A SPATIAL AND SOCIAL ANALYSIS OF GREEN SPACE ACCESS: A MIXED-METHODS APPROACH FOR ANALYSING VARIATIONS IN ACCESS PERCEPTIONS

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Abstract

Much research has considered facility access in terms of geographic location (physical distance) and how access varies for different groups. Perceptions of facilities are known to affect access behaviours but little research has considered how access perceptions interact with access behaviours and location. This PhD thesis addresses this gap and combined qualitative and quantitative analyses in a mixed-methods approach that included GIS-based network analyses, capturing access perceptions through questionnaires, and access behaviours through participatory mapping and in-depth interviews, in relation to green spaces in Leicester, UK. In this process, a large integrated dataset was generated combing questionnaire responses (n=452), access routes captured via participatory mapping (n=245) and in-depth interviews about access perceptions (n=14). The outcomes and methods of this research augment standard distance-based on measures of access by combining these with analyses of green space access perceptions and behaviours: a multi-dimensional approach. Adopting a mixed-methods approach supported a multi-dimensional concept and analysis of accessibility. The questionnaire data highlighted the variations between different social groups, access perceptions and behaviours. Analysis of GIS-based network analysis together with the results of the participatory mappings showed that 31% of the participants travel to green spaces rather than using their local facilities and that the route respondents took to their preferred green space were not the shortest path as determined by a GIS-based network analysis. The in-depth interviews, capturing respondent perceptions of access, highlighted the importance of other access-related factors that influenced their perceptions of access and access behaviours. The key message of arising from this research is that measuring accessibility using only spatial analysis provides a narrow definition of access in terms of distance/travel time. Rather, access should be considered as a broad and multi-dimensional concept that requires holistic investigation within which perceptions of access and access behaviours are also included.

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To my late parents,

Whose memory has been a source of inspiration to me.

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List of Abbreviations

EAP	Environmental Action Plan
GIS	Geographical Information System
UGSs	Urban Green Spaces
DTLR	Department of Transport Local Government and Regions
PPG17	Planning Policy Guideline 17
AHP	Analytical Hierarchy Process
MCA	Multi-Criteria Analysis
CAQDAS	Computer aided qualitative GIS
LCC	Leicester City Council
BOS	Bristol Online Survey
SPSS	Statistical Package for the Social Science
CABE	Commission for Agriculture and Built Environment
IFAD	International Fund for Agricultural Development

Chapter 1: Introduction

Providing people with equity of access to urban green space is a hot and challenging issue in urban planning and management. Academic research has identified that green spaces provide individuals with a broad range of benefits that contribute to human health and wellbeing as well as increasing the quality of life, especially in the urban context (Jim and Chen, 2010; Choumert et al., 2008; Mitchell and Popham, 2007; Hansmann et al., 2007; Mass and Verheij, 2007; Nielsen and Hansen, 2007). Green space infrastructures have been found to be as important as streets, railways and drainage in urban environments (CABE, 2008). They act as the lungs of cities by absorbing pollutants (Baycan-Levent and Nijkamp, 2004), and providing people with spaces to enjoy and experience nature and take time out from the stresses of modern life (Sugimoto, 2013; Grahn and Stigsdotter, 2010). The positive contribution which green spaces make in people's lives increases the demand for more provisions of and access to, green spaces in and around cities (De Ridder et al., 2004). Conversely, the global increase of urbanisation (Teillac-Deschamps et al., 2009) and the population residing in urban areas are the two potential factors that have a negative impact on the quality and amount of green spaces within urban areas (Ward et al., 2010). Such factors support the concern of policy makers for the importance of sustainable development, urban management, in terms of provision of and access to, green spaces in urban contexts (Konijnendijk, 2005).

Early research intensively highlighted the importance of access to green spaces in relation to people's lives. For example, the studies by Moore (1981) on prisoners, Ulrich (1984) on hospital patients, Kaplan and Kaplan (1989) on office workers and

Tennessen and Cimprich (1995) on college students showed the positive influences of direct or indirect access to green spaces, including general health and fitness, reduced consumption of painkillers, shorter hospital stays, fewer illnesses, positive effects on physiological measurements and better college test scores. More recent research has extended the analysis of green space access and the benefits it confers. Being near to green space or experiencing green space has been found to result in health benefits (Grahn and Stigsdotter, 2010; Lee and Maheswaran, 2010; Richardson and Mitchell, 2010; Santos et al., 2009), social benefits (Arnberger and Eder, 2012; Comstock et al., 2010; Jim and Chen, 2009; Mass et al., 2009; Matsuoka and Kaplan, 2008), environmental benefits (Nowak et al., 2006; Chiesura, 2004; De Ridder et al., 2004) and economic benefits (Jim and Chen, 2010; Choumert and Salanie, 2008; Kong et al., 2007; Luttik, 2000). This corpus of research highlights the multiple benefits of green spaces and the way in which access to them benefits public health and social wellbeing. This is also reflected in recent policy initiatives such as the Sixth Environment Action Programme of the European Community 2002-2012 (EAP, 2012).

Building on the multi-beneficial influences of green spaces on individuals and urban contexts, much research has focused on analysis of access to green spaces. The importance of green space provision and access has been considered from two perspectives: accessibility in relation to mode of travel and distance and perceptions of access. From the geographical or distance-based perspective, accessibility is defined as "the ease with which activities at one place may be reached from another via a particular travel mode" (Liu and Zhu, 2004 p.105). Accordingly, a number of studies adopted geographical information systems (GIS) to analyse accessibility to green spaces on the basis of distance, travel time and cost. For instance, Kessel et al. (2009) used GIS to characterise access to green space in distance terms, and how access changed over

time among different social groups. Barbosa et al. (2007) examined how accessibility to public green space varies across different sectors of society. Heynen et al. (2006) compared the spatial distribution of urban green space against income. Neuvonen et al. (2007) studied the relationship between access to green space and the frequency of visits. Oh and Jeong (2007) analysed pedestrian accessibility to urban parks. There is also a large body of research which has analysed green space accessibility using distance and travel times and which has focused on the equity of green space access across different communities, supporting notions of environmental justice (Comber et al., 2008; Omer, 2006; Wolch et al., 2005; Omer and Or, 2005; Smoyer-Tomic et al., 2004; Hewko et al., 2002).

A second perspective, which has became important in more recent times, considers the perception of green space accessibility. In this context, accessibility is a more complex concept since it reflects the users' cognitive (knowledge-related), affective (emotional) and conative (behavioural) responses (Walmsley and Lewis, 1984). The objective of such an approach is to support community participation in planning processes and thereby to optimise local benefits and community involvement (Rinner and Bird, 2009). From this point of view, since "attitudes influence behaviour towards urban green spaces" (Balram and Dragicevic, 2005, p.147), the issues of green space use and access in relation to public perceptions of green structures are considered as tools in the planning and design process (De Ridder, 2004). Grahn and Stigsdotter (2010) argued that it is important to examine how people experience green spaces in more contextually sensitive and less visual ways in order to study the functionality of green space as a place to reduce stress among city populations.

Reviewing the literature reveals that, despite an ample range of studies on geographic accessibility, there is little research focussing on perceptions of access to green space and integrating different techniques, such as qualitative GIS, or on public participation, and little analysis of access behaviours particularly in combination with in-depth qualitative analyses. Matsuoka and Kaplan (2008) reviewed ninety academic articles and showed that the most widely used methods in studying green space access were questionnaires (27%), interviews (24%), case studies (24%), observation (12%), and the existing data (9%). The capability of GIS techniques for visualising and integrating the results of different types of analysis makes them suitable for analysing both spatial and non-spatial factors in relation to green space access. For example, a study by Schipperijn et al. (2010) adopted an integration of questionnaire and GIS methods to describe the use of urban green spaces and to address factors which are correlated with this use. Laing et al. (2006) used a mix of spatial and analytical approaches including visualisation and contingent rating surveys to measure the environmental values of green spaces to make planning decisions for green spaces in urban contexts. Balram and Dragicevic (2005) used collaborative GIS techniques and a questionnaire to improve attitude measurements towards urban green spaces. These studies highlight the benefits of adopting mixed approaches to address different aspects related to accessibility.

This research seeks to extend such approaches in order to address a key gap in current research into access and accessibility: namely to take a mixed-methods approach in order to analyse the multi-dimensional concept of access to green spaces.

The aim of this research is:

to analyse access to green spaces in relation to spatial and behavioural factors and to examine the extent to which these factors vary across different social groups.

In order to support the analysis of accessibility, a combination of quantitative and qualitative approaches was applied, including participatory mapping, GIS-based network analysis, questionnaires and in-depth interviews. The intention in mixing quantitative and qualitative methods was to deal with more variety of spatial and non-spatial data, and to analyse data in terms of integrating spatial understanding into perceptions in order to draw inferences on the perceptions of access and access behaviour across different social groups. In so doing, the present study used the strategy of moving from quantitative to qualitative research methods by collecting quantitative data in order to analyse factors related to green space access and link them to GIS for spatial analysis of access. The findings of spatial analysis were incorporated into qualitative findings of social and behavioural analysis to represent a holistic understanding of geography, behaviour and perceptions of access. A mixture of the following methods was applied:

- A questionnaire was used to capture data from green space users about their perception and opinions of green spaces and the way that they use green spaces. This provided data about respondents' stated preferences in relation to green space and their socio-demographic characteristics

- A GIS-based network analysis was used to generate data describing distances to the green space for each respondent. This provided data to support analyses of the degree to which respondents' access perceptions were associated with distance

- Many of the questionnaire respondents completed a participatory mapping exercise which captured data on the routes they used to access green spaces. This was designed to be used as a comparative approach to GIS-based analyses to provide information on access behaviour

- A small subset of the respondents agreed to participate in in-depth interviews to draw out and discuss further issues related to the access perceptions, behaviour and geography. This was to provide a contextual analysis to support and shed light on the findings arising from other analyses

Integrating the findings from these different approaches generates complementary datasets and results that can be used to understand to provide insights on the spatial and non-spatial attributes related to the perception of green space access. The following research questions were identified to support such an integrated approach:

1. What factors are important in relation to green space access and how do they vary for different social groups?
2. What are people's motives for using green spaces and do they vary for different social groups?
3. How does participatory mapping contribute to a better understanding of green space access?
4. How do access perceptions relate to distance?
5. How do access perceptions influence the use of green spaces?

Adopting a mixed-methods approach was useful in creating a comprehensive set of spatial and non-spatial data to study accessibility from different perspectives. The thesis proceeds as follows:

Chapter 2: Literature review: This chapter reviews the literature to reflect the definition of green space and the potential benefits of such places as well as studying the perception of access and the role of GIS in accessibility studies.

Chapter 3: Questionnaire: Chapter 3 provides information concerning the use of questionnaires in accessibility studies, the structure of the questionnaire applied in this research, methods of distribution, and final findings obtained from analysing the questionnaires (n=452) in relation to the frequency and duration of visits, the activities in which people become involved in green spaces, and access satisfaction with regard to measures of both distance and travelling time.

Chapter 4: Participatory mapping: Chapter 4 describes the innovative way of using participatory mapping as a comparative approach to GIS-based network analysis in order to identify the extent to which people perceive accessibility as a spatial distance to a green space. This chapter also highlights the intentions of those people who travel to other green spaces rather than using local facilities.

Chapter 5: In-depth interviews: This chapter focuses on the complementary role of in-depth interviews in providing a better understanding of green space access. Themes of questions to discuss with respondents were derived from the findings of the questionnaire and participatory mapping, and include the exploration of attitudes of different social groups with regard to the definition of green space, the importance of spatial distance in the way respondents perceive green space access, the identification of factors that respondents linked with their perception of access, and lessons about the influence of green spaces on people.

Chapter 6 Discussion: In this chapter findings obtained from adopting this mixed-methods research are integrated together and linked with the results of pervious works in order to present a holistic concept of accessibility and access perceptions. This chapter also discusses the method applied and the limitations and strong points of the research as well as considering the key findings of results as potential ideas for further work.

Chapter 7: Conclusion: This chapter briefly reviews the aim of the research and highlights the main findings obtained from applying a mixed-methods approach in order to show a spatial and social understanding of green space access.

Chapter 2: Literature review

2.1 Green space definitions

Urban green spaces (UGSs) have been variously defined in the literature: “a combination of public and private, formal and informal landscape and townscape within designated urban boundaries” (GLA, 2003 p. 26); city’s green lungs which contribute to people's physical and mental health by providing breathing spaces to take time out from the stresses of modern life (Dunnett, et al., 2002) and pleasant areas that support the identity of towns and cities and build them up attractive for living, working, investment and tourism (Baycan-Levent and Nijkampb, 2004). This research refers to UGSs as publicly owned and accessible places covered with high degree of vegetation, where everybody can use on a daily basis (e.g. urban parks, public gardens, spinnies and meadows).

The contribution of UGSs in developing urban environment, quality of life and sustainability of cities is highlighted in urban planning and policies as important as the other urban infrastructures, including water and sewage systems and transportation. A growing body of research also studied the importance of provision of access to UGSs in terms of liveability and sustainability of cities (Tyrvainen, 2001), developing interaction between different ethnic groups and experiencing greater community ownership (Grahn and Stigsdotter, 2003), improving health and wellbeing (Adevi and Mårtensson, 2013; Mitchell and Popham, 2007; Maas et al. 2006; de Vries, et al, 2003) particularly for children and elderly people (Francis, 2006), stimulating increased house prices

(Rodenburg et al. 2002; Tyrvainen and Miettinen, 2002) and reducing crime and fear of experiencing crime (McKay, 1998).

Given the fact that by 2030, it is estimated that more than 60% of the world population will live in cities (Zwingle, 2002) and urban lands will get densely populated, maintenance and extension of UGSs is considerably important. In so doing many local authorities adopt a range of strategies to maintain UGSs in order to sustain the quality of day-to-day life. Swanwick et al. (2003) pointed of that the challenging issue when applying UGSs strategies is to determine how much green space of different types exists in urban contexts. To tackle the problem, they highlighted producing a typology of UGSs as one of the important requirements. The essentiality of adopting a typology of UGSs was also highlighted by the Government in the report published by DTLR, 2002 in terms of improving UGSs and planning, design, management and maintenance of the areas. To produce a typology urban green spaces can be grouped on the basis of different factors, including size of the catchment areas, availability of facilities, and the functions a green space plays in the lives of people who live in its neighbourhood. For example, in the UK, The Planning Policy Guidance (PPG17) categorises UGSs as follows:

- Parks and public gardens
- Natural green space
- Green corridors
- Sport facilities
- Amenity green space
- Play areas
- Allotments
- Cemeteries and churchyards
- Civic spaces

With reference to the significant contribution of UGSs in the quality of urban life, the next section describes further benefits of UGSs by focusing on related examples.

2.2 Green space benefits

UGSs are recognised as major contributors to the lives of urban dwellers by enhancing the quality of urban life and improving sustainability and liveability of cities and offering people with a wide range of benefits, including health (Takano et al., 2002; Jackson, 2003), social (Germann-Chiari and Seeland, 2004; Martin et al., 2004), educational (Francis, 2006; DTLR, 2002), ecological (Forest Research, 2010; Gomez et. al, 2004) and economic benefits (Kong et al., 2007; Choumert and Salanie, 2008).

From the **health perspective,** a growing body of research has shown the link between access to UGSs and physical and psychological benefits, including lower levels of stress and obesity (Nielson and Hansen, 2007), self-reported health (de Vries et al., 2003; Maas et al., 2006) and longevity in senior citizens (Takano et al., 2002). The recent research by Tsunetsugu et al. (2013) revealed that even a short-term viewing of areas of greenery such as urban forested landscapes had positive physical and psychological effects, including lower blood pressure and heart rate, on a sample group of 48 Japanese young males. Psychologically, they reported that viewing the scenery of the urban forests made them feel refreshed.

