2) mentioned it has medium affect. Respondents of this route think that this route has high traffic volume and high traffic congestions as well which makes delay to reach to their destination. Beside, some roads of this route are narrow where traffic volume is high; therefore, the situation becomes worse to tackle which made interviewee C3 to think that traffic congestion affects her walkability extremely.

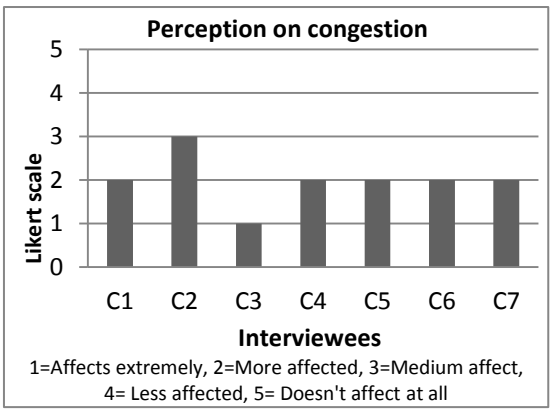


Figure 4-32 Perception on congestion

4.4.2.9. Comfort:

According to Figure 4-33, most of the respondents think the comfort level is medium. Two respondents (C3, C1) think that it is uncomfortable. Respondents of this route are positive about the walking environment overall and think that walking in this route is medium comfortable. On the contrary, one respondent (C3) like to see around while walking and talking with their colleagues. She expressed that if she walks alone, the distance seems so long and feels it like a never end journey whereas with other colleagues the journey comes to an end so quickly and makes her comfortable and hazard free.

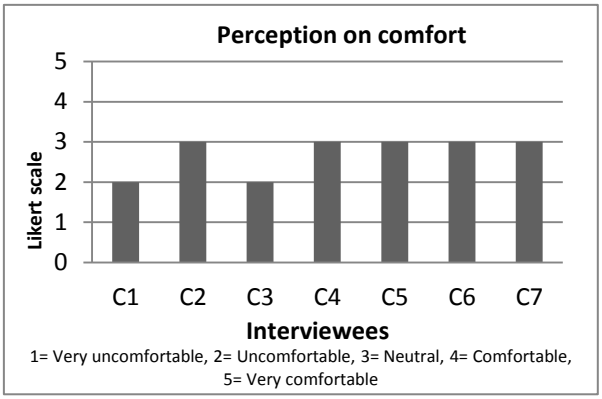


Figure 4-33 Perception on comfort

4.4.2.10. Visual attraction:

In the Figure 4-34, four interviewees strictly do not care about visual attraction where other three think the route is visually very attractive. One respondent (C1) told that there is nothing in the road to like about, however, she mentioned a place names Rabindra Sorobor (See picture 4-2) where lots of people gathers to see events or just for relaxing a while which falls in between the route. Another respondent (C5) mentioned about the park road where there is a lake beside which likes to see while walking and that it makes her mind really refreshing. However, three out of seven respondents think that the route is visually attracted but others does not care about it and do not notice it.

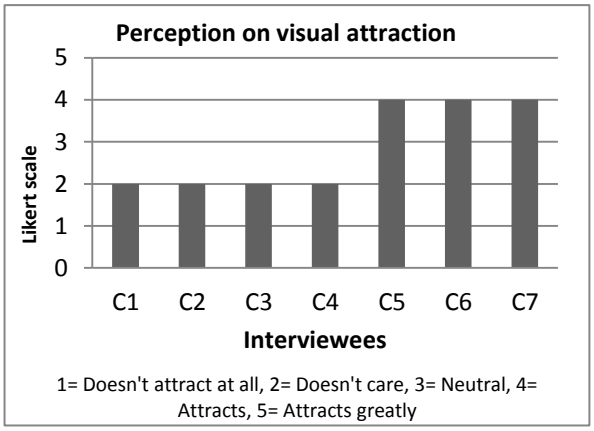


Figure 4-34 Perception on visual attraction

4.4.2.11. Walking environment:

According to Figure 4-35, most of the respondents told that the walking environment is worst to medium. Overall there has a considerable environment to walk in this route. On the contrary, one respondent (C5) did not agree with this statement and told that the walking environment possesses huge traffic congestion and gathering of people and vehicle, therefore, when she tries to go to her job place a bit earlier, sometime it becomes impossible to walk fast with the existing situation. Therefore, the walking environment is bad to her. However, interviewee C4 thinks the overall walking environment is good as she likes to walk and visually attracted to road side views of this route.

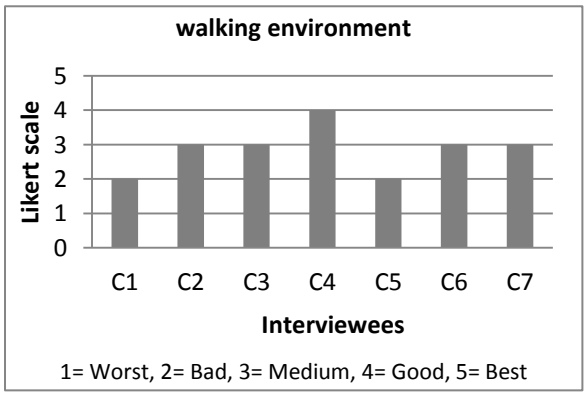


Figure 4-35 Perception on overall walking environment

4.4.2.12. Average perceived level of walkability of route 3

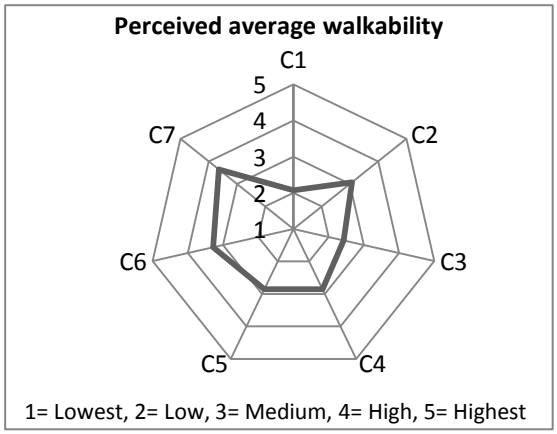
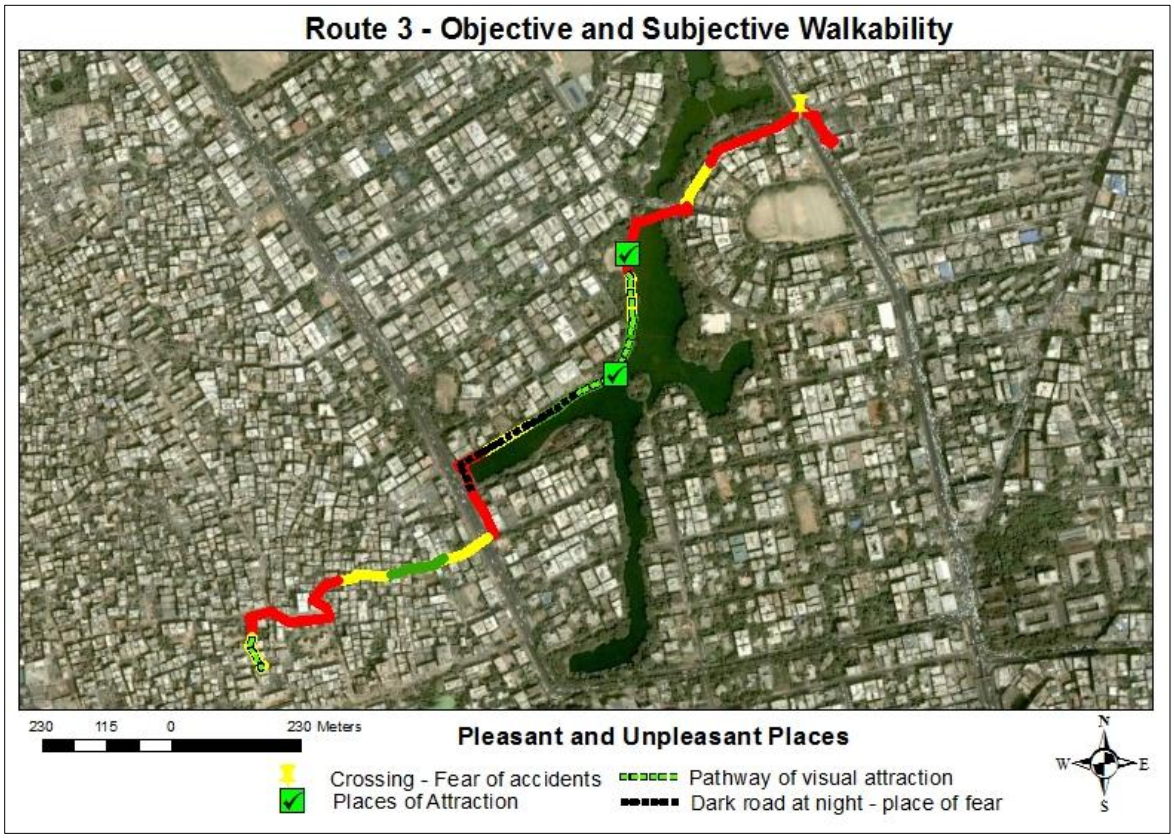


Figure 4-36 Perceived average level of walkability of Route 3

In the Figure 4-36, the overall average subjective level of walkability of route three is ranged from lower walkability to medium walkability. Considering the average score of all the subjective perceptions the walkability scores ranged between 2 to 3 which indicates that walkability level of this route is nearly medium. However, the values varied.

4.4.3. Objective measures and subjective perceptions based on time (day and night)

Respondents of route 3 mentioned that they use same route for going factory and coming back to home. However, they sometime avoid some roads and take big streets to come back home at night. One respondent told that she only knows this route and do not use other ways and she does not know other routes. As she feels the road is okay, she was not curious to use other route either.



Map 4-10 Comparison between Objective and Subjective Walkability of Route 3

According to one respondent (C2), "walking environment is not safe at night. Sometime I use big streets rather than small roads at night." She mentioned that she does not change the whole route but avoid some

roads of the route at night as those roads are short cut but at night those roads become scary due to not having street lights. Moreover, the roads are very narrow and contains gathering of young guys who disturb young girls passing by. According to other respondent (C3), "I use same route. At night I use normal road instead of park road." Other respondents mentioned about park road too which they like to walk through in the morning but when it is too late at night they avoid this road and takes the other big road instead of park road. The reasons behind avoiding park road are its quietness at late night which makes them feel that there could have unknown guys who might disturb them. Quiet and dark place seems scary to them. The Map 4-10 is showing pleasant and unpleasant things the respondents perceive based on day and night time where pathway of visual attraction into the park which they like in the morning but it become dark and scary at night therefore they avoid the park road and take the normal road to go back home. There has a crossing which is an unsafe place for respondents and frequent accidents occur in this crossing.

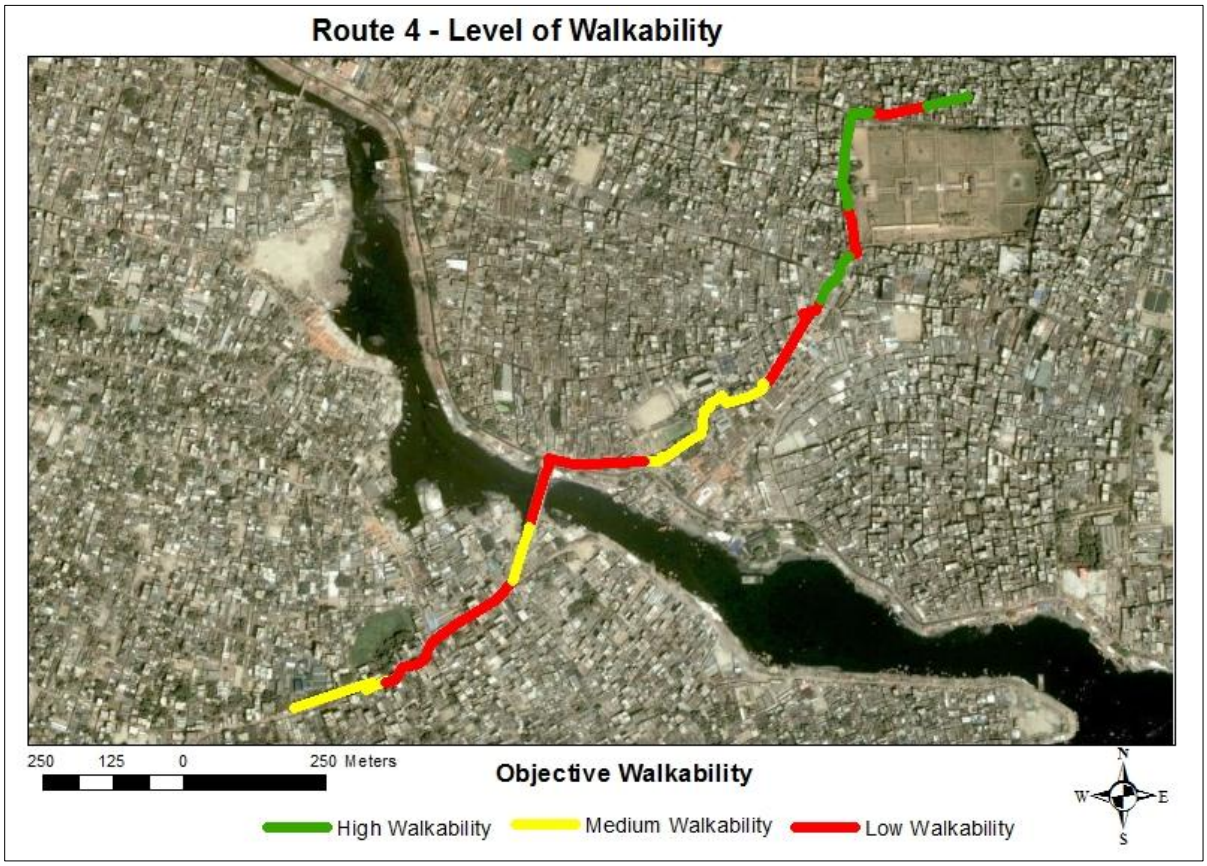
4.4.4. Walkability assessment between subjective and objective measures

Table 4-5 Comparison between subjective and objective walkability of route 3

Similarities	Dissimilarities
• The place of fear and visual attraction possess medium to high walkability segments which indicates that subjective perception has merged to objective indicators. • Another similarity is the place of accidents shows that the walkability level is low and respondents perceived that place as unsafe place.	• Place of visual attraction and place of fear is under medium to high walkability which become place of fear for respondents at night and they perceive the place as unsuitable place for walking.