From the **social and recreational perspective**, some studies showed that UGSs enhance individuals' social and cultural life by providing them with free venues for local festivals, civic celebrations and theatrical performances (Hague and Siegel, 2002; Milton, 2002). Chiesura (2004) pointed of that people perceive the feeling and emotions experienced in green areas as an important factor in the terms of their wellbeing. The

study conducted by Dwyer et al. (1991) revealed that more UGSs in cities resulted in more frequent visits and presumably more communication opportunities. The study also found that in comparison to the residents who lived in proximity to barren areas, those who lived within a short distance from a green space experienced more enjoyable social life and friendly neighbourhoods. Volker (2006) stated that the advantages of breathing fresh air whilst walking in parks or chatting with friends or working in a community garden can be as beneficial to health as joining gyms or doing organised sports which might be less manageable for people. For example, a community garden not only can serve a place where physical activity carried out but also provide an area for bringing together people from different socio-demographic backgrounds who may not have experienced participation in any organised sports or leisure activities before. In conclusion, the social benefits of UGSs promote a sense of community cohesion and ownership among people. A different aspect of the social influence of green space in urban environment was investigated by Maas et al. (2009, p.1763) in terms of the association between green space and people's feelings of social safety. The study interviewed 83,736 Dutch citizens and concluded that greater provision of access to green space in people's living environment "is associated with enhanced feelings of social safety except in very strongly urban areas, where enclosed green spaces are associated with reduced feelings of social safety".

From the **educational perspective**, a review of the literature showed that UGSs provide people with a way of making direct contact with nature. In the report published by DTLR (2002) UGSs were mentioned as outdoor classrooms for school subjects ranging from nature study to citizenship. Francis (2006) revealed that urban parks act as an educational resource for children and adults, as well as playing a significant role in providing work experience and learning opportunities in environmental management.

The results of the study conducted in the Netherlands showed that children who had a better provision of access to green space in their neighbourhood, fewer high rise buildings and more outdoor sports facilities were more physically active (de Vries et al., 2007).

From the **ecological perspective**, findings showed that not only UGSs play a prominent role in supporting biodiversity, but also in sequestering CO_2 (Nowak and Crane, 2002; McHale et al., 2007) and producing O_2 (Jo, 2002) purifying air pollution (Yang et al., 2005) decreasing noise (Fang and Ling, 2003) protecting soil and water (Jim, 2001) improving groundwater recharge (Rijsberman and Van de Ven, 2000) and regulating microclimates and reducing the heat island effect in cities (Shin and Lee, 2005).

From the **economic perspectives**, several studies determined the correlation between economic values and proximity to UGSs. A study of two neighbourhoods in Ontario, Canada, illustrated that the value of property had an increasing trend around $8 per foot closer to green space (Crompton, 1999). The study also found that the most expensive and rewarding properties in London are in proximity to the best urban parks and green spaces. The report published by Greater London Authority (GLA, 2001), on UGSs stated that the most deprived areas in London have the highest green space deficiency. Literature also revealed examples of the positive effects of UGSs on boosting marketing investigations and job opportunities (Mansfield et al., 2005; Hobden et al., 2004; Bengochea, 2003; Tajima, 2003; Heynen et al., 2006).

2.3 Analysis of Accessibility

The importance and value of UGSs are made more obvious by the provision of accessibility to the areas. Therefore, the importance of analysing accessibility has been

highlighted in green space strategies in relation to the precious benefits of green spaces and their contributory role in providing people with pleasant environments in which to live, work, congregate and socialise (Bradley and Millward, 1986). Provision of access to UGSs is also an international competitive index in evaluating cities in terms of their liveability and the high quality of urban life and human wellbeing which they offer (Oh and Jeong, 2007; Matsuoka and Kaplam 2008).

With reference to the contributory role of accessibility to public facilities such as UGSs in relation to the individual and social life of people, this section attempts to present an understanding of accessibility by reviewing the literature from the late 1960s and highlighting the contributory role of accessibility in different sectors of public facilities and services. In this process, the application of GIS is considered as the main method of measuring accessibility and equity of access to public facilities and services.

2.3.1 Accessibility definitions in the literature

Accessibility was described in early research by Gould (1969, p.64) as “a slippery notion... which everyone uses until faced with the problem of defining and measuring it”. According to him, accessibility is related to the reasons why someone or something is ‘inaccessible’ or ‘difficult to get at’. Since 1970s, accessibility has been discussed from a new perspective that has shed light on its spatial concept as the proximity between two points. In this process, the most well-known concept of accessibility was presented by Ingram (1971, p.101) as “the inherent characteristic of a place with respect to overcoming some form of spatially operating source of friction, for example, time/and or distance”. The description of accessibility in terms of spatial distance or time was followed by other researchers and resulted in further definitions of accessibility, as “the ease with which people can reach distant but necessary services”

(Daly, 1975, p.75), and "the ability of people to reach destinations at which they can carry out a given activity" (Mitchell and Town, 1977, p.3).

Moseley (1979), in his book *Accessibility: The rural challenge* reviewed the definitions presented by the authors named above and explained that "when we talk about something being 'accessible' we are referring, to put it crudely, to the degree to which something is get-at-able" (Moseley, 1979, p.56). He took the discussion further by arguing that, whereas the core concept of accessibility presented by the three authors was on the basis of 'capacity to overcome space', by emphasising the words 'ease', 'ability' and 'time and/or 'distance', the way Ingram (1971) defined accessibility was associated much more with mobility than with accessibility. Mobility is about people's ability to move and accessibility is about opportunities that people may or may not meet as a result of moving. Therefore, he came to the conclusion that the definitions of accessibility discussed above were only concerned with spatial dimensions of accessibility, whilst the central focus of concern, if it is to reflect the social dimension, must be on the basis of opportunities.

Wachs and Kumagai (1973) introduced the 'use of opportunity' concept of accessibility as an alternative to the traditional measures employed in transportation planning for measuring accessibility and providing equalisation of opportunities. The early research on both the perceptual and the measurable specifications of accessibility was conducted by Morris et al. (1979), who attempted to establish indicators for transport planning, and revealed that "there is a critical distinction between the derivation of 'objective' indicators of accessibility, and perceived measures" (Morris et al., 1979, p.91).

Accessibility was mainly analysed in the literature in the context of "proximity of one place to another" (Pooler, 1995) or "the ease with which residents of a given

neighbourhood can reach facilities" (Hewko et al., 2002, p.1185), until Gulliford et al. (2002) presented a new definition of accessibility in association with social indicators: "accessibility is a complex concept ... that depends on financial, organisational and social or cultural barriers" (Gulliford et al., 2002, p.186). Farrington and Farrington (2005) also established a conceptual framework to investigate accessibility in terms of social inclusion and social justice. In this process, they revisited the definition of accessibility presented by Moseley (1979) – the degree to which something is "get-at-able" – and articulated it as "the ability of people to reach and engage in opportunities and activities" (Farrington and Farrington, 2005, p.2). From their perspective, while 'reach' indirectly pointed to "spatial separation and therefore mobility and transport use", age, gender, ethnicity and income were also described as the other forms of social separation in relation to accessibility. Such definitions implied a new perspective of accessibility on the basis of demographic separation factors and people's tendency to reach and engage in opportunities and activities rather than relying entirely on the dimension of spatial distance and transport. From this standpoint, analysing accessibility is more concerned with people's perceptions of access, which therefore influence access behaviour.

The next section discusses the definitions of accessibility presented above and analyses different applications of accessibility in the literature.

2.3.2 Accessibility applications in the literature

A review of the literature shows that accessibility analysis has a wide range of applications in different public sectors, including green space, health care, transportation, housing and service planning. In this process, the applications of GIS and spatial analysis are growing because of the advanced power of tools in describing,

computing, interpreting and visualising information and data in accessibility analysis (McLafferty, 2003) and mapping and modelling of land-use suitability, (Malczewski, 2004). In measuring the spatial concept of accessibility, all indices, including distance, time, cost, and choice of travel mode, are important and providing the closer the origin and destination to the main transportation system resulted in the higher the level of accessibility and the less time and money spent in travel to more places (Liu and Zhu, 2004).

With reference to the literature, analysis of accessibility on the basis of spatial context has received a surge of interest among researchers particularly within the last decade, with the purpose of facilitating and equalising accessibility to public facilities and services among different socio-demographic groups. For example, Lindsey et al. (2001) used GIS analyses of census and other related data to assess equality of access to greenway trails in Indiana, USA; Chandio et al. (2011) used an integration of GIS-based accessibility analysis and Analytical Hierarchy Process (AHP) in finding the most accessible lands for the development of public parks in Larkana City, Pakistan. Nicholls (2001) used GIS technology to assess the equity of levels of access to public parks in Texas, USA; Fuglsang et al. (2011) used a raster GIS-based approach to analysing and modelling accessibility in public transport networks in Copenhagen, Denmark; Zhu et al. (2006) used GIS to analyse accessibility to different facilities and amenities and Multi-Criteria Analysis (MCA) to weight buyers' preferences and the general importance of accessibility to facilities in terms of housing development in Singapore; Liu and Zhu (2004) used 'Accessibility Analyst' as an integrated GIS tool for accessibility analysis in a wide range of issues in urban transportation planning; Shariful Islam and Aktar (2011) used GIS in order to measure physical accessibility in terms of

population coverage, average travel time and distance to the closest health facilities in Khulna, Bangladesh.

Apparicio and Séguin (2006) used spatial data analysis in GIS firstly to evaluate the accessibility of various urban resources for each number of public housing projects and secondly to develop an indicator of the accessibility of services and facilities; Soles (2003) used accessibility in terms of transportation and community facilities to assess housing need in North Saskatchewan, Canada; Halden (2002) used accessibility as a criterion to integrate land use and transport policy in Edinburgh and the Lothians; Comber et al. (2009) used GIS-based network analysis and optimisation routines to evaluate service provision by the UK Post Office; and Yigitcanlar et al. (2007) used a GIS-based land use and public transport accessibility indexing model for measuring and mapping accessibility to basic community services on the basis of walking and/or public transport travel time in Australia.

The important contribution of accessibility in improving the quality of life and liveability of cities has influenced urban planning and management strategies and therefore placed at the centre of policy debates. For example, the discussion of accessibility entered the UK policy under New Labour in relation to social exclusion and social justice (Farrington and Farrington, 2005). The discussion of accessibility also entered into Finnish government policy as the main object with regard to improving the quality of life (Van Herzele and Wiedemann, 2003). In this process, Tratsaert (1998) showed that the lack of accessibility to public green spaces and playgrounds in Leuven, Belgium, was the main reason why some families moved to the suburbs. However, despite the steady growth of the literature in analysing the spatial context of accessibility, fewer research projects have investigated the perceptual context of

accessibility in relation to reaching and engaging in opportunities and activities. Whilst perceptions and attitudes influence behaviour, and analysing accessibility in terms of perception and behaviour is as important as the spatial accessed-related factors. However, the complexity with using effective and accurate attitude measurements and the choice of methods could be the reasons to explain the scare coverage of the literature in relation to analysing the perceptual context of accessibility (Balram and Dragicevic, 2005).

With reference to the perceptual analysis of accessibility: Lo and Jim (2012) used a questionnaire to glean the perceptions of people regarding the inadequate provision of access to green spaces in crowded parts of the city in Hong Kong. They found that the way people appreciated green space were in relation to socio-demographic factors such as age, income, education and retirement status and mainly because of the 'micro-climatic and amenity benefits' than social and environmental functions. Shackleton and Blair (2013) used the face-to face interview method to explore the perceptions of people from two small towns in South Africa concerning the use of and willingness to get involved in urban public green space. Baur et al. (2013) used a questionnaire to compare the attitudes of urban park users and nonusers in Portland, Oregon.

Dinnie et al. (2013, p. 1) used a visual and mobile ethnography method, the four-parts methodology, including a semi-structured face-to-face interview with local green space managers and community officers, "a walking interview in the park/green space, video filming of the green space by participants and/or researchers, and a video review with participants" to explore the social wellbeing benefits of urban green space experiences in the UK; Kaźmierczak (2013) used an integration of quantitative methods (questionnaire survey) with a qualitative method (focus group discussion) to study the

contribution of local parks to the neighbourhood social ties in Greater Manchester, UK; Lottrup et al. (2013) used questionnaire to investigate the benefits of access to a green outdoor environment at the workplace in Sweden; Peschardt and Stigsdotter (2013) used a questionnaire to identify whether there is any associations between park characteristics and perceived restorativeness of small public urban green spaces in Copenhagen, Denmark.

A review of the literature exemplified the questionnaire as the main method in analysing people's perceptions regarding green spaces. Downs and Stea (1977) discussed that, although the questionnaire is an appropriate approach in measuring attitude, people can also be influenced by their surrounding environment and therefore an integration of different methods is required to indicate both spatial and non-spatial access-related factors. This argument was to induce a wave of debates in relation to the use of GIS in qualitative research studies. For example, Sheppard (2001) discussed that GIS applications, emerging in the 1990s, were not only capable of working with quantitative data, but could also work with other types of information (photographs, videos, or narratives). In this process, the emergence of studies that incorporated GIS into qualitative methods was the most important development (Kwan, and Knigge, 2006). Pavlovskaya (2002) incorporated post-structuralist methodologies with GIS technology to study urban transformation in Moscow. Kwan (2002) examined the capability of GIS applications to be incorporated into feminist geographic research. Jung and Elwood (2010) extended the qualitative capability of GIS by incorporating it into an approach they called 'computer aided qualitative GIS' (CAQDAS) to enable researchers to take advantage of GIS capabilities, geo-visualization and spatial analysis, as well as the qualitative analysis tools available in a CAQDAS. Comber et al. (2011) studied public perceptions of health facility accessibility in terms of geographical distance, health

status and car ownership. Their results revealed that access is a 'multi-dimensional' concept that varies with location, according to the facility, the health and socio-economic status of the individuals.

In the green space literature, however, there is less research that used qualitative GIS as a mixed-methods approach in studying accessibility from both spatial and perceptual contexts. For example: Sugimoto (2013) used spatial and temporal analysis of photographs to quantify green space visitor' reaction to the settings in urban parks; M'Ikiugu et al. (2012) used a mixed-method approach including orthographic photographs, GIS vector maps, urban green space suitability checklist and interviews as the methods to generate data with regard to identifying the potential areas for expanding green spaces; Laing et al. (2009) used a mixed-method approach including questionnaire and visualisation techniques to assess how variations to physical and nonphysical attributes affect public perceptions of safety and aesthetic quality, and use of green spaces. Their findings highlighted the influential contribution of computer-generated visualisations in environmental economic studies, and the potential to consider a wider range of attributes in terms of studying the way people use green spaces.

With reference to the importance of using a combination of approaches in analysing accessibility, Higgs et al. (2012, p.326) investigated the implications of using alternative GIS-based techniques to measure access to green space. In this process they used a dataset of green spaces and associated attributes as well as a network dataset of the city of Cardiff, Wales, "to examine the sensitivity of findings to the ways in which different metrics are calculated". Their results highlighted that distances to green space vary according to the methodologies and therefore they recommended that "any study that

aims to investigate relationships with attributes of the nearest green space should acknowledge that matches may vary widely according to the techniques used".

In relation to the literature reviewed the above addressing the importance of using combinations of methods in accessibility measurements, and the scarce coverage in the green space literature regarding the analysis of people's perceptions of access, this research incorporated GIS into the questionnaire, participatory mapping and in-depth interviews to support the multi-dimensional concept of accessibility among different social groups. The next chapters will comprehensively present the findings of each of the methods adopted.

Chapter 3: Questionnaire analysis related to green space access

3.1 Introduction

This chapter introduces the questionnaire as the main method used to capture data to identify factors related to green space access. The questionnaire method has been used in the literature as the most appropriate method to collect information in order to "describe, compare, and predict attitudes, opinions, values, knowledge, and behaviour" of individuals with regard to specific issues (Fink, 2003, p.21).

This chapter proceeds by introducing the study area, explaining the use of a questionnaire to obtain data related to the way people use green spaces and perceive access by addressing the broad usage of the method in previous related studies. Further to that, this chapter highlights the power of adopting mixed-methods research in identifying those aspects of access that have been less often covered in the literature. The discussion goes on to describe the questionnaire design, the content of questions and the methods of distribution. The mosaic plot is introduced in terms of the statistical analysis of data to determine factors related to the geography of access and access perceptions and behaviour and the way they vary across different social groups.

3.2 Study area

The study area was the city of Leicester in the East Midlands in England, with a total population of over 300,000. Leicester is the largest city in the East Midlands and the tenth largest in the country it is also reputed as a multi-cultural city whose minority

community accounts for over a quarter of the population (LCC, accessed 2012). LCC is reputed to own and manage about 1,250 hectares of publicly accessible open spaces across the city, including one city park, ten district parks, eighty local parks, four cemeteries and seven local nature reserves. Besides, the River Soar, which runs through Leicester, provides a valuable green corridor in the middle of the city (Leicester City Council Green Space Strategy 2009 – 2015). Figure 3-1 shows the location of the main parks in the city of Leicester from city centre. All these main parks were included in the study areas in this research.

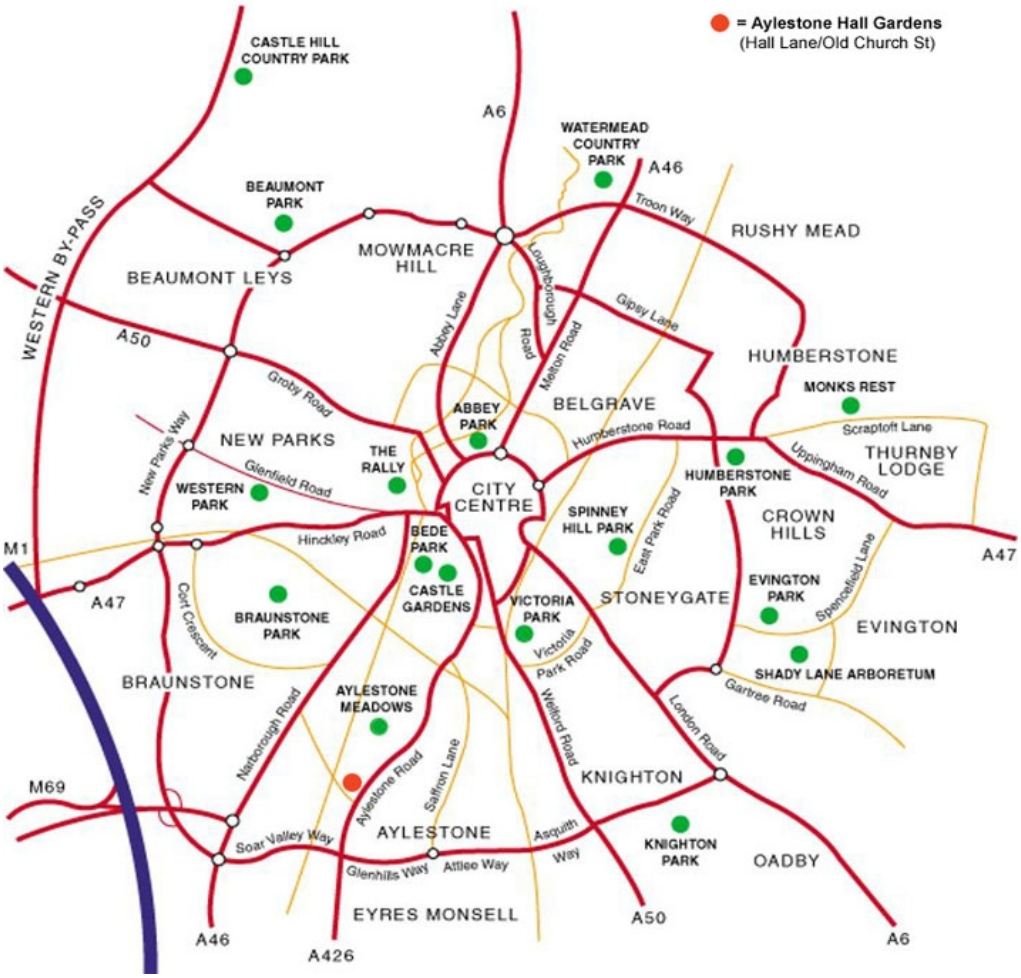


Figure 3-1 Locations of main parks in Leicester (Source: www. leicester.gov.uk)

Figure 3-2 shows images of some of these parks which were part considered as part of the study area in the present research.


Knighton Park


Castle Garden


Nelson Mandela Park

Leicester Riverside


Victoria Park

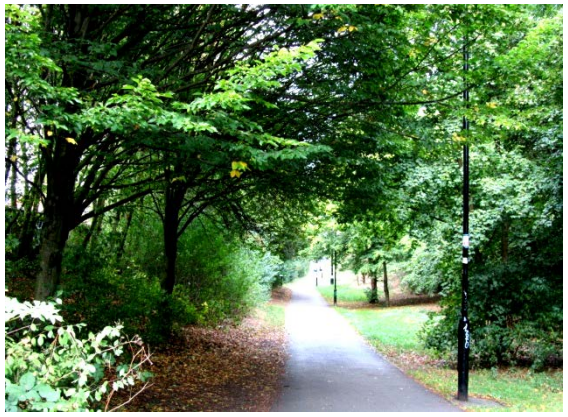

Braunstone Park

Figure 3-2 Images of main parks in Leicester (Sotoudehnia 2010)


Spinny Hill Park


Evington Park


Abbey Park


Aylestone Meadows


Brocks Hill Park


shakespeare Park

Figure 3-2 Images of main parks in Leicester (Sotoudehnia 2010)

3.2 Use of questionnaires in green space literature

A review of green space literature reveals the widespread use of the questionnaire method in generating data for studies that aim to discover the influence of green spaces on human wellbeing and the quality and liveability of life in urban contexts (Lo and Jim, 2012).

According to Hutchinson (2004) the main reason for conducting questionnaire-based research is the flexibility, adaptability and cost-effectiveness of the method in comparison to other approaches in generating data from large numbers of people with different backgrounds in a relatively short space of time.

The high rate of use of the questionnaire method in green space studies was reported by Matsuoka and Kaplan (2008) as 27% of the ninety academic articles which they examined. For instance, the method was used by Arnberger and Eder (2012) as the main approach in identifying the influence of green space on community attachment; by Hosseini and Laing (2011) to evaluate the role of plant clinics in terms of urban green spaces sustainability; by Muderrisoglu et al. (2010) to evaluate green space satisfaction from the viewpoint of users; by Nielsen and Hansen (2007) to reflect the effect of access to green areas on human health; by Sanesi et al. (2006) to assess the psychological and social dimensions of green spaces; by Jim and Chen (2006) to investigate resident perception and attitudes toward urban green space; by Stone (2005) to evaluate perceived values of recreational urban parks; by Chiesura (2004) to determine the role of urban parks in the sustainable city; and by Grahn and Stigsdotter (2003) to investigate the extent to which urban green spaces affect the level of stress in everyday life.

Reviewing the academic work reveals that, despite the broad use of the questionnaire method in green space studies, smaller numbers of research studies have integrated questionnaires with other research methods in studying access perception. With reference to this scarcity, the current research integrates a questionnaire with other methods, including GIS, participatory mapping and in-depth interviews to analyse perceptions of access by identifying access-related factors from the perspective of different social groups.

3.3 Questionnaire design

Designing a questionnaire is a complicated task as it needs to be unambiguous and easy for respondents to follow (Major and Savin-Baden, 2010). Wording questions in a concise and expressive way is important not only in keeping the content consistent, but also in arousing the interest of respondents in truthfully answering all the questions. In essence, in designing the structure of the current questionnaire, the focus was on the content and sequence of questions to collect data related to the aim of the study. In so doing, the study took inspiration from the questionnaires designed by Chiesura (2004) and Leicester City Council (2010) with the aim of studying the use of green space, identifying access-related factors, and analysing perceptions of access. Building upon the need to generate descriptive and behavioural data related to the aim of the research, the key themes of the exemplified questionnaires were highlighted and developed in association with the original ideas for designing the current questionnaire.

The final version of the questionnaire designed for the purpose of this research was composed of twenty questions in a closed-ended format which includes questions on attitudes behaviour and attributes. According to Hartas (2010), in comparison to open-ended questions, the closed-ended ones are more useful for collecting data on specific

issues as respondents are only allowed to choose the best answer from a limited number of prearranged responses. As a result these questions are more likely to elicit accurate reliable responses. Types of closed-ended questions used in this research comprise multiple-choice questions, contingency questions, and matrix questions. Nevertheless, at the end of the questionnaire, an open-ended question was designed to offer respondents the opportunity to leave their own comments, either on the subjects covered by the predetermined questions or on other related subjects that were not covered. In addition to the designing of the questionnaire, it was essential to prepare an information sheet to inform respondents about the aim of the study, the voluntary right of respondents, ethical considerations, and accurate contact information on the researcher and supervisor to establish the credibility of the study (Appendix 1).

The next step prior to distributing the questionnaires was running a pilot test to evaluate the content and design of the questionnaire sample. A selected number of people were provided with a copy of the research information sheet and questionnaire to leave their feedback regarding the clarity of aim of the study and the content and layout of the questions. The voluntary participation of these individuals was not counted in the number of people who completed the questionnaire as part of the data collection process. Feedback comments received from the pilot group were minor and mainly related to the second part of the questionnaire where people were questioned regarding their behaviour in relation to visiting green spaces. Suggestions for refinement included word replacement in the questions that asked people about the frequency of their visits, the approximate travelling time, and their reasons for visiting a green space (see full questionnaire in Appendix (2).

The pilot group also suggested changing the distance measurement unit from metres to miles when people were questioned about their ideal distance to a green space. From

their perspective, since people most commonly use miles to describe a distance, their responses would be more accurate and reliable if they were based on miles. All feedback comments were taken into account in the revision of the pilot questionnaire and the most applicable amendments were adopted. The only exception being that, in the case of distance, it was decided not to use the mile unit, to avoid having decimal digits in mile units. The ready-to-distribute questionnaire consisted of five parts (A-E) and twenty questions presented in the following layout:

Part A: Postcode and name of green space

The first part of the questionnaire asked respondents about their postcode and the name of the green space which they visited most.

Part B: Visit details

The second part was designed with the aim of collecting descriptive data related to respondents' frequency of visits (using an eight-point Likert scale ranging from 'never visit' to 'daily'), duration of visits (a six-point Likert scale ranging from 'do not visit' to 'more than four hours'), mode of travel, actual and ideal travel time and access satisfaction.

Further questions asked respondents to specify if they visited a green space alone or in the company of others. Their response could include one of the three predetermined options: 'alone', 'in a group', 'alone and in a group'. Those who visited a green space in the company of others were asked to specify who accompanied them and from which age range. To address the extent to which respondents value green spaces, they were asked to mark all the appropriate activities in which they would normally get involved from an inclusive list of twenty-four activities under four categories: relaxing activities,

physical activities, social activities and others. The last question in this part aimed to discover how close, ideally, respondents would like to live to a green space. The predetermined answers included an eight-point scale of distance options ranging from 100 m to over 2 km.

Part C: Green space details

The third part of the questionnaire was designed to measure respondents' attitudes concerning the degree of importance of the physical characteristics of green spaces (i.e. appearance, size, walking distance and cleanliness) and the available facilities (i.e. sport facilities, playgrounds, cafe, public toilets, car park, bike park, lighting, public transportation, safety and social events) in the way they perceive green space access. Predetermined responses consist of 'important', 'fairly important', 'not important' and 'do not know'.

Part D: Respondents' details

The fourth part of the questionnaire aimed to gather socio-demographic information on respondents including age, gender, ethnicity, occupation, annual income (optional) and car ownership to reflect the extent to which the sample group was representative of the general population of the city of Leicester.

Part E: Feedback

The last part of the questionnaire asked for respondents' open-ended opinions and feedback either on the subjects covered by the questionnaire or on other possible subjects related to their knowledge and ideas on green space access, perception and management landscape design, and provision of facilities. They were also asked to leave their contact details if they were interested in participating to a face-to-face in-

depth interview related to the subjects noted above. A full copy of the questionnaire can be found in Appendix (2).

3.4 Questionnaire distribution

To achieve the highest number of participants completing the questionnaire, the following distribution approaches were employed:

- on-site participation (completion of the questionnire by people who were visiting a green space)
- community participation (completion of the questionnire by those attending community groups)
- Internet participation (completion of an on-line questionnaire)

3.4.1 On-site participation

On-site participation was used as the main approach in distributing questionnaires. Compared to a postal questionnaire, this approach was more cost-effective and time-efficient in collecting the required data.

Besides, from the perspective of respondents, the approach encouraged more involvement since it provided them with the opportunity of face-to-face communication with the researcher who could inform them directly about the aim and objective of the research, the indirect benefits of their participation, and ethical considerations. Following the communication with Leicester City Council Park Service concerning the aim and objective of this research, the request was sent to the office to ask for their collaboration in providing a list of the main upcoming summer events and festivals, and for their permission to attend and advertise on posters and displays around locations to

attract public attention. Further to receiving their approval, arrangements were made to be present at the best-attended events, including Leicester Summer Festival Day, concerts in Evington Park, Abbey Park and Western Park, Family Fun Days in Knighton Park and Brocks Hill Country Park, Education Days in Watermead Country Park and Brocks Hill Country Park, Planting Days in Evington Park and Western Park and 'Break Easter Egg' in Western Park and Spinney Hill Park. Figure 3-3 shows preparations and advertisements arranged for two of the occasions, Leicester Summer Festival Day and Education Day in Watermead Country Park in summer 2010.

Figure 3-3 Pictorial examples of the procedure of data collection (Sotoudehnia, 2010)

As the photographs show, for each of the above-noted occasions, LCC provided a desk for the purpose of this study, where there was a chance to advertise the research widely on displays to approach people to have a short conversation about the scope of the study and the importance that their participation would play in this research. In the next step,

they were provided with a copy of the questionnaire to complete, and a copy of an information sheet that they could keep for their records. Their last task included marking their location on an A0 map of Leicester and drawing their usual route to get to the green space they visited most often. A number of copies of the maps and pre-paid envelopes were also provided for those individuals who intended to participate but chose not to do so at the time they were in the green space.

In total, this approach resulted in the collection of three hundreds and twelve completed questionnaires from all the green spaces in the city of Leicester.

3.4.2 Community participation

Approaching individuals through groups of ‘users’ and ‘friends’ of parks was the other method employed to distribute questionnaires. The reason for involving community groups was derived from literature concerning the contributory role of community participation in public policy making, local planning and governance (Webler et al., 1995; Rydin and Pennington, 2000; O'Faircheallaigh, 2010). Despite the wide use of community participation in the issues noted above, the approach has rarely been employed in green space literature as a way to distribute questionnaires and involve communities in order to assess their perception of green space access. Therefore, this study employed community participation as a data collection approach alongside on-site participation in distributing questionnaires. In this process, a list of active groups of users and friends of parks was prepared, and these groups were contacted through email to inform them about the scope of this research and asked for their collaboration. A high percentage of responses was received from the groups, enclosed with the schedule of their next meeting. Attending the meetings provided the opportunity to present an introduction on the aim and objective of the study and the content of the questionnaire,

to describe the importance of public participation for the quality of this research, and to clarify the ethical considerations that would concern participants. Accordingly, eighty questionnaires were completed by participants from nine different community groups at the end of their meetings.

3.4.3 On-line participation

On-line participation was used as the last approach in distributing questionnaires because of its fast response speed, low cost, flexibility in response and control of anonymity (Sheehan, 2010). This method of participation was provided to those who were informed about the research through on-line advertisements (i.e. the webpage of the Environmental Team of the University of Leicester), community newspapers (i.e. *Evington Echo* and *Gazette*, community newspapers of the Evington and Western Park areas in Leicester, respectively), and on-site advertisements in green spaces. Figure 3-4 shows examples of advertisements released in summer 2010 for the purpose of this study via the web page of the Environmental Team of the University of Leicester and the *Western Park Gazette* magazine. Advertisements included a brief explanation about the aim of the study and the criteria for potential participants (the survey was open to anyone who lives in Leicester and included any park or any other type of green space in urban areas of the city). The hyperlink directed respondents to an introductory page explaining the scope of the research and ethical considerations via Bristol Online Survey (BOS). A total of sixty on-line questionnaires were completed within the period from April to October 2010 when the questionnaire was available through BOS.