4.5. Level of Walkability of Route four

4.5.1. Objective Walkability



Map 4-11 Level of Objective Walkability of Route 4

Route 4 (2.27 km long) has been divided into 20 segments where each segment is scored considering the objective indicators of the route. After giving weights and making standardization of the indicators using spread sheet based MCE, each segment gets a particular score ranging from 0.510880 to 0.894450 where 0 means not walk-able and 1 means highly walk-able. 20 scores of 20 segments have been calculated in total and classified into three types of groups: High, Medium and Low Walkability. High Walkability group includes segments having scores ranged from 0.894450 to 0.766594; Medium Walkability group includes segments having scores ranges from 0.766593 to 0.638738 and Low Walkability group segments scored from 0.638738 to 0.510880 showing in the Map 4-11.

High walkability segments of the route have medium to good path condition and medium traffic volume, and some street lights. However these paths have modal conflict, vendors, crowded of people and so on.

Those segments having medium walkability mostly have medium path conditions, high traffic volume, however, these segments scored medium because those segments are crowded by young and general people and blocked by infrastructures and modal conflicts are really high. Vendors and items for sale are also taken place to make the walk speed lower. Some segments are blocked by car or rickshaw and bike.

Low walkability segments have high modal conflicts on the walking path, poor path conditions; pathway blocked by infrastructure, high volume of traffic and pedestrians, and most importantly does not have any street lights or suitable pedestrian facilities. Besides, these segments have high speed of traffic which also contributed to make the score lower. This route has road segments which are part of a really busy market area and the segments which scored low generate traffic at a large amount which is actually responsible for lower score of walkability.

The interesting objective observation of this route is this route does not have any walking path and the road goes under water during rainy season. The road becomes muddy and dirty during rainy season as well, however, these road segments are mostly used by low wage working people who work either in garments or in industries, markets nearby. This area that possess this route is recently included under the city corporation, therefore, requires some time to get attention for its improvement.

4.5.2. Subjective Walkability

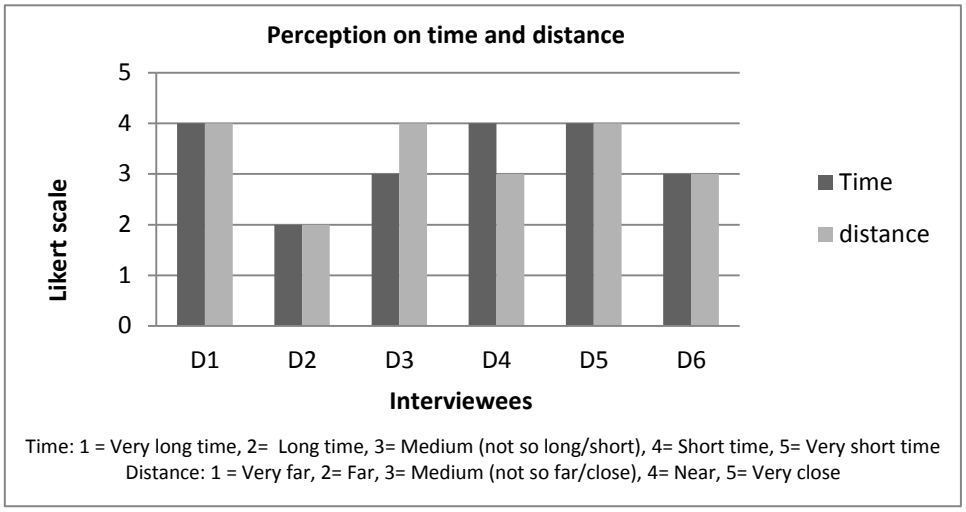


Figure 4-37 Perception on time and distance

4.5.2.1. Time and distance

The Figure 4-37 has presented the perception of Women garments worker on time and distance. "In my previous job I was unable to go to home timely as I worked very far and had to wait for rickshaw or other vehicle for a long time. Now I can go by walking which is good for me and saves my time as well," told one respondent (D1). Two of the interviewees (D1, D5) actually were satisfied with this route they are using now as they worked far away in their previous job which was more hazardous for them as there was no chance to walk from that location. With this new job they felt that their home is within walking distance so that it becomes too late at night, they do not have to wait for any vehicle for so long as they can start walking to reach home within 30-45 minutes of time. Almost all respondents said that they feel the distance is not much of this route except one (D2) thinks that job location is far and takes long time and she also thinks that road condition is poor and crowded. Other respondents said that they go with other girls and talk with each other, the distance seems less than exactly as it is.

4.5.2.2. Transport Cost

Considering the different perceptions in figure 4-38 interviewees gave their opinions. "If I spend about 50 taka per day, it is a high amount of transport cost which I cannot afford," mentioned by one (D2) of the three respondents. There are alternative transport modes like tempo, rickshaw bus available but almost every respondent does not use vehicles because of high transport cost. One respondent (D6) told that she use alternative modes like rickshaw or tempo only it is too late at light as she has child back home and she need to go home as soon as possible. However, she uses alternative modes rarely.

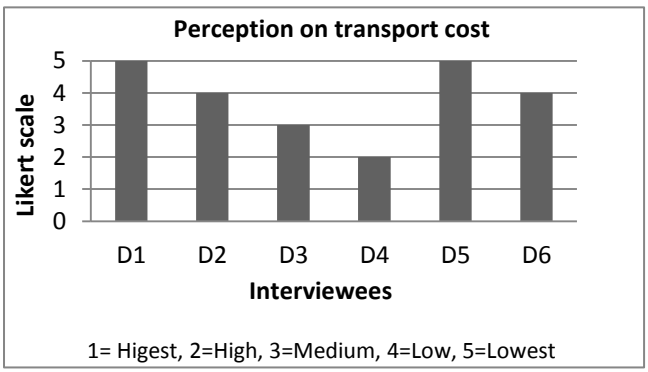


Figure 4-38 Perception on transport cost

Another respondent (D3) mentioned about weather when she only use alternative mode during rainy season. She also told that she uses umbrella during rainy season but if she forgets somehow, she use rickshaw. Otherwise she does not want to use alternative transport mode because transport cost is very high which is unaffordable. Unlikely one respondent (D4) thinks that the transport cost is really high, therefore she has to use alternative modes rarely, and otherwise due to bad road condition she would like to take alternative mode instead of walking.

4.5.2.3. Accessibility:

According to Figure 4-39, every respondent mentioned that accessibility is medium to good in this route. "The road has some facilities. If I have some money I buy some food or other nice things for my child on the way back home," mentioned by one respondent (D1). Respondents of this route can go to every necessary places effectively which values their time and cost. However, one respondent (D6) disagreed that access to local services is not good for her as she does not know the area much whereas another respondent (D5) thinks that access to local services is very good as she gets all the things like school for her children, medical services, shopping and visually attracted places as well.

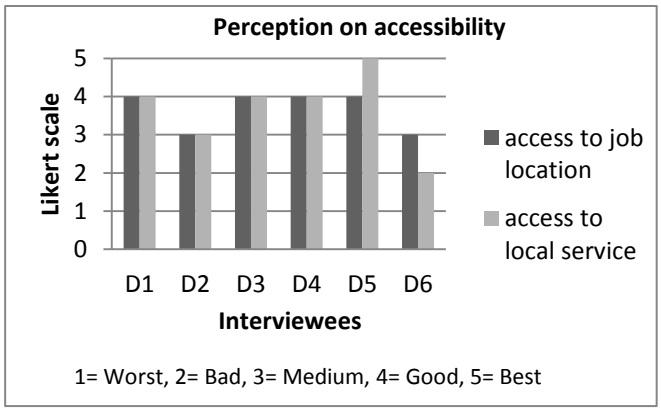


Figure 4-39 Perception on accessibility

4.5.2.4. Walking route quality:

According to Figure 4-40, walking quality is poor to medium. "The path conditions become better than before", mentioned by one respondent (D1). The condition of the road is not that good to respondents which range from worse to medium. In rainy season the condition is undoubtedly worst in one part of the route. Respondents mentioned the condition of the route was worst before compare to present situation, however, during rainy season the situation becomes same as before.

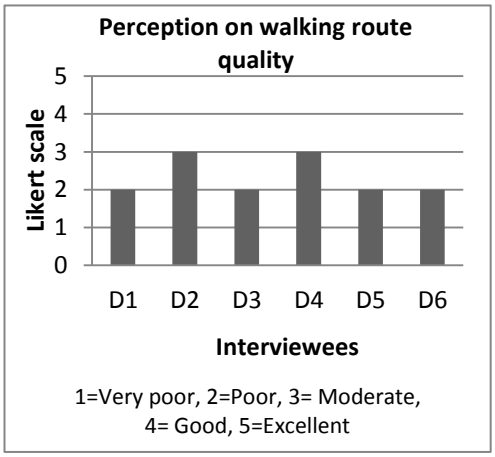


Figure 4-40 Perception on walking route quality

4.5.2.5. Pedestrian facilities

In Figure 4-41, interviewee D1 answered that she doesn't know and her score came to 0. She said "I don't have any idea, what type of facilities a road should have," mentioned by one respondent (D1), therefore, her perception came 0 out of 5. She said that she knows that she needs footpath, street light, pedestrian friendly environment to walk to her job location but she does not have idea about what else are needed to make the road fully functional for pedestrian. However, she already mentioned about pedestrian facilities. About pedestrian facilities the

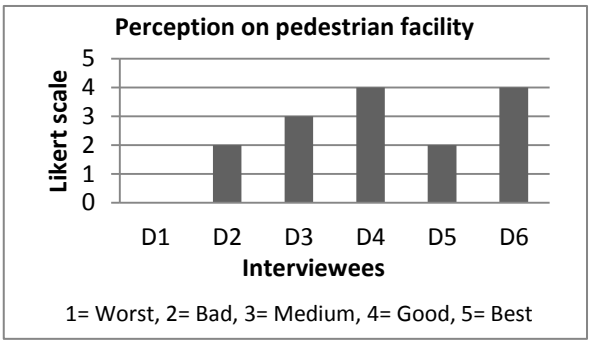


Figure 4-41 Perception on pedestrian facility

route is not very pedestrian friendly but has potentiality to be pedestrian friendly; however, the initiatives should be taken by intriguing opinions of all kinds of pedestrians using this route, mentioned by another respondent (D3).On the contrary, "walking quality and road facilities for pedestrians is okay to me on my walk way," told by another respondent (D6). Though she is passing a long distance and the route visually has many problems, she is not feeling any of them.

4.5.2.6. Safety and security

In this route safety and security has been presented together as interviewees told about the both issues consecutively. The Likert scale perception has been taken separately but the interpretation requires both terms together. Figure 4-42 and 4-43 has been presented the perception on safety and security of women garments workers of route 4.

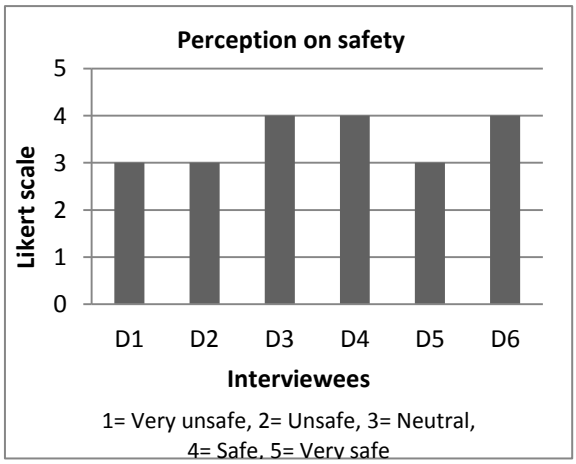


Figure 4-43 Perception on safety

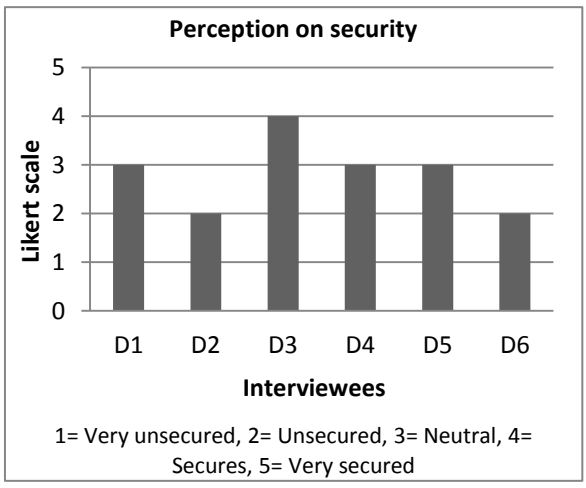


Figure 4-42 Perception on security

"But I do feel afraid of road accidents and unknown road as I do not know all the roads so well and some roads can be more unsecured than others," mentioned by one respondent (D5). Other respondents reacted more or less same about road accidents and unknown roads. Respondents also mentioned about dark roads which is a place of fear for respondents as well. The respondents mentioned that normally every portion of the route seems okay at day time; however, some portions of the route are not okay at nights due to not having street lights. Respondents expressed that any kind of crime can be occurred in the dark roads and also young people mostly gathers in the dark road or nearby comment and humiliate the girls which is unacceptable. On the contrary, "this road is good and I feel secured though it is bit dark but the other main road has risk of accidents," said another respondent (D3). As traffic congestion and traffic volume is high on the other side of road the respondent feels afraid of crossing the road and chose the dark road instead of the busy road. In this case it seems that respondents are thinking about safety issue more than security issue. Respondents said that walking at night can be scared while walking alone but it can be better if all the girls walk all together. Being with others makes most respondents safe and secured. "Though some roads are narrow, dark and is not smooth for walking and also scary a bit but I am working for 2 years but did not face any problem", told by one respondent (D1). As the respondent did not face any problem in her two years of working in the route, she became confident and got adapted with the environment of that road.