In total, 452 questionnaires were collected via on-site participation (n=312), community participation (n=80) and on-line participation (n=60).

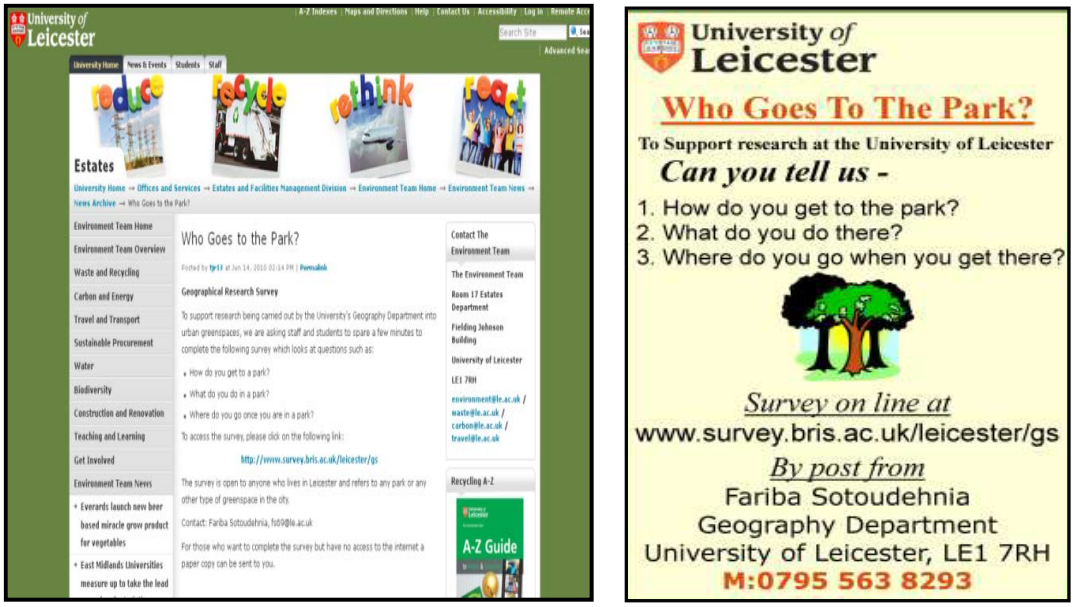


Figure 3-4 Images of online advertisements for the study via the University of Leicester Environmental Team and Western Park Gazette magazine (summer 2010)

3.5 Data analysis

In order to analyse categorical data obtained from questionnaires, the main criterion was using a more graphically oriented approach to present a better understanding of the statistical relationships between different variables. According to Friendly (2006, p. 1), "statistical graphics and data visualization are relatively modern developments in statistics". As a result, the present research used mosaic plots as a statistical graphical method to analyse and address any significant relationships between people's socio-demographic factors (age, gender, ethnicity, occupation, income and car ownership) and dependent variables including travelling-time satisfaction, frequency and duration of visits, and the activities in which people get involved in green spaces. The following section provides a holistic understanding of how a mosaic plot works and how the results should be interpreted.

3.5.1 Mosaic plot

Mosaic plots are graphical representations of the statistical tests applied to examine the relationship among two or more categorical variables. Plots represent the numbers in a contingency table directly by means of tiles whose area is proportional to the cell frequency. The original method was comprehensively extended by Friendly (1994), to a visualisation technique reflecting the magnitude of standardised residuals (often referred to as a standard normal distribution) of a log-linear model through a colour coding strategy (Zeileis et al., 2007).

In the data analysis, the mosaic plot starts as a square with length one. The square is divided first into horizontal bars whose widths are proportional to the probabilities associated with the first categorical variable. Then each bar is split vertically into bars that are proportional to the conditional probabilities of the second categorical variable. Additional splits can be made if wanted using a third variable, fourth variable, etc. The use of mosaic plots was first introduced by Hartigan and Kleiner (1981) to illustrate and analyse different proportions of observed values between crossed categories of two or more variables (Tennekes et al., 2013).

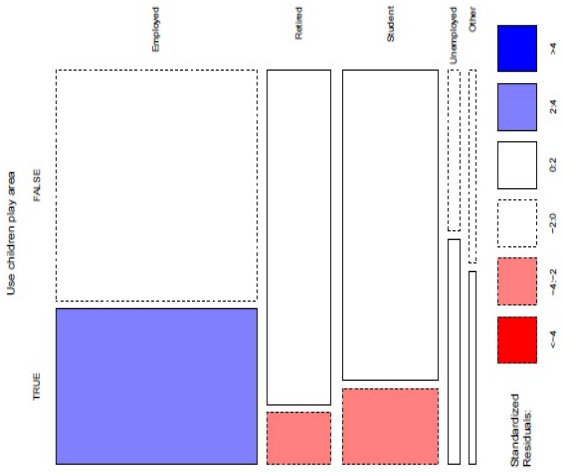
With reference to the aim of this chapter, a mosaic plot was employed as a well-established visualisation technique available in R program to provide a graphic demonstration of the differences between observed cell frequencies and the estimation expected in relation to the use of green spaces and people's socio-demographic factors. Accordingly, frequencies of each dependent variable were visualised by dividing the first unit square of the categorical variable on the basis of the overall proportion of the socio-demographic variables.

In order to provide a better understanding of the way mosaic plots need to be interpreted, one of the plots which describes the variation between different occupational groups in terms of using playgrounds in green space, is shown below. Since the approach is on the basis of colour coding, it needs to be explained that cells corresponding to small residuals ($0 \leq | r_{i\ j}| < 2$) are shaded white, and those with medium-sized residuals ($2 \leq |r_{i\ j}| < 4$) are shaded light blue and light red for positive and negative residuals, respectively. Cells with large residuals ($4 \leq |r_{i\ j}|$) and small residuals ($-4 \leq | r_{i\ j}|$) are shaded with a fully saturated blue and red, respectively. The reason for distinguishing the residuals between 2 and 4 refers to the Pearson residuals that are significant at the '$\alpha = 0.05$' and '$\alpha = 0.0001$' levels.

To interpret the plots, this fixed rule also needs to be considered, that the blue tiles correspond to an over-representation of the groups when compared to an expected log-linear model of a proportionally equal level of responses. In other words, the blue tiles indicate frequencies much greater than would be expected if the log-linear model was true. In the opposite direction, red tiles correspond to an under-representation of the groups when compared to an expected model of a proportionally equal level of responses, and indicate much lower frequencies than would be expected (Comber et al., 2008).

For example, the blue tile in the following example explains that the frequency of cells related to 'employed' respondents was greater than expected when compared to a linear model of a proportionally equal level of responses for all occupational groups. Therefore, it is concluded that employed people use green space for the specific reason of using playgrounds for their children more than other occupational groups. In addition, the red tiles indicate that the frequency of cells related to those respondents who described themselves as 'retired' and 'students' was even lower than expected

when compared to a linear model of a proportionally equal level of responses for all occupational groups. As a result, students and retired people use green space for this specific reason of using playgrounds less than other occupational groups.



3.6 Results

Before the results obtained from mosaic plots are presented, descriptive statistical analysis was used to learn about the socio-demographic profile of the study group extracted from questionnaires.

Table 3-1 shows the socio-demographic profile of the study group (n=452), against the profile for Leicester's residents presented by LCC. Comparison of the two profiles showed that, in age, ethnicity, occupation and car-ownership status, the study group was a representative sample of the socio-demographic status of Leicester's residents. The area profile presented by LCC regarding the demographic and cultural status of the residents, however, did not provide details regarding the income of the individuals.

Table 3-1 Demographic profile of the study group in comparison with Leicester City

Age		Ethnicity		Occupation	
Study group	**Leicester**	**Study group**	**Leicester**	**Study group**	**Leicester**
18-19 7%	**18-19** 3%	**White** 65%	**White** 63.9%	**Employees** 46.5%	**Employees** 47.83%
20-29 19%	**20-29** 17%	**Asian or AB*** 16.5%	**Asian or AB** 29.9%	**Self-employed** 9%	**Self-employed** 5.15%
30-39 25%	**30-44** 22%	**Black or BB*** 2.5%	**Black or BB** 3.1%	**Retired** 15.0%	**Retired** 10.84 %
40-49 19%	**45-59** 15.5%	**Mixed** 1.5%	**Mixed** 2.3%	**Students** 22%	**Students** 12.67%
50-59 13%		**Other** 2.5%	**Other** 0.8%	**Unemployed** 2.5%	**Unemployed** 4.88%
60-74 14%	**60-74** 11%	**Car ownership**		**Other** 2%	**Other** 18.62%
		Study group	**Leicester**		
+75 3%	**+75** 6.6	67%	62%	-	-

* AB: Asian or Asian British; BB: Black or Black British.
(<www.leicester.gov.uk/your-council-services/council-and-democracy/city-statistics/demographic-and-cultural>, accessed 2012)

Descriptive analysis of questionnaires showed a slight difference between females (55%) and males (45%) in terms of participation. It also showed that, of the total 72% of respondents who described their income status, 17% had an income of up to £7 k, 15% of £7-15 k, 16.5% of £15-25 k, and 12% of £25-35 k. The highest levels of annual income, £35-50 k and over £50 k were reported by only 8% and 2% of the respondents, respectively.

Results are presented in the following order:

- access in relation to travelling time
- ideal distance in relation to the UK's benchmark
- frequency and durattion of visits in relation to socio-demographic factors
- activities in relation to socio-demographic factors

3.6.1 Analysing access in relation to travelling time

Travelling time was analysed as a significant factor related to spatial access and access behaviour towards green spaces. To explore the extent to which respondents were satisfied with travelling time to get to a green space, they were asked through the questionnaire to select their travelling time from a list of pre-determined responses.

The following question asked them to determine the ideal time they would prefer the journey to took. Consequently, people's satisfaction with travelling time was determined logically if the actual travelling time was equal to or shorter than the ideal time, it was coded '1' (true) and corresponded to the circumstances in which the individual was satisfied with the travelling time. In contrasts when the actual travelling time was longer than the ideal, it was coded '0' (false) and interpreted as the individual was not satisfied with the access travelling time. As a result, 31% of the individuals selected '0' indicating that were dissatisfied with their access time.

A mosaic plot was employed to illustrate graphically the differences between observed cell frequencies of potential variables, including people's socio-demographic status, the frequency and duration of the visits, and modes of travel. In Figures 3-5 to 3-7, plots showed a lack of satisfaction in association with age, duration of visits and modes of travel among respondents. In these figures (3-5 to 3-7), the blue tiles correspond to combinations of access dissatisfaction with age, duration of visits and modes of travel where the residuals are between 2 and 4 ($2 \leq |r_{i\ j}| < 4$) when compared to a model of proportionally equal levels of access satisfaction for all age groups, durations of visits and modes of travel. This indicates a greater frequency in those cells than would be found if this model were true. In other word, blue tiles show a greater frequency of dissatisfaction with access travelling time among people in the age range of 50-59,

those travelling by bus and those who would like to spend more than four hours in a green space.

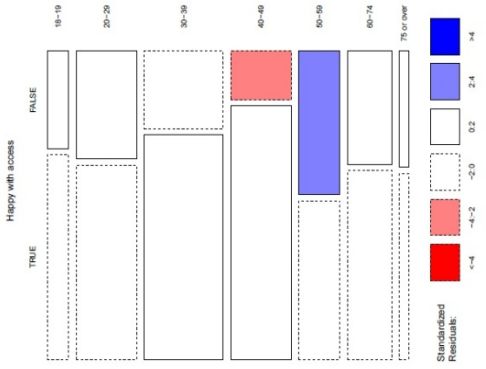


Figure 3-5 Access dissatisfaction by age

Figure 3-6 Access dissatisfaction by duration of visit

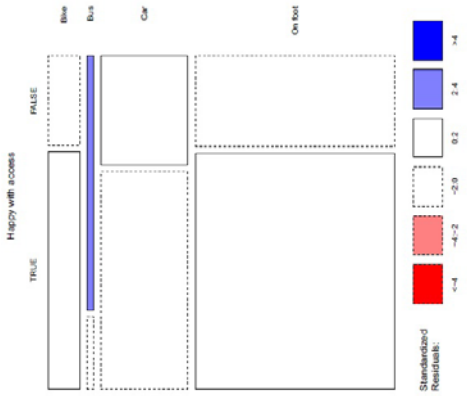


Figure 3-7 Access dissatisfaction by mode of travel

Key findings:

- Travelling time influences people's perception regarding access.
- A total of 31% of respondents are dissatisfied with their access time.
- Participants who are in the age group 50-59, those who travel by bus, and those who intend to spend more than four hours in a green space are significantly more dissatisfied with their access travelling time than other groups.

3.6.2 Analysing ideal distance against the UK's benchmark

In addition to travelling time, spatial distance to a green space was analysed as a significantly related measure of access. To collect the required data, respondents were asked as part of the questionnaire to determine how close they would ideally like to live to a green space. They were provided with a nine-point Likert scale of distances from a minimum of 100 m to over 2 km.

Their responses were compared with the UK's benchmark to discover the extent to which people's distance preference corresponded to the national benchmark that indicates that to make the best of green spaces "no person should live more than 300m from their nearest area of natural green space" (Wray et al., 2005, p. 48). Even though respondents may initially have known about this national benchmark, they were not informed through the questionnaire.

Figure 3-8 illustrates individuals' responses regarding their ideal distance from a green space. According to the chart, 56% wanted to live within the national benchmark (300 m) from a green space.

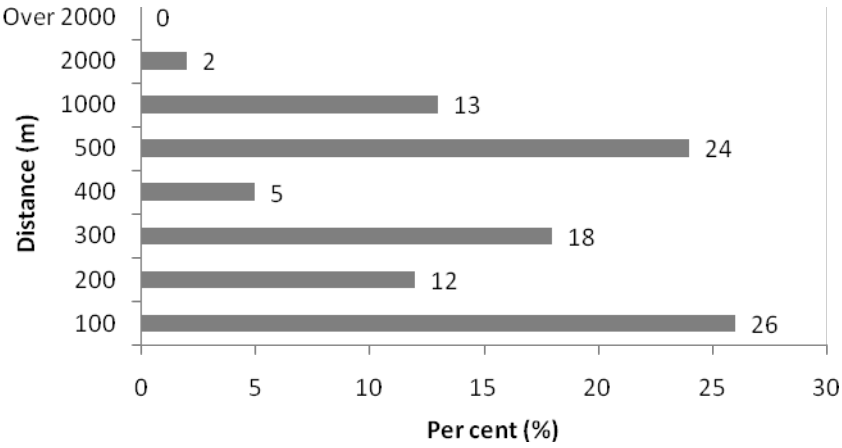


Figure 3-8 Preferred distance of place of residence from a green space

It was significant that, 26% of them would even prefer to live within a very short distance (100 m) from a green space. The remaining 44% were happy to live at a further distance than the national benchmark. However, nobody wanted to live at a distance of more than 2 km (2000 m) from a green space.

To have a better knowledge of those who ideally preferred to live within 300 m from a green space, a mosaic plot was applied to analyse and visualise differences between the observed values in relation to the socio-demographic factors, including age, gender, ethnicity, occupation, income and car-ownership status of respondents. Plots did not show that there was any significant difference between groups of the variables when compared to an expected model of proportionally equal levels of responses. This means the socio-demographic status of respondents had no significant association with their personal preference to live within the distance recommended by the national benchmark.

Key findings:

- Living within 300 m (i.e corresponding to the UK's distance benchmark) from a green space is ideal for 56% of respondents.
- None of the respondents wanted to live further than 2 km (2000 m) from a green space.
- Socio-demographic status of respondents is not associationed with their wish to live within a short distance (up to 300 m) from a green space.

3.6.3 Frequency and duration of visits

Frequency and duration of visits were analysed in relation to perception of access. Figure 3-9 shows the frequency of visits reported by respondents against the percentage

of respondents. According to Figure 3-9 on average, green spaces were visited at least once a week by 56% of the users, at least once a month by 29% and at least once a year by 14%.