4.5.2.7. Congestion:

In Figure 4-44, it is presenting that most of the respondents think traffic congestion has many effects on their walkability. According to the interviewees, Congestion seems a common feature of this route where high traffic volume is the main problem. High traffic volume does not allow people walking effortlessly. Traffic congestion seems unbearable and a big problem for this route according to respondents as it takes a lot of time to avoid traffic congestion or to deal with it. Respondents expressed that the way traffic volume is increasing day by day would be a big problem for pedestrian to walk properly near future. Only one respondent (D3) said that she has medium effect of congestion but the rest of the respondents are extremely to very much affect.

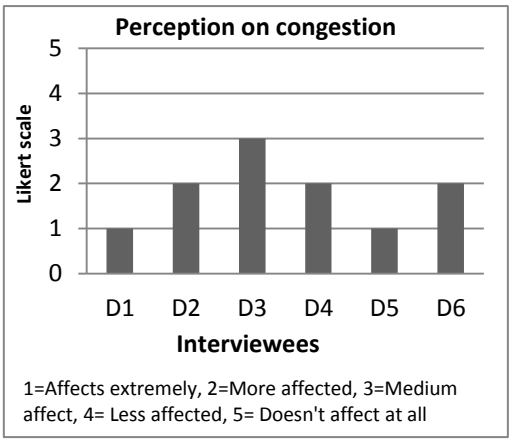


Figure 4-44 Perception on congestion effects

4.5.2.8. Comfort:

In Figure 4-45, many of the respondents expressed that many places of this route is neutral and even uncomfortable due to unavailability of walking path, poor path condition during rainy season, traffic congestion and high pedestrian volume along with high volume of traffic.

"But still I feel good and comfortable while walking. I don't have anything to dislike," mentioned by one respondent (D3) who feels that walking in this route is comfortable as she likes to walk a lot. Moreover, her perception is different to other respondents where she does not dislike anything which is a reflection of a personal perception and is related to personal satisfaction.

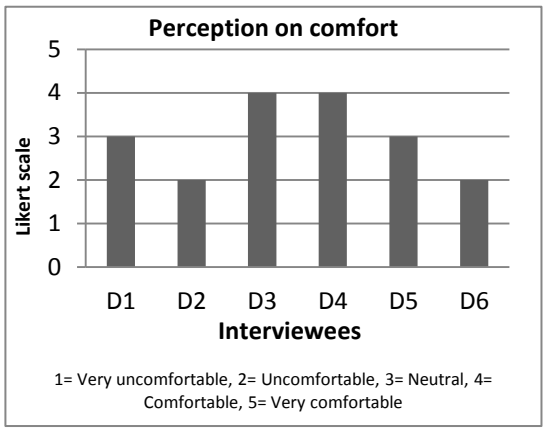


Figure 4-45 Perception on comfort

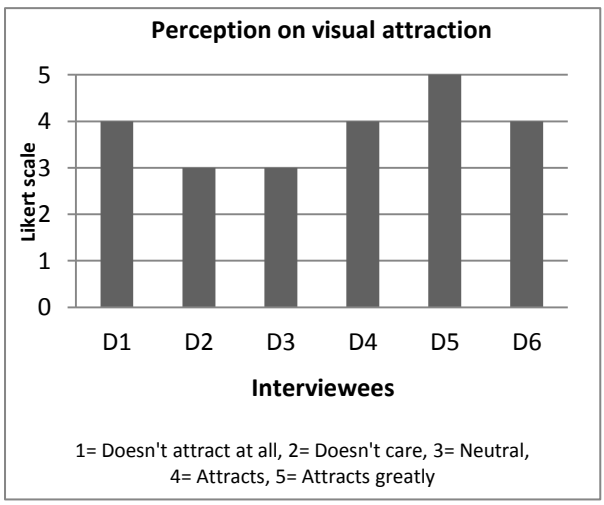


Figure 4-46 Perception on visual attraction

4.5.2.9. Visual attraction:

As showing in the Figure 4-46, most of the respondents of this route are attracted by visual attractions like shopping centres, markets, historical places nearby or natural places like river side. Some respondents just like to walk around. "If something happens in the road I become curious and spend some time to know what is happening, "told one respondent (D5) which means that sometime they become attracted to events too just like other social people even if they work for a long time and becomes tired at the end of the day.

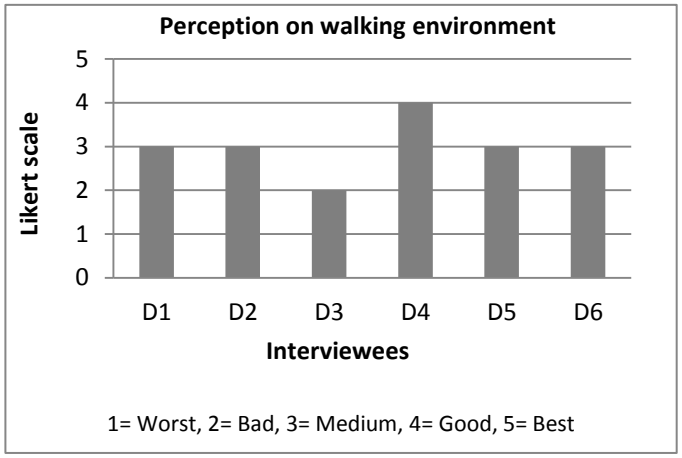


Figure 4-47 Perception on overall walking environment

4.5.2.10. Walking environment:

According to Figure 4-47, overall walking environment is medium to interviewees. "Walking environment is better at day than at night," told by one respondent (D2). Respondents expressed that in the morning the road is clean and quiet and free from traffic congestion. Moreover, safety and security issues like accidents, dark roads, unknown people, and criminal activities do not come to mind in the morning. But according to respondents, at night the walking environment changes quite frequently where safety issues like high traffic volume that causes accidents, security issues like dark roads which could be a place of fear for having unknown people, young perverts or any criminal activities. Therefore, the situation of a road changes for different time.

Average perceived level of walkability of route 4

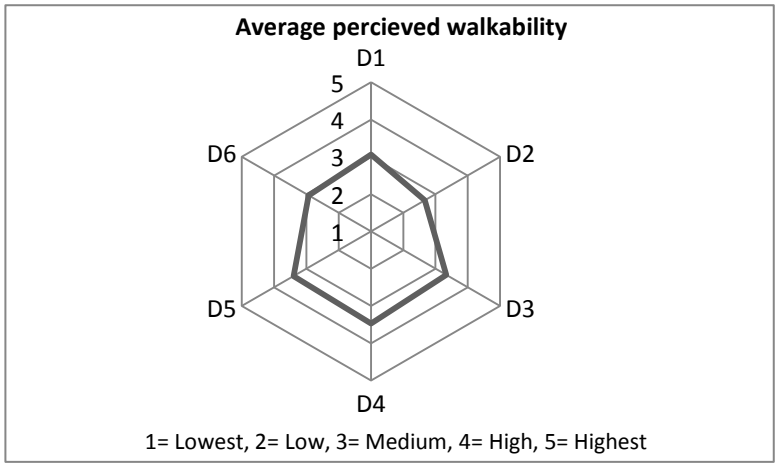
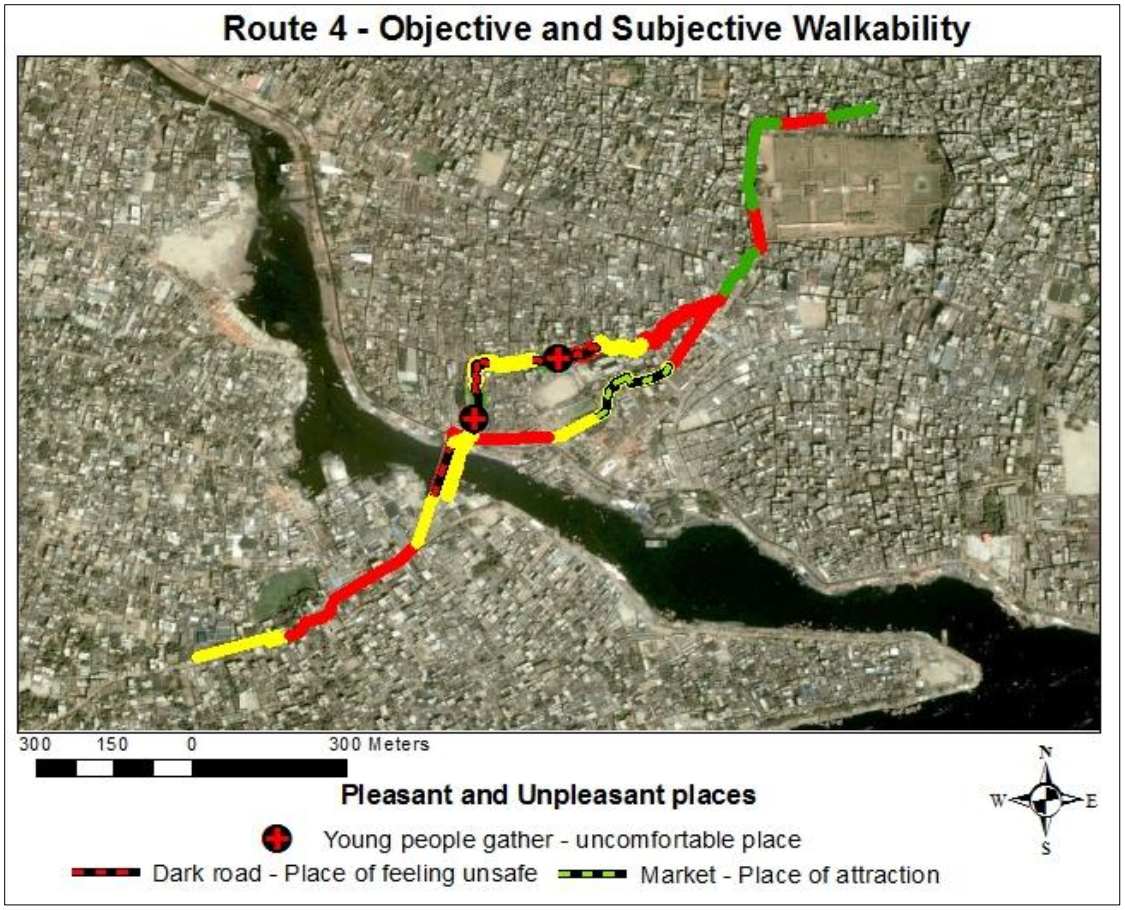


Figure 4-48 Perceived average level of walkability of Route 4

The Figure 4-48 presents that the perceived level of walkability of this route is mostly medium. The average scores of perceived level of walkability become medium based on personal perception of six respondents considering the subjective indicators of subjective walkability.

4.5.3. Objective measures and subjective perceptions based on time (day and night)



Map 4-12 Comparison between Objective and Subjective Walkability of Route 4

Map 4-12 has indicated the subjective issues and objective measures that merge to each other based on time. Six respondents use the same route at day and night, however, in one portion of the route the three respondents chose three different ways to reach to the same destination both in day and night. One respondent took the shortest path whereas the other one chose the way which is safer and the other one chose which one is more secured. This happens due to their different individual perceptions. It can be said that three respondents chose three different ways according to their perception and they follow the same route in the morning and at night to go to factory and coming back home. In the Map 4-12 the alternative path of route four is showing with the objective score.

It is found that both path possess comparatively similar objective score, however, the alternative path scored bit better than the regular path. However, at night the alternative path has problems with street light and gathering of young people who disturbs women garments workers. But the alternative path user woman chose this path as she thought the other road is very busy and accidents happen which is more dangerous than the alternative path. Other respondents chose the regular path as because the alternative one they found unsecured. The map is showing some places of pleasant and unpleasant places and the indication where young people gathers and which roads are more suitable for walking and which one is unsuitable for walking according to the perception of regular users.

The interesting thing about this route is the route is out of very fixed visual attractive places, however, most respondents found the route is visually attractive which has been shown in the perception of visual attraction graph.

4.5.4. Walkability assessment between objective and objective measures

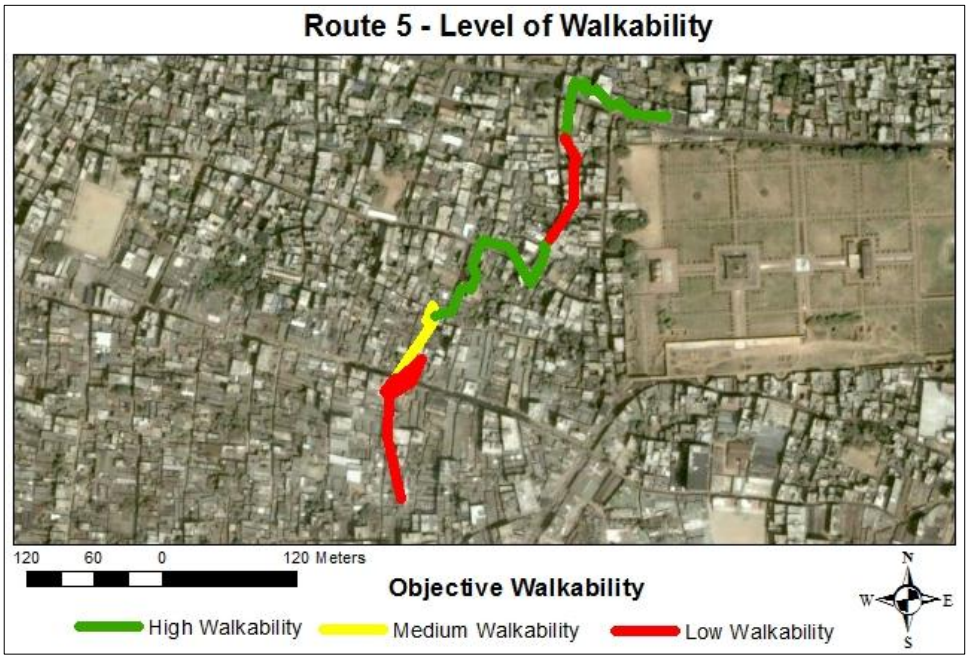
Table 4-6 Comparison between subjective and objective walkability of route 4

Similarities	Dissimilarities
• Alternative route is perceived better to one respondent and it has medium walkability based on objective indicators, therefore, the perception of alternative user's merged with the objective walkability. • Another place of attraction is market place which is liked by three respondents and it has medium walkability.	• Alternative route has security problems at night perceived by regular users which does not match with objective indicators. • Another dissimilarity is unsafe place is not unsafe in the morning but at night which perceived as low walkability but based on objective measures it has medium walkability

4.6. Level of Walkability of Route five

4.6.1. Objective Walkability

Route 5 (870 m long) has been divided into 8 segments where each segment is scored considering the objective indicators of the route. After giving weights and making standardization of the indicators using spread sheet based MCE (multi criteria evaluation), each segment gets a particular score ranging from 0.929560 to 0.821060 where 0 means not walk-able and 1 means highly walk-able. 8 scores of 8 segments have been calculated in total and classified into three types of groups: High, Medium and Low Walkability. High Walkability group includes segments having scores ranged from 0. 929560 to 0.893394; Medium Walkability group includes segments having scores ranges from 0.893393 to 0.857228 and Low Walkability group segments scored from 0.638738 to 0.510880 have represented in the Map 4-13 .



Map 4-13 Level of Objective Walkability of Route 5

High walkability segments of the route have medium to good path condition and medium traffic volume, and some street lights. However these paths have modal conflict, vendors, crowded and so on.

Those segments having medium walkability mostly have medium path conditions, high traffic volume, however, these segments scored medium because those segments are crowded by young and general people and modal conflicts happen. Some segments are blocked by rickshaw and bike.

Low walkability segments have high modal conflicts, poor path conditions; pathway blocked by infrastructure, high volume of traffic and pedestrians, and most importantly does not have any street lights or suitable pedestrian facilities. The interesting objective observation of this route is this route does not have any walking path and the road goes under water during rainy season. Some segments consists very narrow and congested road having no footpaths.

4.6.2. Subjective Walkability

4.6.2.1. Time and distance

According to Figure 4-49, Respondents mostly said the distance is short and it does not take much time where two of them said it is medium and the rest said it is short.

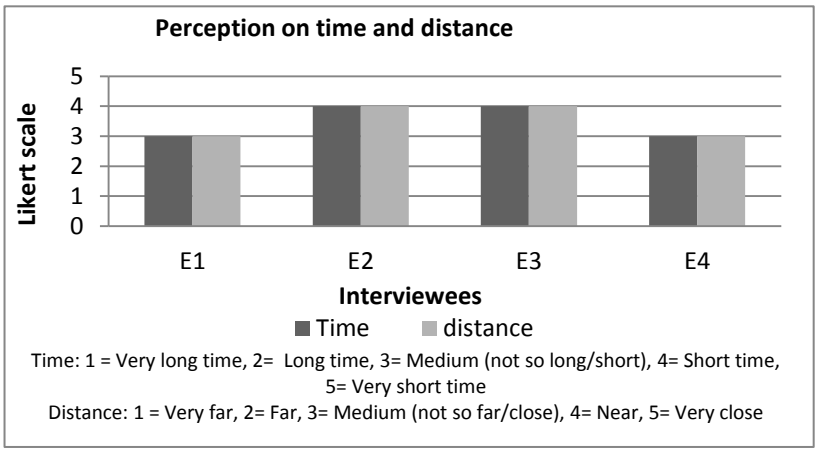


Figure 4-49 Perception time and distance

4.6.2.2. Transport Cost

In Figure 4-50, interviewees only use rickshaw (rarely) when they are very late for office in the morning. However, respondents can realize about high transport cost and using rickshaw quite frequently is not convenient. Moreover, respondents have limited amount of salary with which they have to pay a lot of things. By saving money from the transport cost they can contribute it to other event of their life. However, their perception ranges high to lowest regarding general knowledge and personal experience.

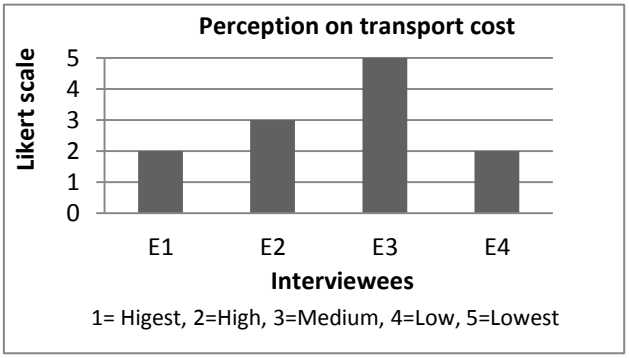


Figure 4-50 Perception on transport cost

4.6.2.3. Accessibility:

In Figure 4-51, interviewee E2 thinks the local service accessibility is worse because she does not know those places otherwise most of the respondents said the accessibility according to job location and local service is good. Respondents of this route get access to shopping centres, markets, grocery shops, and vegetables and even flower shops. Moreover, some more public services like medical centre, schools and other necessaries are also nearby.

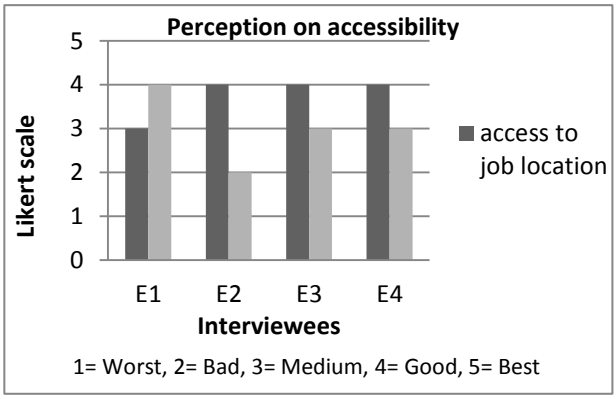


Figure 4-51 Perception on accessibility

4.6.2.4. Walking route quality:

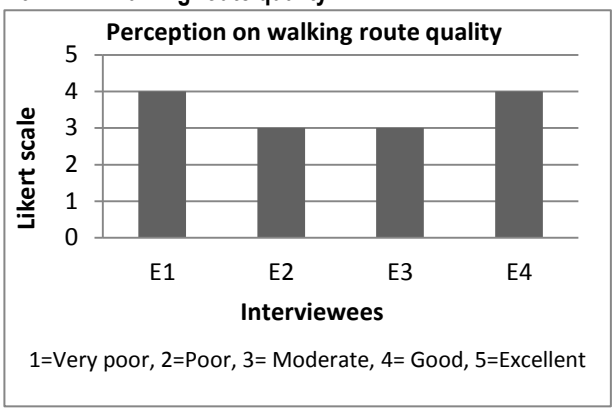


Figure 4-52 Perception on walking route quality

Small space, too narrow roads, crowded of people cause problems. "Many things are not satisfactory but I avoid things when I don't like it" said one (interviewee E3). In Figure 4-52, according to respondents, the road condition is not good with small space, narrow roads, crowded path which are causing lots of problem and make hazards to their daily life. However, respondents do realize that things cannot be changed overnight and they have to adapt with the situation.

4.6.2.5. Pedestrian facilities

As in Figure 4-53, three of the respondents think that the pedestrian facilities are medium where one respondent (E2) thinks that it is worse as she stated that this route has no footpaths, street lights does not function properly and most of the places there have no street lights. According to respondents this route needs footpaths. They also want police to stand by them so that people with bad intention cannot do any harm. Respondents suggested that this route should have more street lights so that dark roads cannot make the respondents afraid. Some infrastructure for disable people should be provided to improve the overall walking environment.

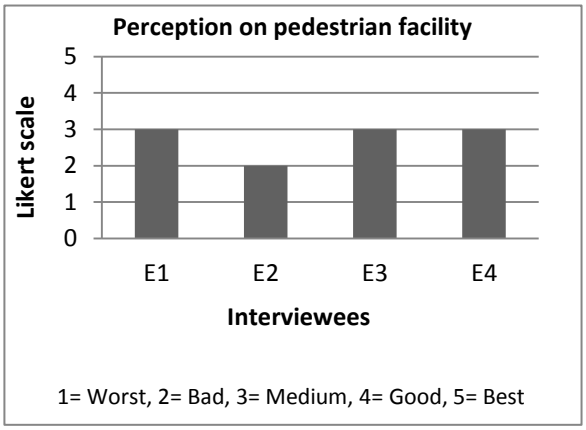


Figure 4-53 Perception on pedestrian facility

4.6.2.6. Safety

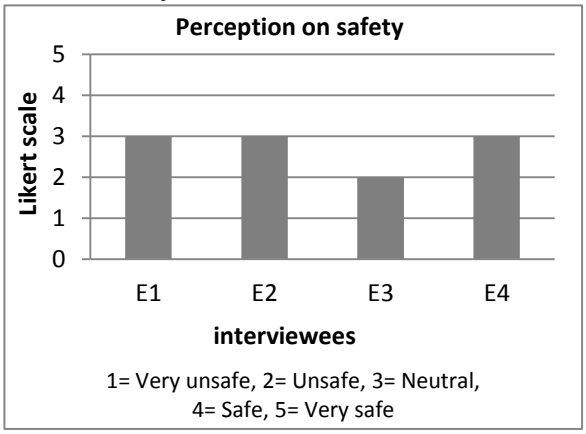


Figure 4-54 Perception on safety

In Figure 4-54, only one respondent (E3) thinks that the route is unsafe due to high volume of traffic; poor road condition might cause accidents too. Moreover, the speeds of the vehicles are very high and the vehicle drivers are not considerable to pedestrians where other respondents think the road safety situation is medium. According to respondents, traffic volume is too high and also there have conflicts with different transport mode, as a result sometime, rickshaws fall to people makes the situation risky and unacceptable.

4.6.2.7. Security

According to Figure 4-55, most of respondents think the route is not secured except one interviewee (E2). According to respondents of this route, gathering of people and vehicle and crowded path is unbearable. Sometime travel by walking becomes a problem, for example, narrow, dark roads or road having street light but non-functional makes the environment scary to walk through. However, interviewee E2 thinks the road is not very unsecure or secured as she thinks day time and night time has difference but she did not face such kind of incidents ever, therefore, her place of fear is not that much.

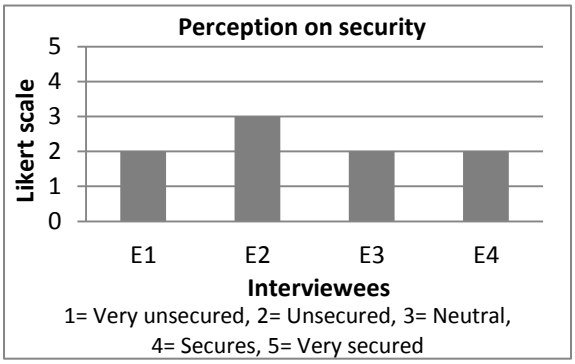


Figure 4-55 Perception on security

4.6.2.8. Comfort:

"I like some places very much along the road. Those places are less crowded and clean", said by one interviewee (E1). In Figure 4-56, most of the respondents think that the comfort level is neutral and one interviewee (E2) thinks the route is comfortable. However, less traffic congestion, clean road and less crowded roads are the place of comfort every respondents are looking for and this route does not have most of it, however, respondents accepted whatever this road are.

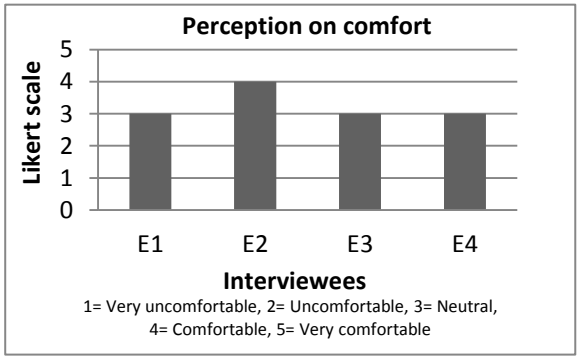


Figure 4-56 Perception on comfort

4.6.2.9. Congestion:

In Figure 4-57, half of respondents think that traffic congestion affects greatly and half of respondents think traffic congestion effects on walkability is medium. Respondents gave emphasize on traffic congestion which they do not like in this route. Volume of traffic is too high and increasing day by day which creates problems like wasting time and increasing life risks of the respondents.

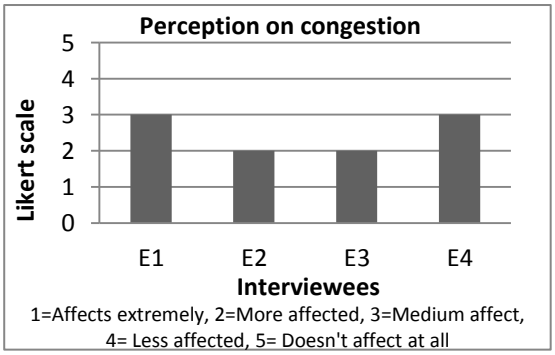


Figure 4-57 Perception on congestion effects

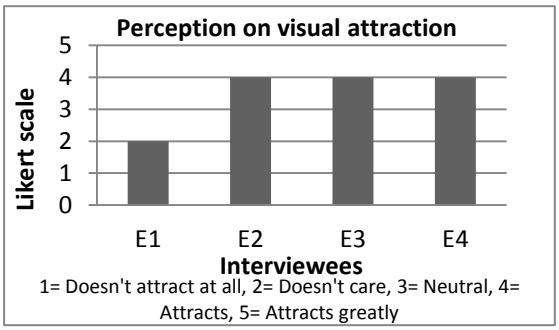


Figure 4-58 Perception on visual attraction

4.6.2.10. Visual attraction:

"I like to see shops while walking along the route. People walk, goes from one place to another which seems nice to me as I like to see people", one respondent expressed (E3). Respondent likes to walk and see things around where she likes to observe people as well which figures out her intention of walking is not only for purpose but also for her mental

refreshment and personal satisfaction. However, In Figure 4-58, most of the respondents are attracted visually to see road side view where one respondent (E1) is not attracted as she thinks there has nothing attractive on the route.