Figure 3-9 Frequency of visits by respondents

A mosaic plot was applied to illustrate the extent to which the frequency of using green spaces could be associated with respondents' socio-demographic factors, including age, gender, ethnicity, occupation, income and car ownership. Accordingly, each point on the eight-point Likert scale of visits was analysed against the socio-demographic factors noted above. The plots showed significant variation among age and occupational groups with regard to visiting a green space on the basis of 'most days' and 'once a week' (Figs. 3-10 to 3-12).

According to the mosaic plots, the tiles with a light blue colour correspond to residuals between 2 and 4 indicating a greater frequency in these cells than would be found if the model was true. The mosaic plots showed that that the 60-74 age group and the 'retired' occupation group visited a green space 'most days' more than the other groups and those who described themselves as 'unemployed' visited a green space 'once a week'

more than other occupational groups, compared to a model of proportionally equal levels of visits for all age and occupational groups (Figs. 3-10 to 3-12).

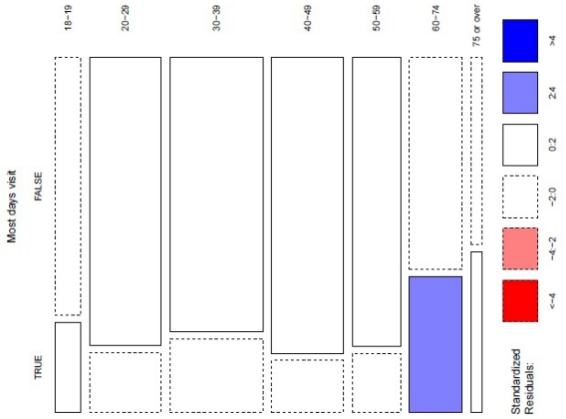


Figure 3-10 'Most days' visits by age

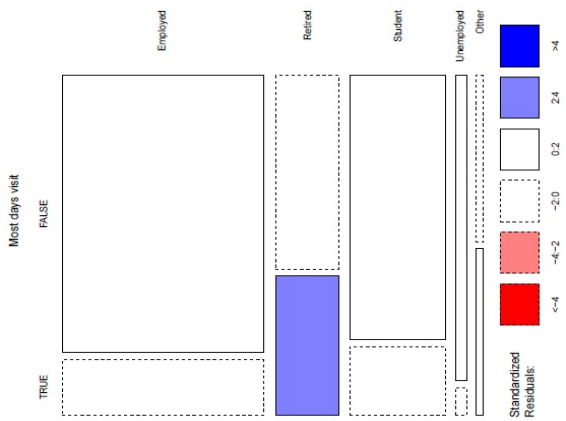


Figure 3-11 'Most days' visits by occupation

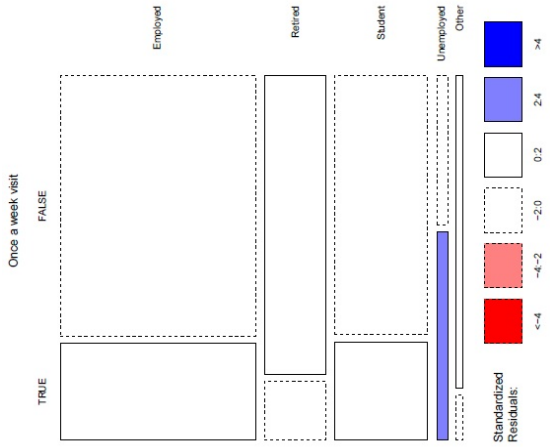


Figure 3-12 'Once a week' visit by occupation

With regard to 'duration of visits', the light blue tiles (Figs. 3-13 and 3-14) correspond to residuals between 2 and 4 indicating a variation compared to other occupational groups for 'students' and 'retired' people regarding visits to a green space for a duration of 'less than 30 minutes' and '1-2 hours', respectively.

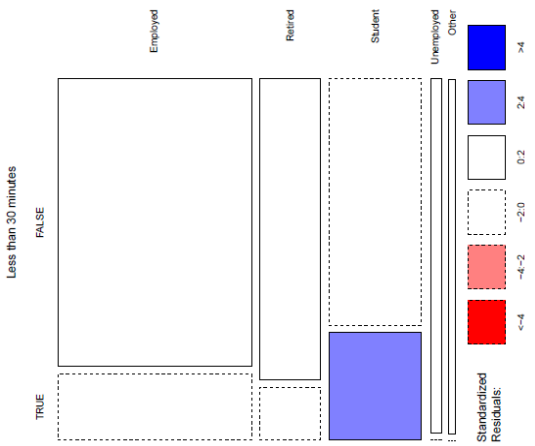


Figure 3-13 'Less than 30 minutes' duration of visit by occupation

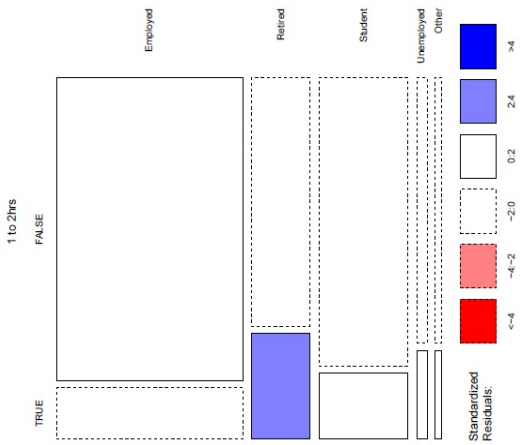


Figure 3-14 '1-2 hours' duration of visit by occupation

Key findings:

- The 60-74 age group and 'retired' respondents visit green spaces as often as 'most days'.
- 'Unemployed' respondents visit green spaces as often as 'once a week'.
- 'Students' and 'retired' respondents visit green spaces for durations of 'less than 30 minutes' and '1 to 2 hours', respectively.

3.6.4 Activities

Learning about the activities in which people participate in green spaces is a key factor in discovering people's attitudes and perceptions towards green space access and in evaluating the extent to which people value green spaces. With reference to the numerous use of the questionnaire in finding out about people's activities in green spaces, respondents were provided with a broad list of twenty-five activities under the four categories of relaxing, physical, social and other activities with the option of marking all the activities that were applicable.

Table 3-2 summarises the list of activities and percentages of participation. As the table shows, physical and relaxing activities comprise the highest percentages of participation, followed by social activities and others (e.g. takeing a shortcut to get somewhere else, photography, or study). Among the relaxing activities, the top three activities in which people participated were 'get some fresh air' (70.2%) 'enjoy flowers/trees' (48.2%) and 'relax/think' (47.3%). Among the physical activities, the ones in which respondents participated included 'to go for a walk' (68.2%) 'keep fit' (48.2%) and 'improve health' (38.4%). The social activities in which most people participated were 'meet friends' (36.7%) 'enjoy family outing' (25.3%) and 'eat/drink' (24.9%). The social activities in which fewest people were involved included 'educational walk' (0.8%) 'guided walk and talk' (3.3%) and 'participating in voluntary activities' (6.5%).

Table 3-2 Percentages of different types of activities engaged in by participants in green spaces

Relaxing activities	**Per cent**	**Physical activities**	**Per cent**	**Social activities**	**Per cent**
Get some fresh air	70.2	For a walk	68.2	Meet friends	36.7
Enjoy flowers/trees	48.2	To keep fit	48.2	Enjoy family outing	25.3
Relax/think	47.3	To improve health	38.4	To eat/drink	24.9
Enjoy the beauty of nature	43.3	Use playground	38.0	Attend events	22.0
For peace and quiet	41.2	Play sports/games	30.6	Picnic/BBQ	21.2
See and feed birds/wildlife	23.7	Ride a bike	26.1	Enjoy entertainment	14.7
Other activities	**Per cent**	Walk the dog	15.1	Voluntary activities	6.5
		Watch sport /games	10.6	Guided walk/talk	3.3
Take a shortcut to get somewhere else	20.8	———	-	For educational walk	0.8
Others	6.9	———	-	———	-

In addition to highlighting the most and least popular activities, it was important to discover if the way people perceived, experienced and valued green spaces was associated with the variation between social groups. Accordingly, a mosaic plots was applied to analyse and visualise the association between each one of the twenty-five activities and the dependent socio-demographic variables, including age, gender,

ethnicity, occupation, income and car-ownership status. Mosaic plots revealed no significant variation between male and female respondents or between car owners and those without cars with regard to the activities in which they participated in a green space. The list of relaxing, physical, social and other activities for which the mosaic plot visualised significant variation between different groups of respondents is presented in Table 3-3.

Table 3-3 Activities that varied between different groups of respondents

Activities	Age	Occupation	Ethnicity	Income
Relaxing activities	To relax/think To enjoy flowers/ trees	To relax/think To enjoy flowers /trees	———	———
Physical activities	To play sport To use a playground To improve health	To use a playground To improve health	To walk the dog To play sport To use a playground	———
Social activities	To meet friends To enjoy family outing To eat /drink Picnic/BBQ	To meet friends To enjoy family outing	To enjoy family outing Picnic/BBQ	To enjoy family outing To meet friends To eat/drink
Others	To take a shortcut to get somewhere else	To take a shortcut to get somewhere else	———	To take a shortcut to get somewhere else

The following sections show the plots for activities listed in Table 3-3 where participation varies between groups:

3.6.4.1 Activities analysed against age

The plots visualise variation between age groups with regard to participation in some activities. This means that the ways in which respondents from different age groups valued, experienced and perceived green spaces were different. In general, to interpret plots, it needs to be considered that plots show people's participation in activities for different age groups and the tile areas are proportional to the numbers of respondents affected. Blue tiles correspond to positive residuals and the red ones to negative

residuals. As a result, the plots show which groups are under- or over-represented. For example, comparing tiles in Figs 3-15 and 3-16 shows that there is a variation between the '20-29' and '60-74' age groups and the average for all age groups with regard to visiting a green space as a place 'to think/relax' and 'to improve health', respectively. According to Figs. 3-15 and 3-16 the tiles with a light blue colour correspond to combinations of activities including 'to think/relax' and 'to improve health' with age whose residuals are between 2 and 4 when compared to a model of proportionally equal levels of activities for all age groups. This indicates a greater frequency in these cells than would be found if this model were true. The light red tile (Fig. 3-15) corresponds to the residuals between -2 and -4 indicating lower frequencies than would be expected.

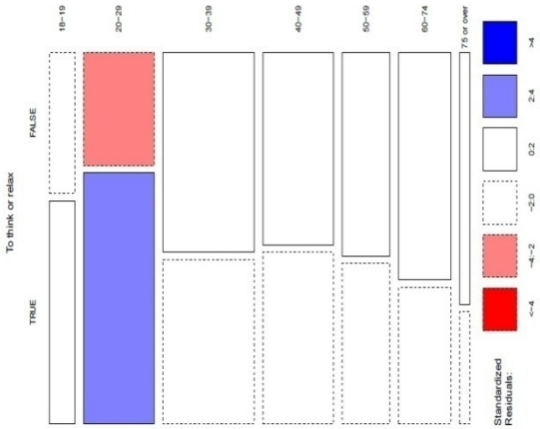


Figure 3-15 'To think/relax' by age

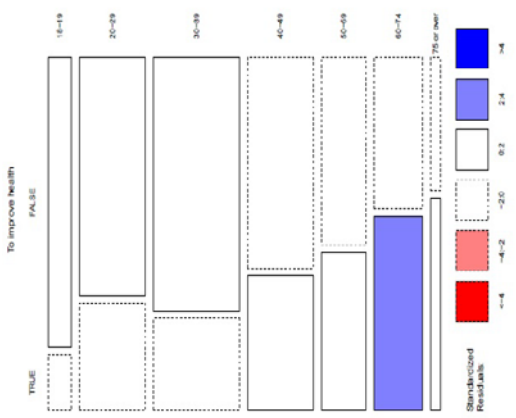


Figure 3-16 'To improve health' by age

With regard to visiting a green space as a place 'to meet friends', the tile with a dark blue colour (Fig. 3-17) corresponds to the residuals greater than +4 when compared to a model of proportionally equal levels of participation in this specific activity for all age groups. This indicates a much greater frequency in those cells than would be found if this model were true. Therefore, respondents aged 18-19 perceived and valued green space more than other age groups for the purpose of 'meeting friends'. The light blue tile (Fig. 3-18) shows that, a model of proportionally equal levels of participation for all

the age groups, respondents in the age range of 18-19 visit green spaces as places ‘to eat/drink’ more than other age groups.

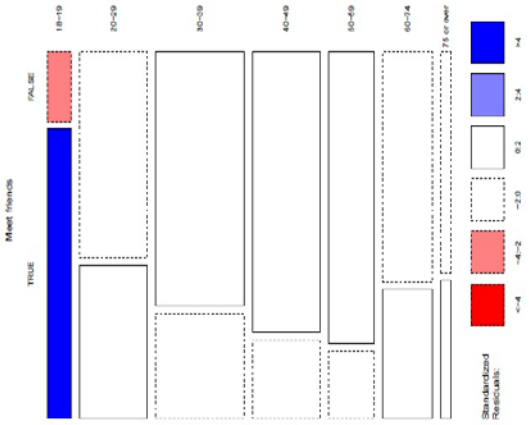


Figure 3-17 ‘To meet friends’ by age

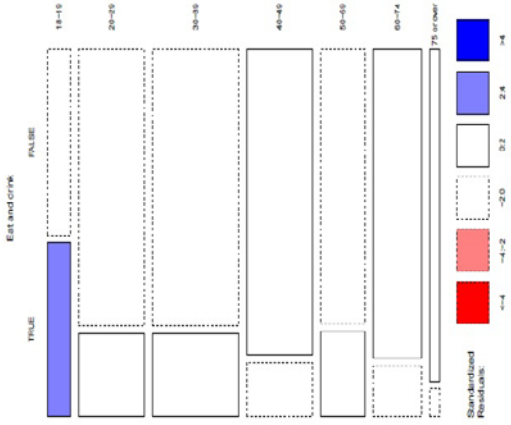


Figure 3-18 ‘To eat/drink’ by age

Visiting green spaces to have a ‘picnic/BBQ’ (Fig. 3-19) and ‘to take a shortcut to get somewhere else’ (Fig. 3-120) are the other two activities that showed a variation of participation between the age groups. The light blue tiles (Fig. 3-19) with residuals between 2 and 4 indicate a greater frequency of participation in the age groups 18-19 and 20-29 than in other age groups. The dark and light blue tiles (Fig. 3-20) correspond to the residuals greater than +4 and between 2 and 4 respectively, when compared to the model of proportionally equal levels of participation for all age groups. The light red tiles correspond to the residuals between -2 and -4 indicating a lower frequency than would be expected. The mosaic plot shows that, compared to all the age groups, only respondents aged 18-19 and 20-29 use green spaces, with a greater frequency, as a short cut to get somewhere else.

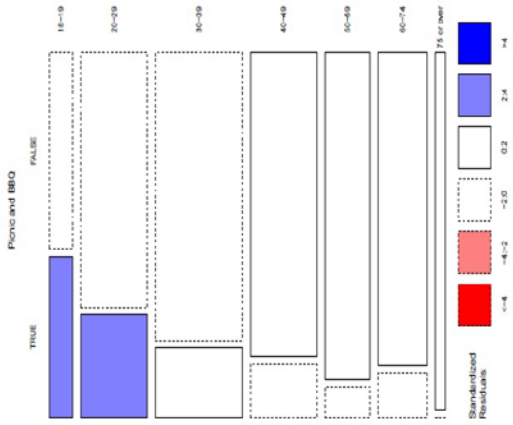


Figure 3-19 'To picnic/BBQ' by age

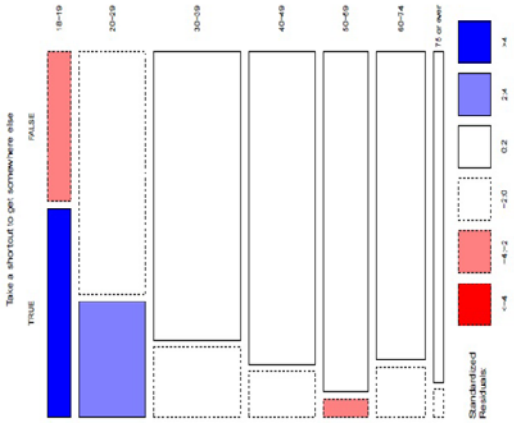


Figure 3-20 'To take a shortcut to get somewhere' by age

The light blue tiles (Figs. 3-21 and 3-22) correspond to residuals between 2 and 4 and indicate a greater frequency of participation in these cells than other groups under the assumption of a model of proportionally equal levels of participation for all age groups. The light red tiles also correspond to residuals between -2 and -4 indicating a significantly lower frequency of participation than would be expected. Thus the mosaic plot (Fig. 3-21) highlights a variation between age groups in how they perceive and value green spaces as places 'to play sports'. This variation is greater between respondents aged 18-19 and 20-29 and other age groups. Besides, the plot visualises that visiting green spaces to take part in this specific activity was less frequent among respondents in the age groups 50-59 and 60-74. Under the same model, light blue tiles (Fig. 3-22) show a significant variation for respondents in the age groups 20-29 and 60-74 with regard to visiting green spaces for the purpose of 'enjoying flowers/trees'.