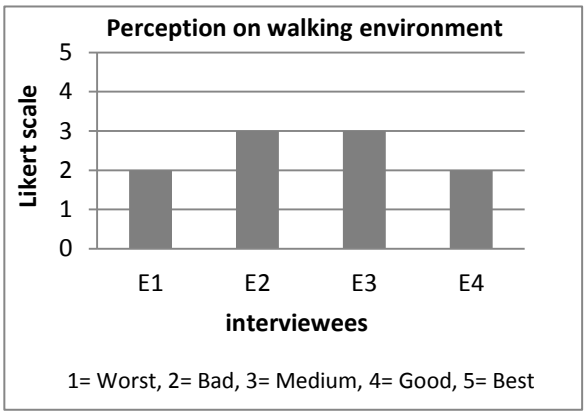


Figure 4-59 Perception on overall walking environment

4.6.2.11. Walking environment:

In Figure 4-59, two respondents think that the walking environment is bad where another two think that the situation is bit well than bad and it is medium. According to respondents, the walking environment is relatively good compare to previous situation which made them think that the environment will be better later on.

4.6.2.12. Average perceived level of walkability of route 5

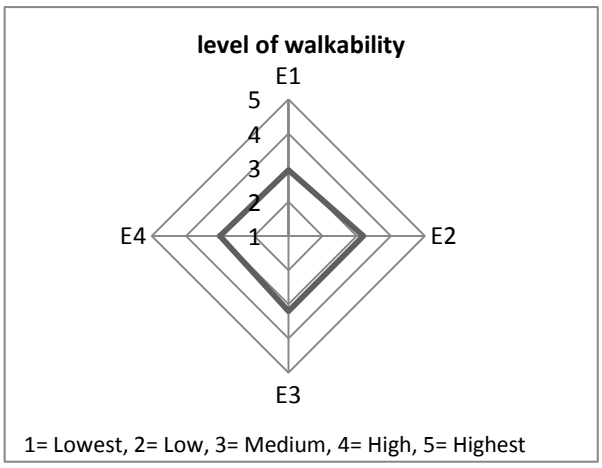
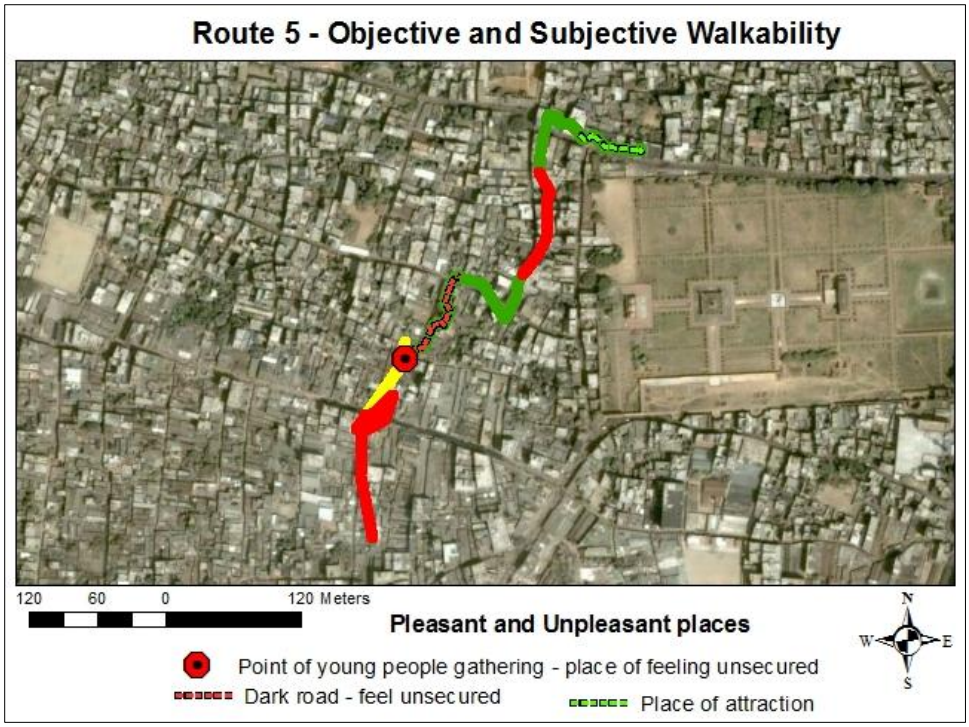


Figure 4-60 Perceived average level of walkability of Route 5

Considering all the subjective indicators of perceptions about walkability of the route, the average level of subjective walkability of the route is medium showing in the Figure 4-60. The perception of the four respondents about the route has been considered to conclude the result of subjective walkability.

4.6.3. Objective measures and subjective perceptions based on time (day and night)



Map 4-14 Comparison between Objective and Subjective walkability of Route 5

According to respondents, they use the same route at day and night as because this route is shortest and little bit free from traffic congestion. If they do not have other things to do, they normally use this route for going office in the morning and coming back to home at night. If they want to buy other thing like groceries or medicine or even flower, they use the high traffic volume road as this road has the accessibility of all necessities. The Map 4-14 is showing the points of young people gathering and place of attraction due to historical and lively places which respondents like to enjoy and place of fear which are dark and narrow roads that the respondents does not like to pass through at night. As this is the short route and they do not use any alternative routes, this place seems to be place of feeling unsecured for the women due to gathering of young people who disturbs women garments workers.

4.6.4. Walkability assessment between subjective and objective measures

Table 4-7 Comparison between subjective and objective walkability of route 5

Similarities	Dissimilarities
• Dark road is place of feeling unsecured which has perceived by women garments workers has been merged with the objective measures where that segment seems the path with low walkability. • Place of attraction segment which is perceived by users is under low walkability segment based on objective measure which are merged to each other.	• Place of young people gathering falls under medium objective walkability which is perceived as unsecured places by women garments workers.

4.7. Observations

From the analysis of subjective and objective walkability the following observations can be made:

The objective measure of walkability has been investigated into 100 meters segments. Each 100 meters segment of a route has been scored considering the existence of indicators in that particular segment. Therefore, the level of walkability of the route has been measured considering the different scores of the particular segment. But regarding the subjective measures, the perceptions of the interviewees mostly concerned the whole route they use to go to their job location and back. Apart from some direct observations during the walking interviews, the respondents did not provide their perceptions on a segment by segment basis. Therefore, it is understood that the variation between subjective measures and objective measures are not directly comparable as their scale of measurement is different. However, considering the perception, respondents pointed out some places and segments of the route which has been combined and showed in the Maps (4-6, 4-8, 4-10, 4-12, 4-14) of five routes. From the maps it can be said that the measurements of the routes based on objective indicators and subjective indicators are complementary to each other to get an impression of the walkability level/situation of the road.

From the maps of five routes the similarities and dissimilarities of the routes have been identified which in turn helps to understand where subjective and objective measures have merged and did not merge and also the reasons behind it whether it is for whole route and or in different small segments of the routes. This is helpful to get an idea about where the objective measures and where subjective perceptions are applicable to understand the situation of that particular segment and the route as a whole.

Sometimes places from subjective perceptions and objective level of walkability did not merge or did not agree about the situation which concluded that the different time of travel is responsible for that result. Where objective indicators are applicable regardless time, subjective perceptions are so dynamic for the variation of day and night travelling, during travelling at night they change not necessarily the whole route but some parts of it.

Subjective perceptions and objective measures are investigated at the personal level, however, places of fear, places of visual attractions, unsafe places, pleasant and unpleasant things has been identified in the map as a combination of all interviewees' perception. It is found that in safety, security, visual attraction etc. issues, their perceptions about indicating any specific place are more or less same. However, their perception regarding convenient issues like time, cost, route choice etc. differ from each other.

Regarding subjective measurement, interviewees gave the perceptions of walkability level based on three or four subjective issues where in objective measurement about twenty four indicators were considered. In general it might give the impression that issues of perceptions and objective condition indicators are two different things but subjective issues have been perceived based on objective indicators. For example, the number of street lights or number of signal crossings have been considered in objective measure which in turn is an important issue of personal safety in subjective measurement. Therefore, the result statement shows the evidence of the theoretical model of Campbell et.al (please see section 2-1, figure 2-2 in Chapter 2) where they stated that subjective measures or people's perceptions have influence of objective attributes.

In this research, parting from personal level walkability assessment, the variation of subjective and objective indicators separately has been found out between routes of spot one and spot two where it has been found that the level of walkability based on objective indicators is better in routes of spot one (Map

4-3) than spot two (Map 4-4). However, the perceived level of walkability based on subjective indicators is better in routes of spot two than spot one. The provision of pedestrian facilities and services are better in routes of spot one than spot two where in spot two the situation is far worse regarding pedestrian facilities and services. However, respondents of both spots have more or less same perspective about the routes they are using. In some cases women garments workers of spot two showed more satisfaction level than route users of spot one such as visual attractions, comfort etc. The reason behind these differences can be the land use setting of these two spots. Routes of spot one is under a well-established urban settings where services and other infrastructural facilities are available from the very beginning but the routes of spot two is under a newly developed urban settings where services and infrastructural facilities are just entered recently which have made some good impression to route users of spot two. Therefore, it is grasped that personal perceptions not necessarily always depend on objective conditions.

Level of walkability has been measured using quality of life approach where objective conditions and subjective perspective have been taken into consideration which in turn makes a sense that there must have relation between level of walkability and quality of life of women garments workers. From the literature review it is grasped that walkability level make both positive and negative impacts to different domains of quality of life (please see Section 2.2.1 in Chapter 2). From the subjective perspective and objective measures it is observed that women garments workers have response to different level of walkability such as pleasant and unpleasant things they mentioned which are responsible for high and low walkability respectively and consecutively affects their daily life. They perceive the level of walkability of the route not only by their satisfaction level based on route environment but also the perceptions which differ according to different time of the day (day time and night time). Therefore, the places which they like in the morning become the place of fear to them at night and they take decision to avoid those parts of the route to reach the destination. However, there are some roads of the route which are unavoidable and they do not have any alternative to avoid the risks of that portion, they solve the problem by being all (colleagues) together to pass through it as they perceive that some risks specially related to safety and security cannot be removed but can be reduced by dealing it within group.

5. UNDERSTANDING THE RELATIONSHIP BETWEEN LEVEL OF WALKABILITY AND QUALITY OF LIFE

The following discussion is the outcome of Focus Group Discussion mainly and from few Walking Interviews. The discussion is about to find out the subjective and objective dimensions of the issues and find out the aspects of walkability that has influence on life domains of overall quality of life. During Focus group discussion and walking interview, several walkability issues related to the quality of life of women garments workers came up during the analysis has been structured as following sections:

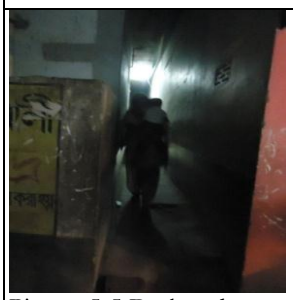
- Walkability problems
- Pleasant and unpleasant things during waking
- Improvements of walking environment
- Impacts of walkability in daily life and Relationship of walkability with Quality of life

5.1. Walkability problems and its relation to Quality of life of Women garments workers

Table 5-1 Walkability problems related to quality of life

Walkability problems	Objective and subjective dimensions
Participants (1 to 10) in Focus group discussion, mentioned walkability problems like, traffic jam, high speed of traffic, high traffic volume; roads are broken, unclean path, poor condition of road and so on. Traffic jam is too high due to high traffic volume which takes a lot of time to reach to destinations. Roads having bad condition and unclean paths are obstructs of walkability.  Picture 5-1 Unclean walking path	• High Congestion wastes time, causes delay to reach to destination • Poor road condition interrupts smooth journey
According to participant 1, "I feel so afraid while crossing the road as traffics are so fast. Many of our colleagues fall into accidents while crossing the road." Road crossing is also a problem to garments workers. Some roads have crossings without signal which is very risky to cross as frequent accidents happen to these roads always. High speed of traffic is another risky situation of the road for which women garments workers become afraid to cross the road or sometime they even avoid those busy roads which are also risky at night.  Picture 5-2 Road crossing	• Risky road crossing makes afraid of accidents. • High speed traffic roads have risks of accidents • Avoiding high speed traffic roads and choosing low speed dark road.
One participant (3) told, "Roads are very crowded and traffic jam is	• Crowded path and modal

Walkability problems	Objective and subjective dimensions
very high which interrupts to go to factories on time." Some of the participants (2,3,5) talked about road situation as walkability problems; such as crowded road which means traffic volume and number of people are too high to walk on the street. As most of the road does not have any footpath or sidewalk, vehicles and people has become problem to each other by gathering and making the place crowded.	conflicts happen because of not having walking path. • People gathering due to high traffic and pedestrian volume.
Several participants (1,9,8) highlighted walkability problems during rainy season where water logging is the main problem. According to one participant, "Sometimes sewer water also mixes up with logged water and we have to walk into it as we don't want to spend money for it." In the rainy season most of the walking routes become inundated, muddy, and dirty and it is very tough to walk at that time. Some of the participants unwillingly take rickshaw to go to factories on time whereas some of the participants do not want to waste their money and walk through the water. The water is dirty which mixes up with sewer drain water most of the time. Therefore, many participants informed that they get skin diseases sometime and also get fever as well.  Picture 5-3 Walking in rainy day when road goes under water	• Road becomes muddy, water logged, dirty during rainy season • Unwillingly have to (financial crisis) take alternative transport during rainy season which costs money • Walking into dirty water causes skin diseases and fever.
"Over bridge is too high and also it takes too much time to pass it and reach to garments. Garments is very far from my home, therefore, I don't want to waste my time." One participant (6) said. Some participants expressed their opinions about over bridge. Over bridge is an alternative way to avoid congestions and accidents in the road, however, the participants, interestingly feel that over-bridge is not feasible to them. One said that over bridge is too high which requires physical effort to pass it. Another participant told that crossing over-bridge takes more time than crossing crowded road.  Picture 5-4 Foot Over bridge	• Foot over bridge takes much time than regular time • Foot over bridge takes physical effort to cross it

Walkability problems	Objective and subjective dimensions
 Picture 5-5 Dark and narrow passage One interviewee (A4) mentioned, "At night, road becomes dark. Where there is dark, young people gather and disturb us. At that time we cannot say anything. If we protest at that time, they could do anything in dark which could bring more trouble for us." Major portion of the participants talked about young people who disturb at night. However, there have significant numbers of problems regarding night time. Many participants feel scared of dark road at night especially where street lights do not function. Because in these dark roads many young people gather, throw comment, make sounds and tease these women garments workers. Those kinds of activities are offending and responsible to make women workers humiliated. Besides they are afraid of being physically harassed in the dark where nobody can be recognized.	• Street light do not function at night in roads and young people gather in that dark roads. • Young people gathers in dark road having bad intensions.
There are several effects of the above problems which in other way making their life full of miseries. While taking child to school, more time requires than it should and makes delay to reach to factory. Therefore, wages of one becomes cut from their salary which is a pain for them and have great affects to their mind. Besides, disturbance by young people also have great impacts to their mind which restricts them to go many places they would like to go.	• Walking environment is responsible to be late to reach job location on time which cut down salary. • Cutting salary increases tension of managing expenditure.

5.2. Pleasant and Unpleasant things while walking and its relation to Quality of life of women garments workers

Table 5-2 Pleasant and unpleasant experience related to quality of life

Pleasant and unpleasant experience while walking	Objective and Subjective dimensions
 Picture 5-6 Chatting with each other "When the road is quite, we can chat with each other. During chatting most of the time we become unaware whether we are walking or going by rickshaw. We enjoy talking a lot", one participant (7) said. Most of the participants simply like to walk and talk with each other while walking to their job locations as they enjoy talking. They enjoy it, therefore, sometime do not notice the time or distance. They even forget to notice that they have passed a long distance. Time flies instantly. It expresses that how much they like to talk with each other while walking. It seems that they don't get much time to talk as they work for a long time like about 10-12 hours every day. During walking they	• Enjoy talking while walking • Talking to each other helps to forget distance and physical constraint

Pleasant and unpleasant experience while walking	Objective and Subjective dimensions
only get time to talk which refreshes their mind.	
 Picture 5-7 Dhanmondi Park road "I like to walk beside lake. I can see birds, people in the park which feels really nice", expressed by one participant (4). On the way to job location there is a park with a nice lake. Some respondents expressed that they like to walk on the road with views. Lakes, clean road, shopping centres with colourful lights or even listening music from music shops are their amusements for the entire working life which they feel pleasant. Sometimes they like to buy things while passing some market area which is part of their enjoyment and getting necessary stuffs for home. Besides, women garments workers emphasized on wide, quite, clean and beautiful road on which they can walk with pleasure and freely. One participant mentioned if the roads are free of problems they mentioned, it will be more than enough pleasant to them. Some participants like to watch children playing nearby beside the road or some like to see the regular morning view that parents are taking their children to schools.	• Enjoy walking alongside visually attractive places • Enjoy road side views • Wide, clean, quiet and beautiful road makes walking a pleasure and leisure activity.
Exceptionally one participant (10) expressed that she does not like anything. She told, "We are poor and bound to work. I don't like anything. If I am not at office on time, they cut down one day salary from my monthly salary. This is ridiculous. I don't have anything to like." It seems that she is exhausted by her working and daily life schedule. She has to drop her child to school and have to do other family works for which sometimes she can't make to reach office on time. But office rules do not consider her situation which makes her feel ridiculous and as this is happening recently and affecting her mind, she is not enjoying anything or feeling anything pleasant.	• Exceptional case • Does not like to walk but have no other choice for being poor. • Late arrival cut down salary which is a misery.
"Sometime, young boys smoke and blow smoke in our faces at the time of passing them which is really humiliating. It is so embarrassing for me." One participant said (1). Other participants also supported her and told that these incidents happen very frequently while walking. Young people gather and tease and also make sounds which are really offending and disrespectful for the women garments workers. They told that sometime they feel like crying and feel like not going for work, however, they are bound to work and there is no other way to survive, therefore, they have to tolerate these things. These are unpleasant to them to a great extent. Besides, noises of traffic, crowded, bad smell and so on are also unpleasant to the garments workers.	• Mentally depressed by young people's behavior on the road • Scared of young pervert's bad intention.

5.3. Improved walkability and its relation to Quality of life of Women garments workers

Table 5-3 Improved walkability related to quality of life

Improved walkability	Subjective and objective dimensions
"It feels good while walking if the road has less traffic, clean and has good views. These things help to walk comfortably.", expressed by one participant (2). Several participants had the same opinion. Road has to have less traffic, clean and wide so that pedestrian walk can be comfortable. Sidewalks or walking paths or footpaths should be enough to support walking environment. Several participants told about narrow roads as many of them are taking short cut paths for going to job locations to save time and also to avoid accidental risk in the big streets. Therefore, several participants indicated improvements for wide road with less traffic. One of the participants think that private building builders are occupying the road space illegally that are making roads narrower, therefore, she thinks that law enforcement is applicable in this situation to protest it. One participant said, "We have to work in any way as we have no other options except walking; less traffic volume, roads with footpaths, clean roads are appreciated."	• Good walking environment makes good feeling of walking • Less traffic for comfortable walk • Walking path for smooth walk
"Most of the time young people disturbs at night. More lights in the road and wide roads could help to avoid these kinds of problems. I feel very scared to these things. As we are poor, we have to walk and do not have money to get into vehicles; tensions regarding these situations come into mind", said by one participant (5). Other participants also supported here by admitting her way of solution. Many streets have street lights which do not function at night, besides; adequate lights are not provided to all roads they are walking. Young people gathers in the dark side of the road so that women garments workers or any people cannot recognize them properly. They take advantage of this situation and tease women garments workers. Women garments workers are main victims of this type of harassment as because they come back from their factory to home late night and they pass these young guys by walking. Therefore, young people get chance to disturb them on their way back home. In this situation very few participants mentioned about police who can also be helpful to protest this situation. However, one mentioned that police only stands on big street where this type of situation does not happen.	• More street light will help to prevent young people who disturb on the road • Road police can protest physical and mental harassment caused by young people • Protection can help not to be scared and tensed
"If you improve walking environment, my ease of movement will be increased. I can get access to my job location properly", one interviewee (B3) said. Most of the participants agreed that good walkability will enhance mobility. The mobility towards job location will be easy and comfortable as good walkability will ensure less traffic, crowded free road and so on; therefore they will be able to walk without any hesitation. Mobility is an	• Improved walking environment will help to go to job place smoothly without any hazard

Improved walkability	Subjective and objective dimensions
important issue for women garments workers to reach to their job location. They would be more beneficial out of it as walking is an important form of mobility to get access to their job locations.	
One participant (4) said, "Normally it takes one to one and half hour to go to our job location but improved walkability could help us to reach our job locations within 30 minutes." For women garments worker time is an important issue. They have to go to factory on time otherwise their wages will be cut down which has great impact to their quality of life. The walkability situation is not favourable and it impacts on their travel time. If they can save time they can easily do their family jobs within time like drop their children to schools, doing grocery shopping etc. saving time obviously has monetary value as well. Frequent mobility saves time and money which in turn can be used in other purposes.	• Improved walking condition will save time • Reaching job place on time will not cut down salary.
One participant (3) said, "As I don't go anywhere except garments, improved physical condition of the road is necessary and beneficial. It will make my journey safe." Safety is also an important issue where women garments workers always walk and feel risky while walking down the street. As road is very busy and crowd with high speed traffic make them scared to walk as many accidents happen frequently on their way to factory and back home. Parents also become worried due to this type of problem for their daughters. Most of the participants agreed that roads are unsafe where improved walkability is needed to get rid of safety problems to make the journey safe. Physical condition of the road is mostly responsible to make the journey more risky, therefore, they emphasized to improve physical condition of the road	• Improved physical condition will ensure safety
One participant (8) expressed, "I walk to save money but if walking environment will be improved, I'll walk for pleasure." Walking is the only option of the women garments workers. They do not use other transport mode except walking. All participants actually agreed that financial problem is the main issue not to use other vehicles except walking. Women garments workers get limited amount of wages with which they have to maintain their life and their family life. If they spent money on travel, major portion of their wages will be finished; therefore, they don't want to waste their money on travelling to other vehicles. They do not walk for pleasure, they are bound to walk. Therefore, if the walking environment is unbearable, they have to face it in anyway which put impacts to their mind and sometime to their health as well. If they do not enjoy walking, it reflects to their quality of life that is personal happiness. It seems that with current walkability situation they are not happy, they have preferences, perspectives and feelings that in turns reflect to their quality of life. If the walkability will be good, they will be happy with the improved situation and actually they will start walking for pleasure. Some participants mentioned	Improved walkability will increase walking for pleasure and not only for saving money • Low walkability of road have bad impacts on mind and health • Good walkability will encourage to go outside to enjoy weather and to see pleasant things

Improved walkability	Subjective and objective dimensions
that they don't go much places to visit. Sometime they wish to go outside to enjoy weather or to see pleasant things but road condition is not good so that they don't go outside just to walk or without any purpose. They wish to do so if the walkability level can be improved.	
One participant (9) mentioned, "More road lights at night and roads having good condition make walking easy and comfortable. Police check post is useful and help us to feel more secured at night." Women garments workers feel insecure while coming back from their job at night. The road becomes quiet and dark as most of the roads does not have enough street lights even if there have, many of them does not function properly. In this time many incidents can be happened which makes them feel insecure. Most of the workers use short cut paths to save the time while walking which paths are narrow and sometime does not have any physical amenities of a road. These roads are risky at night as many unknown people could be there, hijacks, pick pocketing and other harassment can be happened. Therefore, they think that police posts in certain locations and enough street light would be very helpful and support to solve these problems.	• More street light can ensure that burglary, theft and other crime activities will not happen • Police post in dark and narrow roads can prevent crime incidents
Participant 2 stated, "If the roads are nice and clean, it helps to refresh our mind and health while walking. Walking is also good for health as well." Most of the garments worker do not visit much places for pleasure, they only walk to their job location. In the current state of walkability situation, they become more disturbed that being refreshed which has affect to their work and daily life. Skin diseases happen to them during rainy season for water logging situation in the street. Road becomes muddy and dirty too. Good walkability would not allow that kind of situation which in turn will make the clean and nice. Women garments workers think that if the roads show up nice and clean having a good view will help to refresh mind. They wish to enjoy weather, wish to see pleasant views on the way just to get a journey of pleasure. Refresh mind could do more work than a disturbed mind. Besides, walking is a good exercise and good walkability of a place supports to influence walking to make health better.	• Good walkability helps to make a good walk that refreshes mind • Refresh mind can do more work • Good walkability makes a good walk which is a good exercise for health

From the above assessment of walkability based on existing problems, pleasant and unpleasant experiences women garments workers experience and their requirements for improved walkability has been described in detail. From the objective and subjective measures of specific route walkability and their assessment indicates that measuring walkability level in a quality of life perspective is itself establishing a relation between walkability and Quality of life. Moreover, the discussion and highlights of objective and subjective dimensions of general walkability problem, pleasant and unpleasant experiences and opinion about improved walkability impact on their quality of life also show that connection between walkability and Quality of life exists.

The level of walkability is the quality of walking environment which has been assessed in a quality of life perspective where objective indicators and subjective perceptions have been taken into consideration. In

the above discussion it has come to the light that walkability problems are the reasons of the low quality of walking environment for which perceptions on pleasant and unpleasant experiences differ. Low quality walking environment in other word low walkability cause walkability problems which has a negative impact on the mobility and accessibility of the women garments workers. Therefore, they have bad impression and expression about the route. Again, they think that improved walkability will have positive impact not only on their mobility and accessibility of journey but also will put positive impact to different domains of life. In this research Quality of life of Walking Environment (Walkability) has been assessed to satisfy individual well-being of women garments workers.

It has been discussed in the literature review (see section 2.2.1 in chapter 2) that walkability and quality of life is related in the sense that walkability have impacts on different life domains. Assessment of the objective measures and subjective perception of the specific domain provides domains satisfaction of that particular domain. Overall quality of life comprises different domains as discussed earlier in the literature section (See 2.1, Table 2-2 in Chapter two). From this research it has been identified by inquiring subjective and objective dimensions from focus group discussion and individual interviews analysis that different level of walkability has impacts on different domains of overall quality of life by influencing major aspects. Different aspects of different domains affected by level of walkability advance the particular domain satisfaction and overall life satisfaction as well. Therefore, the relationship between walkability and quality of life domains exists considering major aspects. The following aspects of the domains of quality of life of women garments workers have been affected by different level of walkability. Therefore, it has been established that level of walkability is related to different domains of individual well-being (QoL) of women garments workers. The domains of individual well-being which are affected by different level of walkability are highlighted below:

Table 5-4 Quality of life domains affected by different level of walkability

Quality of life domains of women garments workers affected by level of Walkability	
Domains	**Aspects**
Physical wellbeing	Personal safety: Improved walkability ensures personal safety while walking Personal mobility: Improved walkability ensures ease mobility to job locations Health & Fitness: High walkability ensures good health and physical fitness.
Material well being	Accessibility: Walkability ensures job location accessibility of women workers Security: High walkability ensures security in the walkway and vice versa. Finance: Improved walkability saves money of this captive group
Social well being	Personal interaction: Walkability enhanced personal interaction with colleagues. Social involvement: Walkability enhances walking as an active mode which increases social involvement
Productive well being	Leisure: Improved walkability helps to make the walking as leisure activity Job productivity: Improved walkability helps to refresh mind and refresh mind can work more Personal independence: Women garments worker feel independent and free in a high walk-able place
Emotional wellbeing	Visual attraction: women garments workers visually attracted to some places due to walking and have pleasant and unpleasant things. Comfort: Improved walkability provides comfort to women garments worker Satisfaction: women expressed their satisfaction level on provided services, safety, security and other issues while walking.