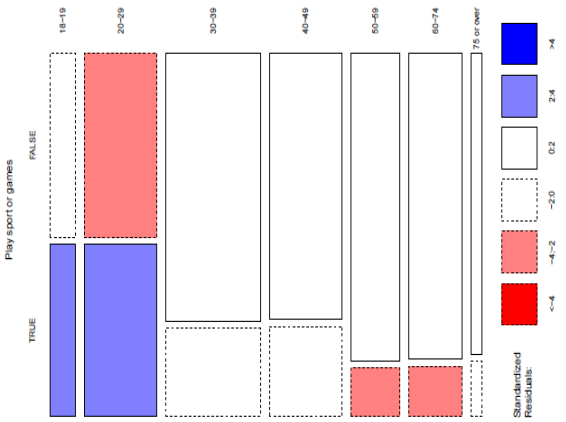


Figure 3-21 'To play sport' by age

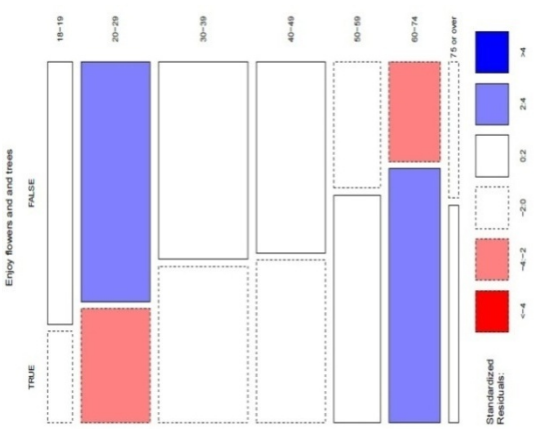


Figure 3-22 'To enjoy flowers/trees' by age

The tiles with a light blue colour in Fig. 3-23 correspond to residuals between 2 and 4 when compared to a model of proportionally equal levels of participation for all ages. They indicate a greater frequency of visiting green spaces for the purpose of 'using playgrounds'. As a result, the mosaic plot shows a significant variation between the age groups 30-39 and 40-49 and the other age groups regarding visiting green spaces in order to use playgrounds. The light red tiles corresponding to the residuals between -2 and -4 indicating a lower frequency than would be expected for the age groups 50-59 and 60-74 concerning this specific reason for visiting. Under the same model, the dark blue tiles (Fig 3-24) correspond to the residuals greater than +4, indicating a much greater frequency of visiting green spaces for the 'family outing' occasion in the age group 30-39 than in the other groups and in particular the age group 20-29.

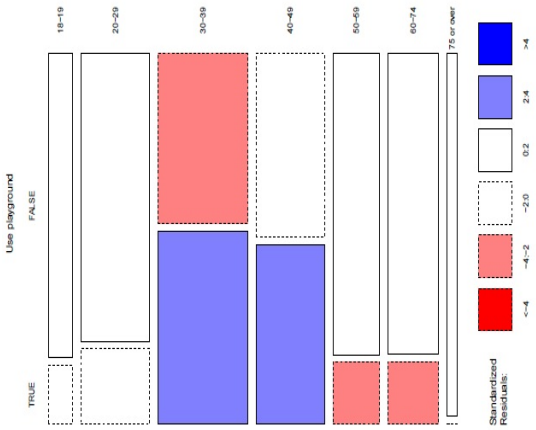


Figure 3-23 'To use playground' by age

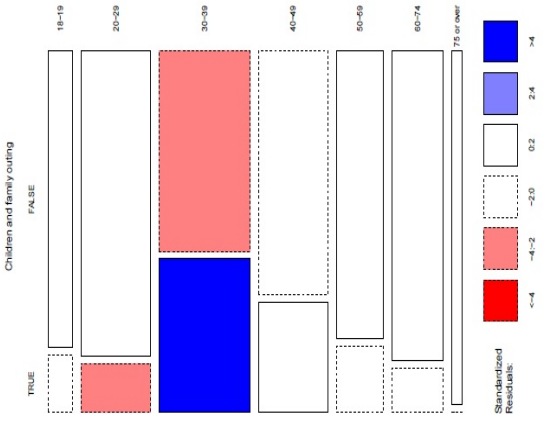


Figure 3-24 'To enjoy family outing' by age

Key findings:

- Respondents aged 18-19 visit green spaces 'to meet friends, 'to eat/drink', 'to picnic/BBQ', 'to take a shortcut to get somewhere else' and 'to play sport'.
- Respondents aged 20-29 visit green spaces 'to think or relax', 'to picnic/BBQ', 'to take a shortcut to get somewhere else' and 'to play sport'.
- Respondents aged 30-39 visit green spaces 'to use a playground' and 'to enjoy a family outing'.
- Respondents aged 40-49 only visit green spaces 'to use a playground'.
- Respondents aged 60-74 use green spaces 'to improve health' and 'to enjoy flowers or trees'.

3.6.4.2 Activities analysed against occupation

Mosaic plots were applied to visualise combinations of activities and occupations that are higher than average to indicate where there is variation between occupational groups in the way of perceiving and experiencing green space access. The plots highlight variations between occupational groups concerning purpose for visits, including 'to enjoy flowers/trees', 'to improve health', 'to think/relax', 'to meet friends', 'to take a

shortcut to get somewhere else', 'to use a playground and 'to enjoy a family outing'. For example, the light blue tiles (Figs. 3-25 and 3-26) correspond to the residuals between 2 and 4 showing over-representation of 'retired' respondents with regard to visiting green spaces 'to enjoy flowers/trees' and 'to improve health', when compared to a model of proportionally equal levels of participation for all occupations. This indicates a much greater frequency in these cells than would be found if this model were true. The light red tiles correspond to the residuals between -2 and -4, indicating lower frequencies than would be expected. Thus, it is concluded that green spaces were perceived only as places 'to enjoy flowers/trees' and 'to improve health' more by 'retired' respondents than by the average of all occupations. Besides, 'students' were the only group that visited green spaces less than the average of all occupations specifically for taking part in these activities.

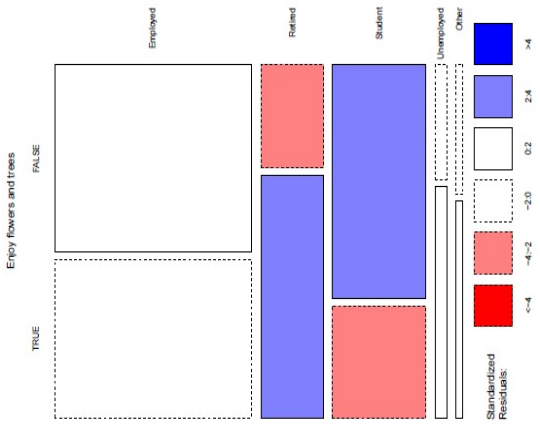


Figure 3-25 'To enjoy flowers/trees' by occupation

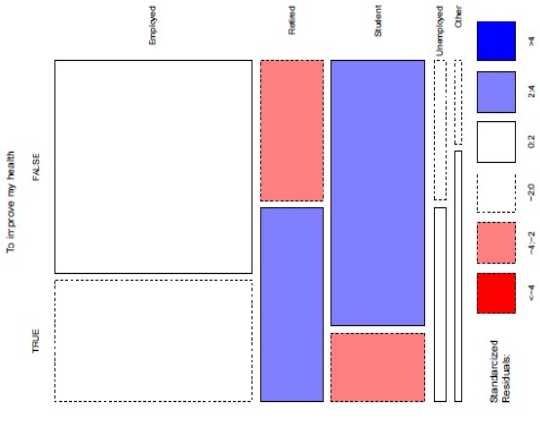


Figure 3-26 'To improve health' by occupation

The light blue tiles (Figs. 3-27 and 3-28) indicate a higher than average frequency of visiting green spaces for the purpose of 'meeting friends' and 'thinking or relaxing' among 'students' compared to other occupations.

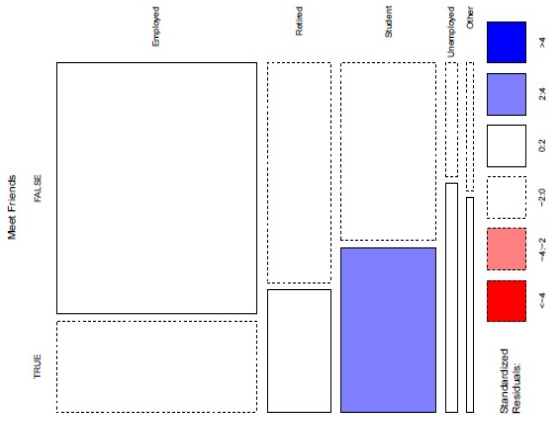


Figure 3-27 'To meet friends' by occupation

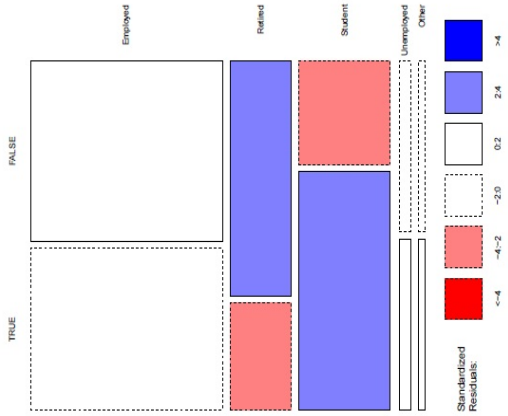


Figure 3-28 'To think/relax' by occupation

Besides, the dark blue tile (Fig. 3-29) shows the residuals greater than +4, indicating a significantly over-representation of 'students' as the only occupational group who visited green spaces for the purpose of 'taking a shortcut to get somewhere else'. The light red tiles correspond to the residuals between -2 and -4 indicating a lower than average use of green space for this particular reason by 'employed' and 'retired' respondents.

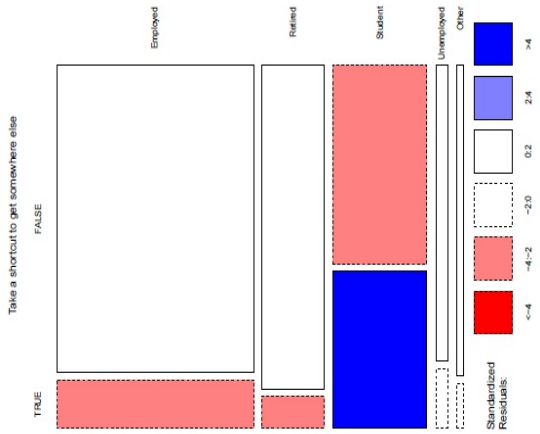


Figure 3-29 'To take a shortcut to get somewhere' by occupation

Figures 3-30 and 3-31 indicate the variation between 'employed' respondents and other occupational groups with regard to visiting green spaces for the purpose of 'using playgrounds' and 'enjoying family outings'. The light blue tiles corresponding to the residuals between 2 and 4 show the representation of 'employed' respondents with regard to taking part in these two activities when compared to a model of proportionally

equal levels of participation for all occupations. The light red tiles also correspond to lower than average participation in these activities by 'retired' respondents and 'students'.

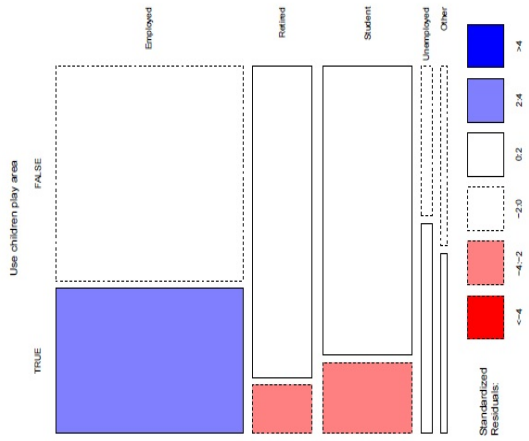


Figure 3-30 'To use playground' by occupation

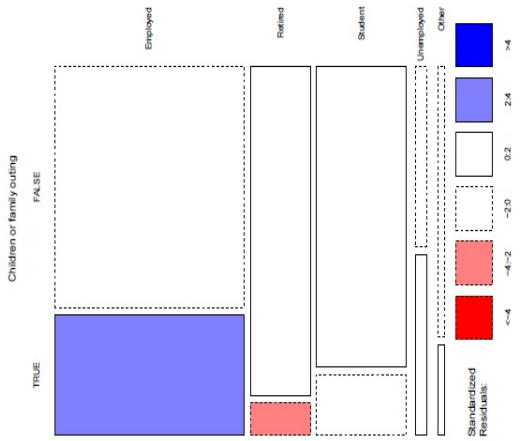


Figure 3-31 'To enjoy family outing' by occupation

Key findings:

- 'Retired' respondents visit green spaces 'to enjoy flowers/trees' and 'to improve health'.
- 'Students' visit green spaces 'to meet friends', 'to think/relax' and 'to take a shortcut to get somewhere else'.
- 'Employed' respondents visit green spaces 'to use playgrounds' and 'to enjoy family outings'.

3.6.4.3 Activities analysed against ethnicity

The mosaic plot was used to visualise whether there is significant variation between different ethnical groups concerning the reasons for visiting green spaces. Mosaic plots (Figs. 3-32 to 3-36) reveal that, with regard to purposes for visits, including 'family outings', 'to have picnic/BBQ', 'to use playgrounds', 'to play sport' and 'to walk the

dog', there was recognisable variation between ethnic groups. For instance, the light blue tiles in Figs. 3-32 to 3-34, correspond to the residuals between 2 and 4, indicating a greater frequency of visiting green spaces by 'Asian or Asian British' respondents for the purpose of 'family outings', 'picnic or BBQ' and 'using playgrounds' when compared to a model of proportionally equal levels of participation for all ethnic groups.