Quality of life domains of women garments workers affected by level of Walkability	
Domains	**Aspects**
	Positive affect: Improved walkability has positive affects to their transport as well as overall quality of life.

The table is a framework to understand the relationship between walkability and quality of life. Walkability has been assessed in considering subjective measures and objective measures which are two important dimension of quality of life concept where objective measures are quantitative and subjective measures are the individual perception of satisfaction level. From the chapter four the subjective perceptions of different indicators as well as objective measures of indicators have been measured where the variations between subjective perspective and objective measures are also assessed considering route environment in general and based on different time. However, many perceptions related to quality of life were not raised up by assessing only subjective and objective measures. Therefore, for in depth understanding a focus group discussion was conducted where some relevant issues related to quality of life domains were raised up along with personal interviews. From the focus group discussion and also from personal interviews some more issues which were not generally counted during subjective perceptions and objective measurements have been emerged like experience of walking impact on health, perception on walking as pleasure, perception on walking environment as a whole, perception on accessibility etc. therefore, information that are obtained from all the methods (objective measurement, subjective perception on objective measures to find out satisfaction level, personal interviews and focus group discussion) are accumulated and presented in the following figure (5-1). Assessment of different domain aspects are set here as standard of comparison to get the level of walkability and identified which aspects of domains are related to get overall life satisfaction and establishes the relationship between walkability and quality of life.

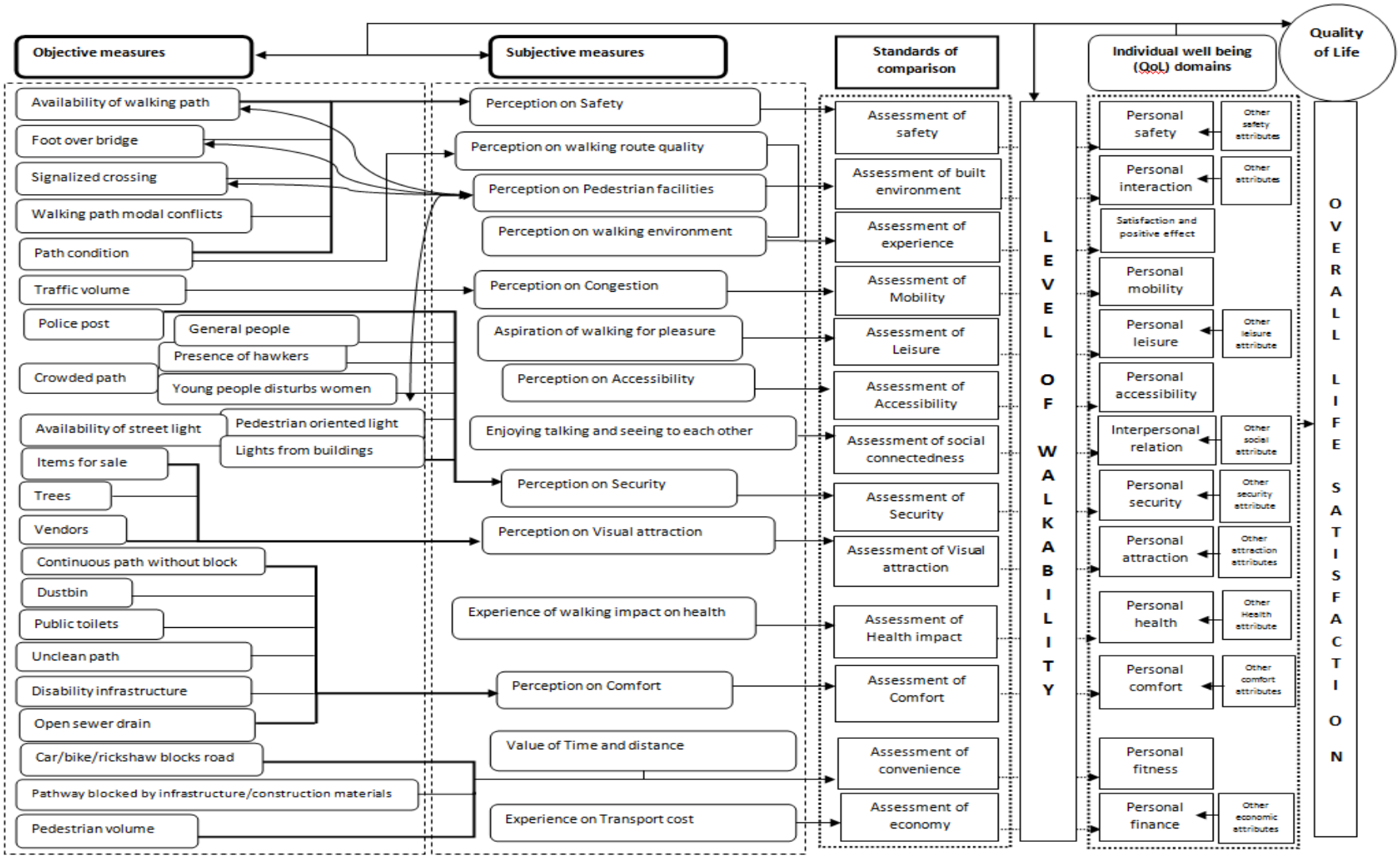


Figure 5-1 Relation between Walkability and Quality of Life domain aspects Adapted by Campbell, Converse, and Rodgers (1976), modified by Author

6. IS THE RELATIONSHIP BETWEEN WALKABILITY AND QUALITY OF LIFE REALLY SIGNIFICANT?

In previous chapters, it has been established that the relationship between Walkability and Quality of Life exists. The understanding of relationship between Walkability and Quality of Life lies on understanding the importance of the context. There are two types of relationship has been investigated between Walkability and Quality of Life in this research. One is to measure the level of walkability following quality of life concept the other is where the walkability stands in the whole Quality of Life of women garments workers. This research studied to grasp the essence of both types of relationships.

The Quality of Life concept contains two major dimensions named subjective and objective quality of Life. These two dimensions have to be considered in any Quality of Life aspect. In this research, walkability of a route which is used by a captive group has been examined where the two major dimensions of quality of life concept have been applied to understand walkability of a particular route so that the level of walkability can represent the standard of the route. In this case objective indicators and subjective perception have been applied to understand the status of the route used by women garments workers following quality of life dimensions. The objective indicators of walking environment and subjective perceptions of women about the walking environment have been considered to understand the level of walkability of their walking routes they use to get access to job locations. The relationship between walkability and Quality of Life, therefore, is established methodologically by measuring the walkability level following quality of life perspective.

In this study to understand the walkability level of the route used by women garments workers to go to their job location is important because walkability of the route for women garments worker is problematic and found as a social problem which is needed to deal with. To deal with such problem, it was obvious to understand the walkability in a quality of life perspective which implies the importance of improving the walkability level respecting the perceptions of women garments workers. Therefore, walkability and Quality of life is related significantly on the process of evaluating the walkability level of the walking routes and to what extent the women garments workers are satisfied with the existing situation. Therefore, the importance of the relationship between walkability and quality of life is worthwhile.

In another way, Quality of Life itself is a term which has different domains. Individual well-being or Quality of Life depends on cumulative life domain satisfactions. In personal well-being mobility is an important domain. In this research, walkability and mobility is synonymic to women garments workers as they do not use other alternative transport modes. Therefore, walkability interchangeably has become one of the domains of the quality of life of women garments worker. Therefore, being one of the several domains of quality of life the relation establishes however does not indicate how significant the relation is.

In a general point of view anyone would think that the relationship between walkability as a domain in overall quality of life is not that significant or walkability might have little impacts on overall quality of life and in a sense that might not be wrong. But this research is done on a specific group where the context of the research is undoubtedly a major concern. In this research the relationship between walkability and quality of life is contextually very significant in the sense of domain satisfaction. The main factors that are

responsible to make relation significant between walkability and quality of life of women garments workers are highlighted below:

- Women garments workers are captive group (economically) who do not have other options except walking to go to their job locations. This factor implies that they have to walk in any condition which in turn threats their perception of satisfaction in different situation.
- Women garments workers are under the vulnerable group in the context of Dhaka, Bangladesh (more discussion on section 2.4 of chapter 2). In this context, they are working late night in their job place and coming back to home from job location at night by walking which has impact on their overall quality of life experiences. Based on safety and security and the walking environment at night, they are more vulnerable addition to other factors regarding vulnerability, than man.
- Mobility and accessibility to job places are two most important domains in quality of life which directly relates walkability to quality of life of women garments worker. Moreover, the walkability to job location also includes employment accessibility domains to quality of life which has additional importance in overall life satisfaction.
- Besides, walking safety, walking security, visual attraction, leisure walking, walking for health etc. are contributing to personal safety, personal security, personal visual attraction, personal leisure, personal health etc. of individual well-being. These cumulative contributions (as contributions are grounded to different domains) surely are granted very important in the overall quality of life.

Therefore, it can be concluded that the relation between walkability and quality of life of women garments workers is context specific but is significant in both methodological point of view and domain satisfaction aspect.

7. CONCLUSION

According to first objective and research questions under it, different walking routes of women garments workers has been identified using mobile GPS device and also the physical environment of walking routes has been measured based on predefined walkability indicators (Objective indicators). Personal perceptions of women garments workers' were also investigated by walking interviews while walking with them which has been considered as answer of all research questions under first objective. In the second objective, objective level of walkability and subjective level of walkability has been measured by scoring them using and standardize them using MCE (multi criteria evaluation) to analyse the walking environment condition and perceptions related to objective attributes. Moreover, for analysing walking interviews and focus group discussion, Atlas.Ti has been used to identify the subjective and objective dimensions of the walkability related issues related to quality of life domains which in turn answered the research questions of the second objective. Regarding third objective, the variations of objective and subjective walkability has been established by assessing the similarities and similarities between them based on different routes and different times (Day time and Night time). From the objective and subjective walkability observations and analysing walking interviews and focus group discussion results, it is found that several aspects of different levels (high/low walkability) of walkability has impact on quality of life domains which established the relationship between walkability and quality of life of women garments workers and answered the questions of third objective.

Establishing the relationship between walkability and quality of life have positive impacts on policy implications as it considers the perception of individuals and can identify what actually people want in a given environment respecting what is offered to them. Therefore, it is important to establish the relationship between walkability and quality of life so that policy makers can take suitable decision for further progress of the environment as well as the quality of life of individuals. This research has considered a specific vulnerable group who are captive users of walking mode. Therefore, if policy makers improve the objective condition of the route considering level of objective walkability and perceptions of the workers about the route, it will be easy to identify the specific place or route that requires attention to be improved. In this way the specific group like women garments workers will be benefitted and their individual well-being domains will be enhanced that in turn will improve their overall quality of life.

This research has some challenges regarding context, analysis and measurements that are mentioned below:

- The relationship between walkability and quality of life is established to a specific vulnerable captive user group which might not be applicable for a large group of population.
- Besides, objective indicators were measured using Boolean logic for scoring which considers only the existence of particular indicator in that place but does not specify the quality of the indicators.
- This research indicated that walkability and quality of life relationship is significant in a contextual perspective but did not go through an evaluative significance test to clarify the extent of significance between their correlations.
- The research has problems of comparing subjective and objective measures due to different scale of measurement.

Measuring quality of life of walkability is less complicated than establishing relationship of walkability with overall quality of life because evaluating the significance between life domains with a particular aspect

requires a long term involvement and detail information relating to context and domain satisfactions. Therefore, this research enhances the further study towards significance of a definite domain to its overall quality of life. Enhancing improved walkability for specific groups implies that this kind of research can be implied to such kind of research where a particular aspect is dominating the life domains turning to overall quality of life. This research also implies the importance of decision making of policy makes for specific group.

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APPENDIX 1 QUESTIONNAIRE

Walking interview

Subjective walkability

The interview is only for academic purpose and completely voluntary. All information will be kept confidential. The purpose of this questionnaire is to know the experience of women garments workers while walking on the way to their job locations and coming back to home. Answer the questions if only:

- *You are a woman garments worker*
- *You only use walking mode to get access to your job locations.*
- *You have no other options except walking to go to your job locations in day time and at night.*

1. Name: ……
2. Age:……
3. Residence address:……Garments address:……
4. How often do you make this journey?

	Once	Twice	Thrice	Forth	Fifth	Sixth	Everyday	Time
Day shift								
Night Shift								
Over time								

5. Do you use the same route both day and night while going to and coming back from job locations?

	Yes	No
Reasons		

6. Which alternative modes of transport are available in your journey?

   1. Rickshaw 2. Bus 3. Tempo 4. Easy Bike 5. CNG 6. Others ……

7. Which mode of transport you prefer to reach your destination?
   ……..
8. How much money does it cost?
   …… BDT
9. What stops you using your preferred mode of transport?
   Please specify the reasons……..

10. What things you **like** most in your daily trip? Specify the reason. ……
11. Which **places** you like most in your daily trip? Please point out the places…….
12. What things you **dislike** most in your daily trip? Specify the reasons……..
13. Which **places** you dislike most in your daily trip? Please point out the places…….

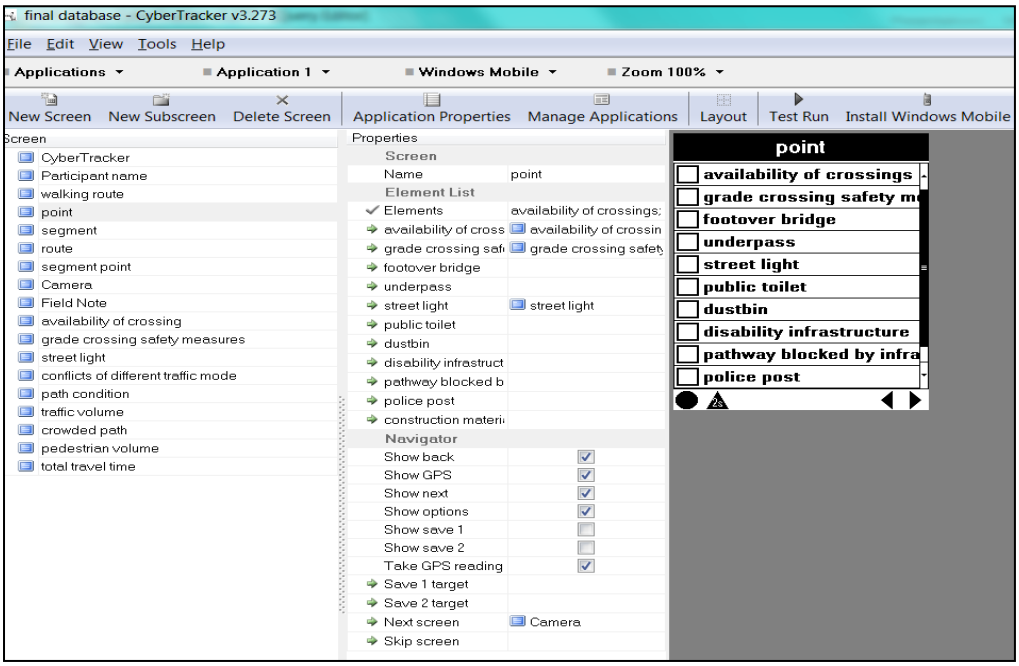
14. Perception, experience and assessment of women garments worker about their walking route

Attributes	**Level of assessment**				
	1	**2**	**3**	**4**	**5**
How do you feel about distance from home to job location?	Very long time	Long time	Medium	Short time	Very short time
How do you feel about travel distance from home to job location?	Very far	far	Medium	Near	Very close
How do you describe the overall quality of journey?	Worst	Bad	Medium	Good	Best
How would you describe the access to job location from your home?	Worst	Bad	Medium	Good	Best
How would you describe the access to the local services you need?	Worst	Bad	Medium	Good	Best
How much your weekly budget is taken up by transport costs?	Highest	High	Medium	Low	Lowest
How do you rate the quality of your walking route?	Very poor	Poor	Medium	Good	Excellent
How do you rate the pedestrian facilities in the city?	Worst	Bad	Medium	Good	Best
How safe do you feel while travelling by walk?	Very unsafe	Unsafe	medium	Safe	Very safe
How secure do you feel while walking at night?	Very unsecured	Unsecured	Medium	Secured	Very secured
What makes you feel unsecure? Please specify the reasons.	Reasons/experience:				
How does congestion affect your journey?	Affects extremely	More affected	Medium	less affected	Not at all
What are the main causes of congestion and crowd?	Reasons/experience:				
How would you rate the overall walking environment?	Worst	Worse	Medium	Good	Best
How comfortable do you feel while walking?	Very uncomfortable	uncomfortable	Medium	comfortable	Very comfortable
How does visual attraction affect your journey?	Does not attract at all	Does not care	Neutral	Attracts	Very much
How does improved walkability will affect your quality of life?	Will not affect at all	will not affect much	Medium	will affect	extremely affect

15. If given an opportunity, what improvement would you like to have in pedestrian facilities?

	Top 5 Priority (1 is top most and 5 is lowest)
Easy access for disable people	
Improved street light	
Wide, level, clean sidewalks and footpaths	
Reduced and slow traffic on road	
Remove obstacles and or parking from footpaths	
More crossing points	
Police protection at night	
Less congested and less crowded walkways	
Reducing eve teasing	

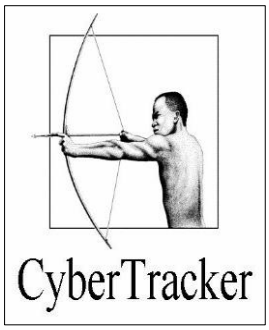
APPENDIX 2 CYBERTRACKER APPLICATION PACKAGE



1 Database

4 IPAQ

3 Mobile GPS

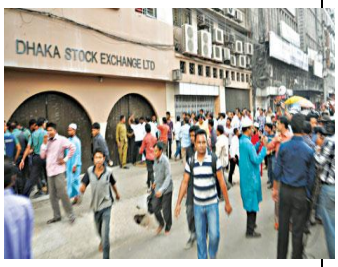
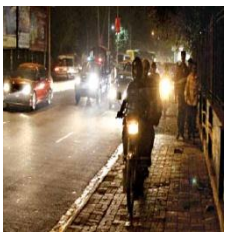


2 CyberTracker application

APPENDIX 3 OBJECTIVE AND SUBJECTIVE INDICATORS

Values	**Subjective Indicators**	**Objective Indicators**
Sense of safety from traffic	Confidence level of personal safety during walking	Availability of crossing
	Satisfaction level about safety measures like crossings, walking path	Grade crossing safety
	Level of expectation regarding safety	Walking path modal conflict
		Availability of walking path
		Path condition
		Traffic volume
		Foot over bridge
Sense of security from crime	Level of vulnerability by existence of others	Availability of Street light 1. Pedestrian oriented light 2. Lighting from buildings along walking path
	Level of apprehension while walking at night	Availability of police at night
	Level of satisfaction about security measures	Crowded path 1. Presence of hawkers 2. Young people gathering who disturbs women 3. 3. General people gathering
Comfort	Level of satisfaction about LoS	Continuous path without having step into street.
		Public toilets (Pos. env. Effects)
	Level of comfort regarding scale and enclosure	Unclean path (Neg. env. Effects)
		Open sewer (Neg. env. Effects)
		Disability infrastructure
Convenience	Level of mobility	Frequency of crossings
	Level of accessibility to other services	Pathway blocked by infrastructure
	Level of expectation regarding time and money	Pedestrian volume
Visual interest	Degree of enjoyment regarding visual variety	Trees
	Degree of happiness regarding attractive things	Vendors/items for sale

Visual interpretation of objective indicators

Indicators			
Traffic volume	High 	Medium 	Low 
Pedestrian volume	High 	Medium 	Low 
Walking path modal conflict	More than 4 modes 	4 modes 	3 modes 	Less than 3 modes 
Path condition	Bad path condition 	Moderate path condition 	Good path condition 
	Unclean path 	Hawkers 	Young boys tease women 

APPENDIX 4 WALKABILITY SCORING

	Note:			
	segment unit is 100 meters			
	modal conflicts, path conditions, traffic volume and pedestrian volume are considered homogenous within each segment			
Indicators	**scoring**			
availability of signaliged crossings	no. of signal crossing /total no. of crossing per unit			
grade crossing safety	yes = 1	no= 0		
walking path modal conflicts	more than 4 modes = 4	4 modes= 3	3 modes = 2	less than 3= 1
availability of walking path	yes = 1	no= 0		
path condition	Bad= 3	Moderate= 2	good= 1	
traffic volume	high = 3	medium = 2	low = 1	
footover bridge	yes = 1	no = 0		
availability of street light	Pedestrian oriented light = no. of lights			
	Lights from buildings= no. of lights			
Police post	yes = 1	no= 0		
crowded path				
young people gathering who disturb women	yes = 1	no= 0		
presence of hawkers	yes = 1	no= 0		
general people gathering	yes = 1	no= 0		
continuous path without block	yes = 1	no= 0		
Public toilets	yes = 1	no= 0		
unclean path	yes = 1	no= 0		
open sewer drain	yes = 1	no= 0		
disability infrastructure	yes = 1	no= 0		
construction materials	yes = 1	no= 0		
dustbin	yes = 1	no= 0		
pathway blocked by infrastructure	yes = 1	no= 0		
pedestrian volume	high= 3	medium= 2	low= 1	
car parking blocks road	yes = 1	no= 0		
bike/rickshaw blocks road	yes = 1	no= 0		
trees	yes = 1	no= 0		
vendors	yes = 1	no= 0		
items for sale	yes = 1	no= 0		

APPENDIX 5 SAMPLE SEGMENT SCORES

Criteria Tree	seg0	seg1	seg2	seg3	seg4	seg5	seg6	seg7	seg8
Walkability -- Direct	0.61112	0.74088	0.75519	0.84360	0.71700	0.71509	0.50174	0.43891	0.42167
0.20 Safety -- ExpVal									
0.17 availability of walking path -- Std:Maxim...	0.0001	1	1	1	1	0.0001	1	0.0001	0.0001
0.17 foot overbridge -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.17 walking path modal conflict -- Std:Maxi...	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	3	3	0.0001
0.17 path condition -- Std:Maximum	3	2	2	1	2	2	3	2	3
0.17 Traffic volume -- Std:Maximum	2	3	3	3	3	2	3	2	2
0.17 Signalized crossing -- Std:Maximum	0.0001	0.5	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.20 Security -- ExpVal									
0.33 police post -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.33 availability of street light -- ExpVal									
0.75 pedestrian oriented light -- Std:Maxi...	3	1	4	5	5	8	3	3	6
0.25 lights from buildings -- Std:Maximum	0	1	0.0001	0.0001	0.0001	1	0.0001	0.0001	0.0001
0.33 Crowded path -- RankSum									
0.33 presence of hawkers -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	1
0.33 young people gathering disturbs wo...	1	1	1	0.0001	0.0001	1	1	1	1
0.33 general people gathering -- Std:Maxi...	0.0001	1	1	1	1	0.0001	1	1	1
0.20 visual interest -- ExpVal									
0.33 trees -- Std:Maximum	0.0001	1	1	1	1	1	0.0001	0.0001	0.0001
0.33 vendors -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	1	1	1	1	1
0.33 items for sale -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	1	1
0.20 Comfort -- ExpVal									
0.23 continuous path without block -- Std:Max...	0.0001	0.0001	1	1	1	0.0001	0.0001	0.0001	0.0001
0.23 public toilets -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.06 unclean path -- Std:Maximum	1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	1	1
0.03 open sewer drain -- Std:Maximum	1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	1
0.23 disability infrastructure -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.23 dustbin -- Std:Maximum	0.0001	0.0001	0.0001	1	0.0001	0.0001	0.0001	0.0001	0.0001
0.20 Convenience -- ExpVal									
0.14 pathway blocked by infrastructures -- Std...	1	0.0001	0.0001	0.0001	0.0001	1	1	1	1
0.14 car parking blocks road -- Std:Maximum	0.0001	1	0.0001	1	1	0.0001	1	0.0001	0.0001
0.14 bike/rickshaw blocks road -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	1	0.0001	1
0.46 Pedestrian volume -- Std:Maximum	2	3	3	2	3	2	2	2	3
0.14 Construction materials block road -- Std:...	1	0.0001	1	1	0.0001	0.0001	0.0001	1	0.0001

Criteria Tree	seg9	seg10	seg11	seg12	seg13	seg14	seg15	seg16	seg17
Walkability -- Direct	0.63525	0.62353	0.69858	0.83623	0.64747	0.92511	0.74569	0.92284	0.57464
0.20 Safety -- ExpVal									
0.17 availability of walking path -- Std:Maxim...	0.0001	1	1	1	1	1	1	1	0.0001
0.17 foot overbridge -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.17 walking path modal conflict -- Std:Maxi...	0.0001	2	0.0001	0.0001	0.0001	0.0001	3	0.0001	0.0001
0.17 path condition -- Std:Maximum	3	3	2	1	1	1	1	1	3
0.17 Traffic volume -- Std:Maximum	1	1	3	2	3	3	2	2	3
0.17 Signalized crossing -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.20 Security -- ExpVal									
0.33 police post -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.33 availability of street light -- ExpVal									
0.75 pedestrian oriented light -- Std:Maxi...	1	2	0.0001	1	0.0001	3	0.0001	3	0.0001
0.25 lights from buildings -- Std:Maximum	0.0001	0.0001	1	1	0.0001	1	0.0001	0.0001	0.0001
0.33 Crowded path -- RankSum									
0.33 presence of hawkers -- Std:Maximum	0.0001	0.0001	1	0.0001	1	0.0001	0.0001	0.0001	1
0.33 young people gathering disturbs wo...	1	1	1	1	1	0.0001	0.0001	1	1
0.33 general people gathering -- Std:Maxi...	1	1	1	0.0001	1	1	1	0.0001	0.0001
0.20 visual interest -- ExpVal									
0.33 trees -- Std:Maximum	0.0001	0.0001	1	1	1	1	1	1	1
0.33 vendors -- Std:Maximum	0.0001	1	1	1	1	0.0001	1	0.0001	1
0.33 items for sale -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	1
0.20 Comfort -- ExpVal									
0.23 continuous path without block -- Std:Max...	0.0001	0.0001	1	1	0.0001	1	1	1	0.0001
0.23 public toilets -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.06 unclean path -- Std:Maximum	1	1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.03 open sewer drain -- Std:Maximum	1	1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.23 disability infrastructure -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.23 dustbin -- Std:Maximum	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.20 Convenience -- ExpVal									
0.14 pathway blocked by infrastructures -- Std...	1	1	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
0.14 car parking blocks road -- Std:Maximum	0.0001	0.0001	1	0.0001	0.0001	0.0001	1	1	1
0.14 bike/rickshaw blocks road -- Std:Maximum	0.0001	0.0001	1	0.0001	1	0.0001	0.0001	0.0001	0.0001
0.46 Pedestrian volume -- Std:Maximum	3	3	3	3	3	3	2	2	3
0.14 Construction materials block road -- Std:...	1	0.0001	0.0001	0.0001	1	0.0001	1	0.0001	0.0001

APPENDIX 6 ATLAS TI OUTCOME OF FGD AND CYBERTRACKER DATA VIEW