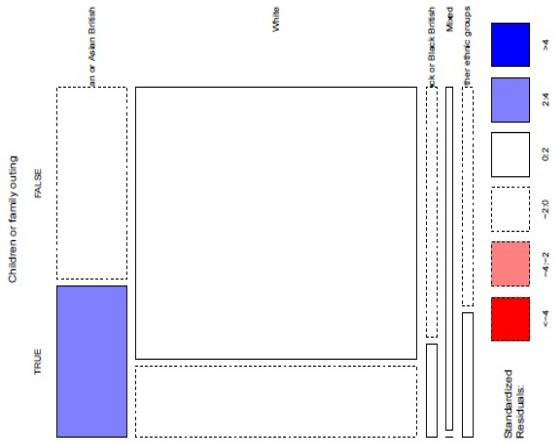


Figure 3-32 'To enjoy family outings' by ethnicity

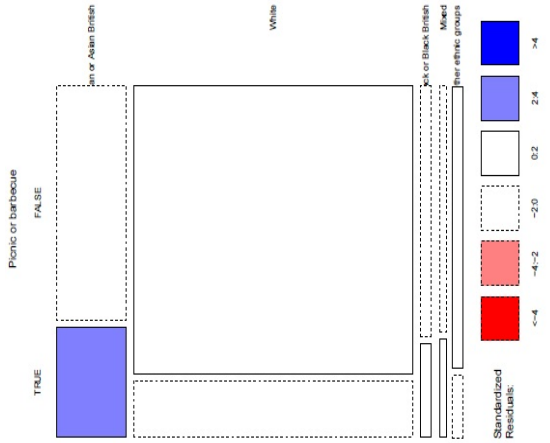


Figure 3-33 'Picnic/BBQ' by ethnicity

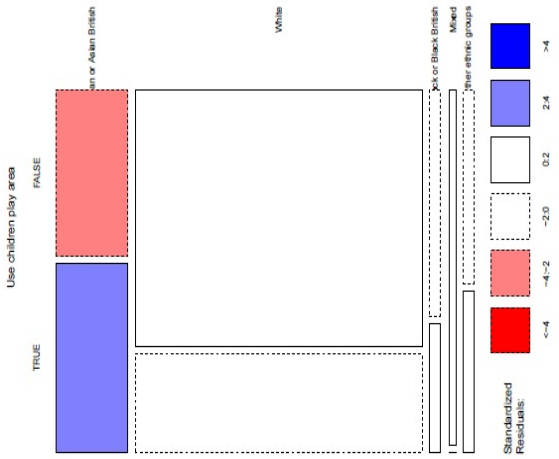


Figure 3-34 'To use playgrounds' by ethnicity

The light blue tiles in Fig. 3-35 visualise the greater frequency of visiting green spaces for the purpose of 'playing sport' among 'Black and Black British' and 'Asian and Asian British' than for the other ethnic groups. Besides, the light blue tile (Fig. 3-36)

reveals the greater frequency of visiting green space by 'White' people for 'dog walking' when compared to a model of proportionally equal levels of participation in this activity for all ethnic groups. The light red tile corresponds to the residuals between -2 and -4, indicating a lower frequency than would be expected.

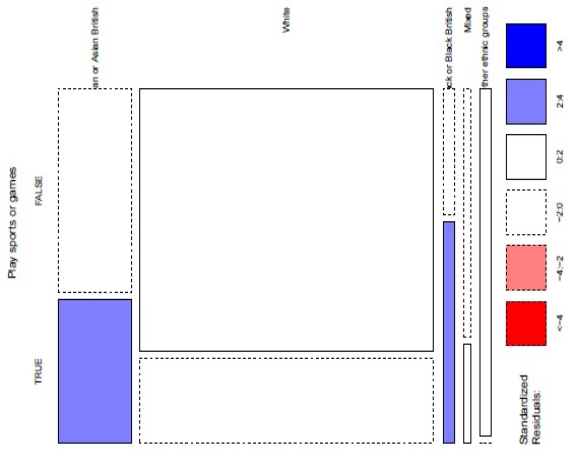


Figure 3-35 'To play sport' by ethnicity

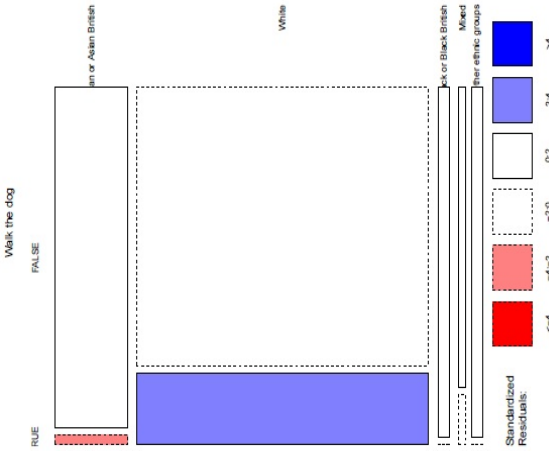


Figure 3-36 'To walk the dog' by ethnicity

Key findings:

- 'Asian and Asian British' respondents visit green spaces for the purpose of 'family outings', 'using playgrounds', 'picnic/BBQ' and 'to play sport'.
- 'White' respondents visit green spaces only for the purpose of 'dog walking'.
- 'Black and Black British' respondents visit green spaces only 'to play sport '.

3.6.4.4 Activities analysed against income

The use of a mosaic plot to visualise potential variations between groups of respondents with different annual incomes and their reasons for visiting green spaces show significant variations between the different income groups in their participation in activities, including 'to have family outing', 'to meet friends', 'to eat/drink', and 'to take a shortcut to get somewhere else'.

The light blue tiles in Figs. 3-37 to 3-40 correspond to combinations of activities and income groups whose residuals are between 2 and 4, when compared to a model of proportionally equal levels of participation for all the income groups. This indicates a greater frequency in these cells than would be found if the model were true. The light red tile in Fig. 3-37, corresponds to the residuals between -2 and -4, indicating a lower frequency than would be expected. The mosaic plot (Fig. 3-37) shows that those respondents who had an annual income of '£35-50 k' visited green spaces more than the other income groups for the purpose of 'family outings'. The respondents with an annual income of 'up to £7 k' (Figs. 3-38 to 3-40) visited green spaces as a place 'to meet friends', 'to eat/drink' and 'as a shortcut to get somewhere else.

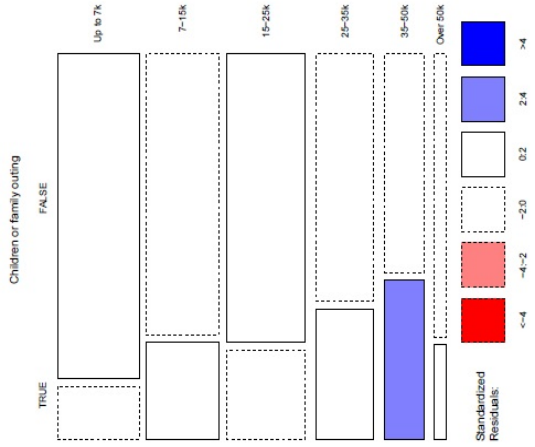


Figure 3-37 'To enjoy family outings' by income

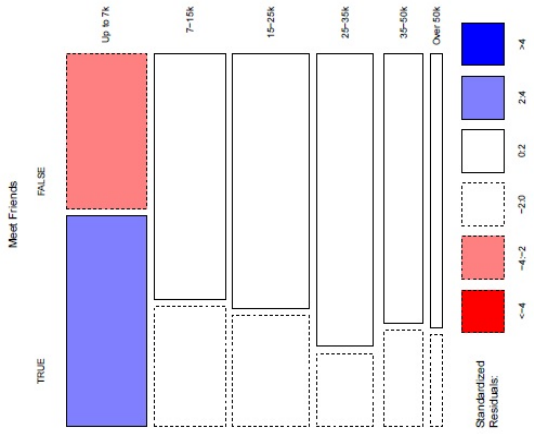


Figure 3-38 'To meet friends' by income

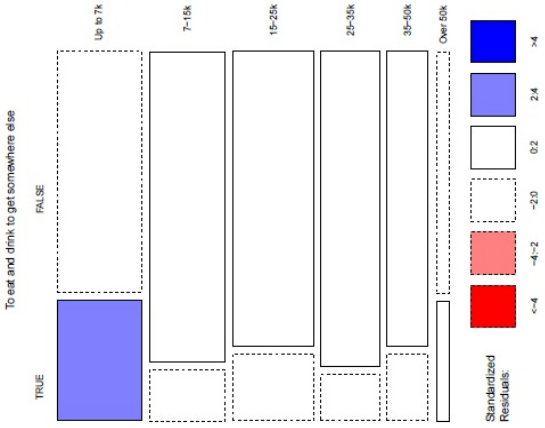


Figure 3-39 'To eat/drink' by income

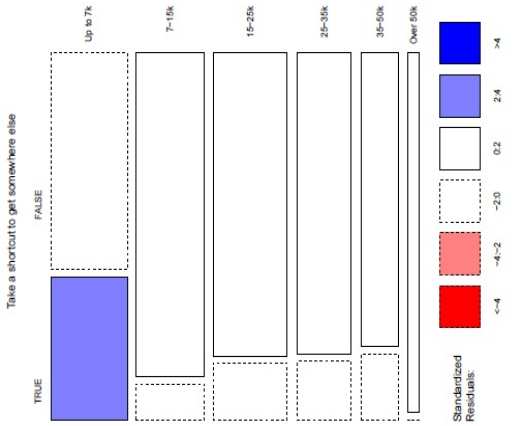


Figure 3-40 'To take a shortcut to get somewhere else' by income

Key findings:

- Respondents with an annual income of 'up to £7 k' visit green spaces 'to meet friends', 'to eat/drink' and 'as a shortcut to get somewhere else'.
- Respondents with an annual income of '£35-50 k' visit green spaces for 'family outings'.

3.6.5 The importance of environmental factors and facilities for green space access

Further to analysing combinations between the dependent variables – 'travelling time' 'spatial distance', 'frequency and duration of visits', 'activities' and 'socio-demographic factors' – in relation to people's perceptions of access this section aims to indicate the importance of the physical characteristics of green spaces and the provision of facilities in the way people perceive access. In this way, required data were extracted from Part C of the questionnaire and analysed by SPSS (i.e. Descriptive Statistics Analysis) to reflect the extent to which the factors were important to respondents. Figure 3-41 lists physical characteristics of green spaces and facilities offered against their degree of importance to respondents. Respondents highlighted 'cleanliness', 'appearance',

'safety' and 'walking distance' as the top physical factors they consider as the most important ones with regard to their perceptions of access. After these physical characteristics of green spaces, they highlighted provision of, and access, to 'public toilet', 'playground' and appropriate 'lighting' as important in relation to their perceptions of access.

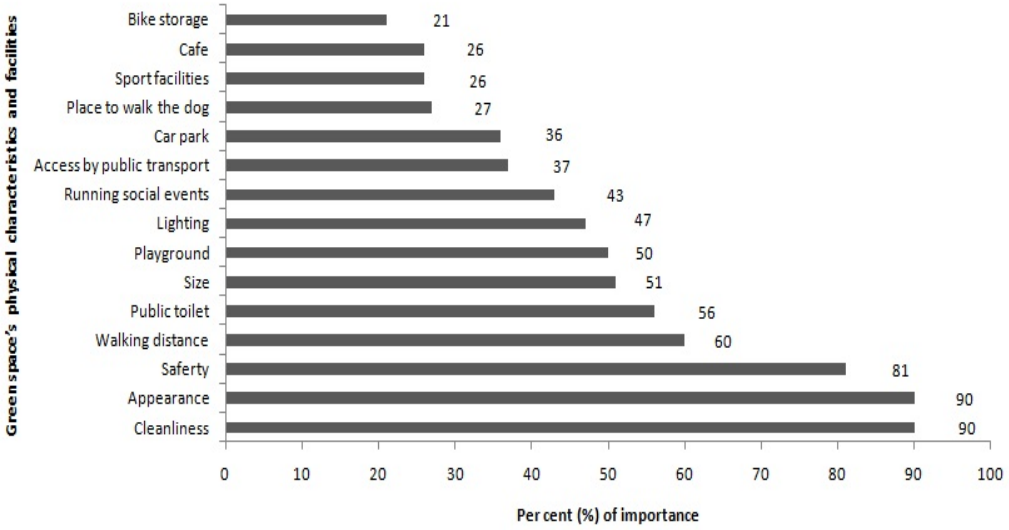


Figure 3-41 Participants' perceptions of the importance of environmental factors and facilities in relation to green space access

Following the descriptive statistics analysis, the mosaic plot was applied to identify the influence of participants' socio-demographic status on their perspectives regarding the importance of the factors noted above. Mosaic plots, however, did not show any significant variation between respondents' demographic status and their perceptions of the importance of these factors.

Key factors:

- 'Cleanliness', 'appearance', 'safety' and 'walking distance' are the top physical characteristics of green spaces that influence respondents' perception of access.

- Provision of facilities including ‘public toilet’, ‘playground’ and ‘appropriate lighting’ in green spaces is important to respondents with regard to their perception of access.
- No significant variation was found between respondents from different social groups in the relationship between theire perception of access and the way they perceive and value the importance of the physical characteristics of green spaces and the provision of facilities.

3.7 Conclusion

This chapter focused on the use of the questionnaire method in identifying factors related to access and the association between the socio-economic status of individuals and their preferences regarding access perceptions, access behaviour and geography of access. In this process, the total number of 452 completed questionnaires obtained via on-site participation, community participation and on-line participation were analysed by the use of the mosaic plot approach available in R programe. Mosaic plots were used to visualise graphically the extent to which there is a variation between different social groups with regard to perception of access. Access satisfaction, ideal distance, frequency and duration of the visits and activities were the variables analysed against social factors, including age, gender, ethnicity, occupation, income and car ownership. Summary of the findings show that:

- Access dissatisfaction varied between respondents from different age groups, and by mode of travel and duration of the visits. For example, 31% of respondents were dissatisfied with their access travelling time. Mosaic plots visualised variations for respondents in the age group 50-59, those who travelled

by public transport (bus) and those who intended to spend more than four hours in green spaces.

- Comparing respondents' ideal distance to the UK benchmark showed that more than 50 per cent of respondents preferred to live within 300 m of a green space. Nevertheless, the mosaic plot did not visualise any variation between different social groups with regard to their preference to live within the UK benchmark distance from a green space.

- Mosaic plots visualised a variation between different age and occupational groups with regard to the frequency of their visits. In this way, respondents in the age group of 60-74 and those who were 'retired' visited green spaces 'most days' more than other age and occupational groups. In addition, compared to other occupational groups, 'unemployed' respondents visited green spaces 'once a week' more often than other occupational groups.

- With reference to the duration of the visits, the preference for spending a particular length of time in green spaces varied only between different occupational groups. For example, compared to 'students' who spent the least amount of time 'less than 30 minutes' in green spaces, 'retired' respondents spent the time between '1 to 2 hours' in the areas.

- Table 3-4 summarises the findings obtained from mosaic plots to show the extent to which taking part in activities varied between different social groups. The first column of the table lists activities that showed variations between different age, occupational, ethnic and income groups. For example, according to the table, with regard to the use of green spaces as a place 'to think or relax', there is a variation between respondents from different age and occupational

Table 3-4 The variation between different social groups with regard to taking part in activities in green spaces

Activity	Age	Occupation	Ethnicity	Income
To relax/think	* 20-29	* Student (-) Retired people	-	-
To walk the dog	-	-	* White (-) Asian or Asian British	-
To use a playground	* 30-39 and 40-49 (-) 50-59 and 60-74	* Employed people (-) Students and Retired people	* Asian or Asian British	-
To play sport	* 18-19 and 20-29 (-) 50-59 and 60-74	-	* Black or Black British and Asian or Asian British	-
To meet friends	** 18-19	* Students	-	* Up to £7 k
To enjoy a family outing	** 30-39 (-) 20-29	* Employed people (-) Retired people	* Asian or Asian British	* £35-50 k
To eat/drink	* 18-19	(-) Retired people	-	* Up to £7 k
To improve health	* 60-74	* Retired people (-) Students	-	-
To enjoy flowers/trees	* 60-74 (-) 20-29	*Retired people (-) Students	-	-
Picnic/BBQ	* 18-19 and 20-29	(-) Retired people	* Asian or Asian British	-
To take a shortcut to get somewhere else	** 18-19 * 20-29	** Students (-) Employed and Retired people	-	* Up to £7 k

** Significantly greater than average participation (residuals greater than 4) when compared to a model of proportionally equal levels of participation for all groups

*A greater than average of participation (residuals between 2 and 4) when compared to a model of proportionally equal levels participation for all groups

(-) A lower than average participation (residuals between -2 and -4) when compared to a model of proportionally equal levels of participation for all groups

groups. For example, those respondents who were aged between 20 and 29 and were students used green spaces more than the average of other social groups for this specific purpose. The second row explains that, 'White' people were the only ethnic group who used green spaces as a place to walk the dog significantly more than the average of all ethnic groups. Conversely, 'Asian or Asian British' people used green spaces for this specific purpose less than the average of other ethnic groups. Interpreting the rest of the table in a similar way reflects the perceptions of other social groups towards green space access.

Chapter 4: Participatory mapping and GIS-based network analysis

4.1 Introduction

In the process of studying perceptions of access and access behaviour across different social groups, this chapter introduces participatory mapping as an approach to be compared with GIS-based network analysis in terms of measuring physical accessibility and the extent to which distance would influence people's preference and perception of green space access. To use participatory mapping, participants are asked to mark their location (supply point) and green space destination (demand point) on the base map of the city of Leicester, and then draw the route they usually take to get from supply to demand point (referred to as 'actual routes'). Destinations and actual routes are compared to the closest destinations and shortest routes determined by GIS-based network analysis approach (referred to as 'network routes') to reveal to what extent people perceive accessibility in terms of a short distance to a facility. In the next step, the spatial datasets (actual routes) and non-spatial datasets (questionnaires and in-depth interviews) are linked together to show what are the other important access-related factors for those who do not prioritise accessibility in terms of distance.

The key message of this chapter is highlighting the significance of adopting a mixed-methods approach in developing multi-dimensional concept of access in terms of geographic distance, access perceptions and behaviours. The contents of this chapter proceed as follows:

1) a review of the contribution of GIS in measuring physical accessibility to green spaces

2) methodology: a description of the study area, data, and methods

3) data analysis: a description of the Chi-square test

4) results: reflecting respondents' perceptions of green space access from different aspects through linking spatial and descriptive data

5) conclusion: presenting the key message of the findings and methods applied

4.2 Use of GIS in measurement of accessibility

"Accessibility is a broad and flexible concept" that is measured in terms of travelling distance, time or cost (Halden, 2011, p. 12). A review of the literature shows that, in measuring accessibility, distance is the most common measure and is estimated as a simple straight-line distance, buffer or by adopting more complicated formulations.

Nowadays the power and versatility of GIS make it remarkable in quantifying accessibility, managing data and conducting spatial analysis in different public fields including green spaces (Zhou et al., 2003). This section focuses on highlighting the application of GIS in studies that measure accessibility to green spaces: for example, Schipperijn et al. (2010) employed GIS spatial analysis to study the potential health benefits associated with the use of green spaces. Kara and Demirci (2010) used GIS and remote sensing to explore whether outdoor recreational areas are sufficient in Istanbul, Turkey, in terms of surface areas and facility characteristics. Kessel et al. (2009) used GIS to characterise access to green spaces in terms of distance, and in relation to changes across individuals' socio-economic status. Comber et al. (2008) used GIS-based network analysis to analyse equity of access to green spaces among different

ethnic and religious groups in Leicester, UK. Panter and Jones (2008) used road network analysis and questionnaire to explore the association between physical activity and neighbourhood perceptions, access leisure facilities, and green spaces. Oh and Jeong (2007) used GIS-based network analysis to analysis pedestrian accessibility to urban parks in Seoul, Korea. Barbosa et al. (2007) measured provision of access to public green spaces for households from different sectors of society in Sheffield, UK. Hillsdon et al. (2006) showed how GIS is used to determine the relationship between accessibility and quality of urban green space and people's physical activity. Tsou et al. (2005) employed GIS and spatial analysis models in order to determine integrated equity indices that planners need to analyse the relative equity distribution of public facilities. Nicholls and Shafer (2001) used GIS in their study of urban parks and recreational services to evaluate accessibility and equity in a local park system in Texas, USA.

A review of the literature shows that, despite the prevalent use of GIS tools in measuring accessibility in relation to proximity to green spaces, there is less research focusing on incorporating GIS into qualitative methods to help the study of accessibility in terms of people's perceptions of access and access behaviour towards green spaces.

In this sense, qualitative GIS emerged in the mid 1990s to analyse non-spatial qualitative data in the context of GIS digital technology. A review of literature by Elwood and Cope (2009) showed that in spite of debates regarding the difficulty of integrating non-cartographic forms of spatial knowledge (e.g. audio, video, photographs) into GIS, in recent years there has been a rapid growth of interest among researchers in developing GIS-based spatial analysis into qualitative methodologies (i.e. focus groups, participatory action and interviews) in different areas of research.

Responding to the growing use of qualitative GIS as a mixed-methods approach Elwood and Cope (2009) argued that the core commitment of qualitative GIS to the integration of multiple forms of knowledge and findings from various techniques is what positions qualitative GIS as a mixed-methods approach; and Pavlovskaya (2009) argued that the power of GIS to create visual images of the world to unveil hidden natural and social landscapes is what enables it to engage with qualitative analysis and to be used as a mixed-methods approach.

In spite of the potential use of a mixed-methods approach in studying green space from multiple perspectives there are few research studies that have used a GIS mixed-methods approach to study people's attitudes towards green spaces. Therefore, this research uses qualitative GIS as a mixed-methods approach to study green space access in terms of people's perspectives and behaviour, as well as spatial distance to green spaces. In this study, qualitative methods including a questionnaire and in-depth interviews were employed to study people's perspectives and behaviour towards access (Chapters 3 and 5). To represent the multi-dimensional concept of access to green spaces, this chapter employs GIS-based network analysis and participatory mapping to measure accessibility in terms of physical distance to green spaces. The following section provides more details concerning the required data and the methods applied.

4.3 Methodology

4.3.1 Required data

To study people's perceptions of access in terms of the shortest distance between a supply and a demand point, a GIS-based network analysis needs to be developed to

calculate the shortest routes (network routes) from each of the 245 supply points (postcodes) to the nearest demand point (green space). Next, network routes are compared to the 245 actual routes drawn by respondents from similar supply points to their favourite demand point. Comparing actual and network routes and destinations provides the opportunity to study people's lived experiences of access than just relaying on outcomes of network analysis. In this process, the first step to take is to develop a network analysis through creating the following three layers of data:

- **Road network layer**

To make a road network layer for the city of Leicester and its surrounding areas, primary road data were extracted from Edina Ordnance Survey (OS Meridian 2, 1:50,000) and established in ArcCatalog based on the connectivity at the coincident endpoints of line features during the build process. Figure 4-1 shows the image of the road network for Leicestershire County.

- **Supply layer (Location layer)**

The postcodes provided by 245 respondents were imported into ArcMap to establish the supply layer. Figure 4-2 shows the locations of respondents inside and outside the Leicester city boundary.

- **Demand layer (Green space layer)**

The demand layer was created on the basis of spatial data for 35 green space polygon areas in the city of Leicester. Access points to these green spaces were manually digitised by using OS 1:10,000 scale colour raster data. Figure 4-3 shows the locations of green space polygon areas and 206 access points to these places.

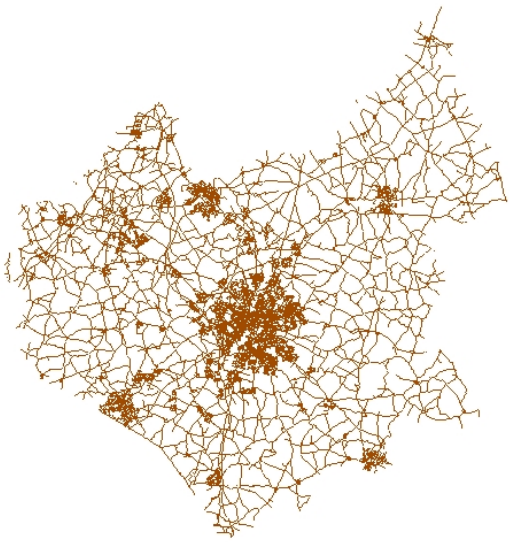


Figure 4-1 Leicestershire Road Network

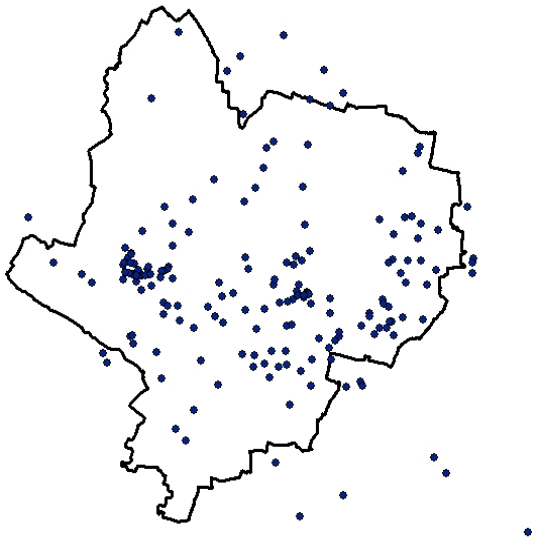


Figure 4-2 Locations of respondents based on postcodes

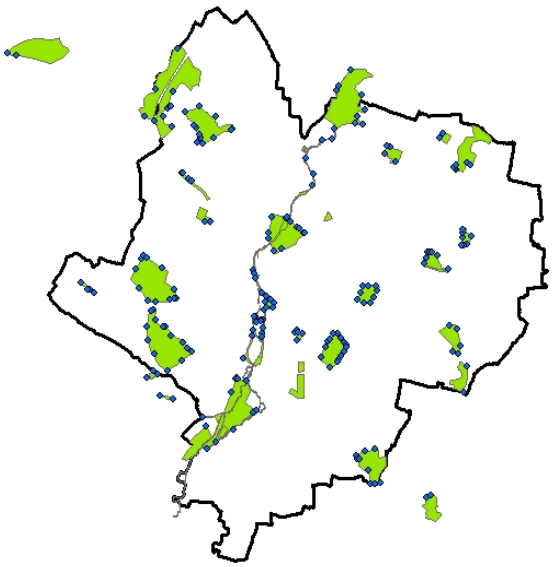


Figure 4-3 Geo-locations of green space polygons and their access points

4.3.3 Methods

This section introduces the two comparative methods, GIS-based network analysis and participatory mapping, used in this part of research to reflect people's perceptions of access.

4.3.3.1 GIS-based network analysis

GIS-based network analysis is a precise, realistic and easy-to-use alternative to the most commonly used approaches, including buffering and straight-line distance, in terms of measuring physical accessibility. The method was previously used by Bagheri et al. (2005) to measure spatial accessibility to primary health care in New Zealand and by Comber et al. (2008), to quantify accessibility of green spaces among different ethnic and religious groups in Leicester, UK.

In order to use the method and develop a GIS-based network analysis, firstly, the three layers of road network data, supply data and demand data are imported to the ArcMap environment. Secondly, the supply and demand points are inserted into the road network, with maximum tolerance set to 300 m, which means the locality of demand points must be closer than 300 m to be located in the road network. By choosing the button of solving network, for each of the 245 supply points the closest demand point is specified and the shortest route between them will be calculated. Figure 4-4 presents an image of the supply and demand points inserted into the road network.

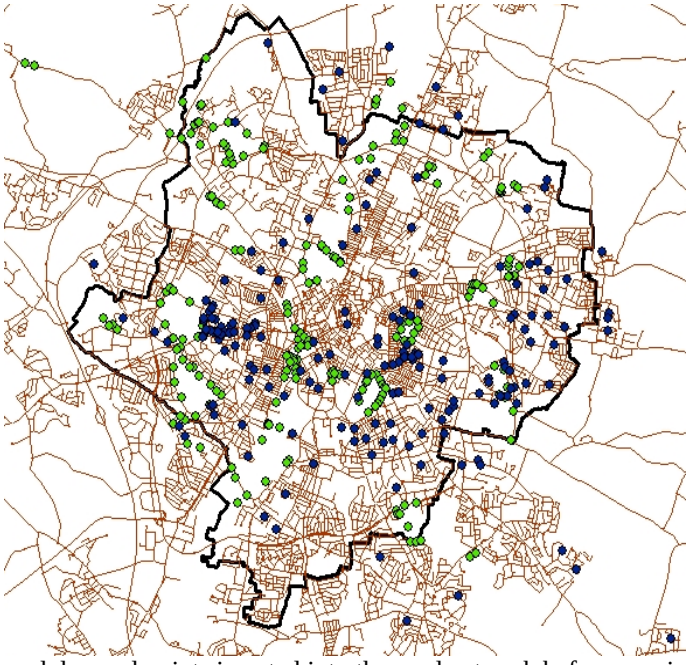


Figure 4-4 Supply and demand points inserted into the road network before running network analysis

An image of the network after running the analysis is presented in Figure 4-5. In this figure, red bullets indicate the closest demand points (green space) allocated to yellow supply points (postcodes) and blue lines show the shortest route between them. Opening the attributes table for the routes shows a collection of columns under the title of supply ID, demand ID, demand ID allocated to supply ID, and total length. To differentiate each supply point from others, a descriptive dataset extracted from the questionnaire is joined through postcodes to the supply layer. Joining the two layers creates a large dataset including both spatial and non-spatial data collected from 245 respondents in order to understand people's perceptions and behaviour towards distance as an access-related factor.

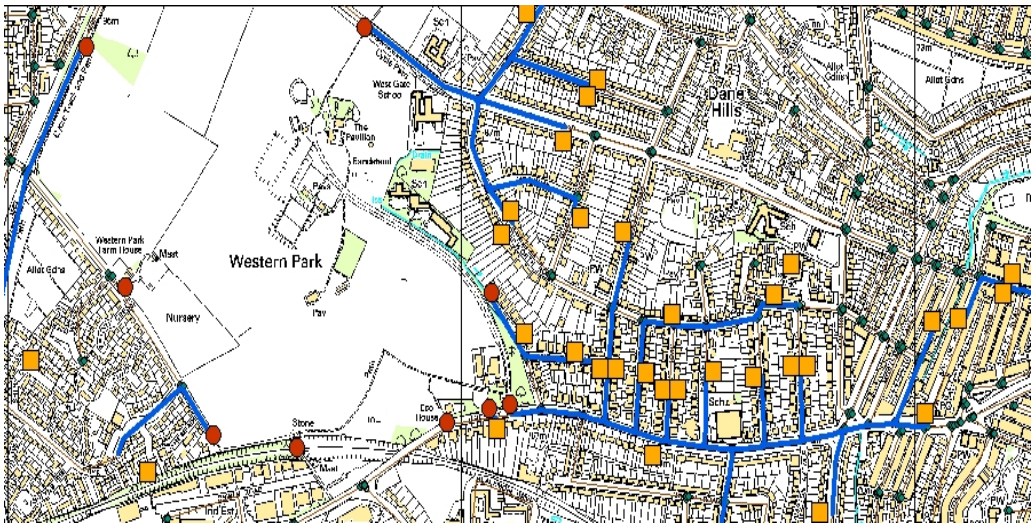


Figure 4-5 Shortest routes from supply points (postcodes) to demand points (green spaces)

4.3.3.2 Participatory mapping

Participatory mapping – also referred to as sketch mapping, community mapping and indigenous mapping – is a qualitative approach that stimulates community cohesion in terms of people working together to share their spatial knowledge regarding social, cultural, and biophysical environments. The value of data is expressed once they are geo-referenced, documented and visualised. (Corbett and Rambaldi, 2009).

In this process, the knowledge of community members is incorporated into the science of cartography to reflect a distinct understanding of the human-land relationship where it cannot be examined by quantitative methods (Gunderson and Watson, 2007). The key application of participatory mapping is involving people in the planning and decision-making process to obtain findings that are more readily understandable and acceptable in communities (Kingston et al., 2000). In fact, the higher level of participation could create more outcomes to reflect the knowledge, information and perspectives of community members.

Participatory mapping was employed by Carver et al. (2009) to capture personal and community meanings associated with different landscapes that are otherwise difficult to document. A holistic review of the literature conducted by Chapin et al. (2005) described the history of participatory mapping as well as mentioning different applications of the method across the world. The report published by IFAD (2009) highlighted the contribution of participatory mapping mainly in terms of land-use occupancy, traditional use of natural resources, sacred areas, and territorial boundaries, and exemplified the application of the approach in projects such as cultural mapping in Peru, participatory land-use planning in Thailand, mapping ancestral domains in Northern Mindanao, talking maps in Peru and GIS and conflict resolution in Ghana.

A reviewing of the literature shows that the application of participatory mapping is rapidly evolving in qualitative studies by incorporation into GIS where it is known as participatory GIS (PGIS). Corbett and Rambaldi (2009) and Corbett and Keller (2006) argued that PGIS can be a form of qualitative GIS because of the capability of the approach in demonstrating the multiple dimensions of human-land relationships by

linking spatial information to attribute datasets and other form of digital information, including images, audio and video.

Building upon the increasing use of public participation as an approach to collecting people's knowledge regarding different issues, this research uses participatory mapping as a new method of measuring physical accessibility by adding the value of public responses: this method, which is new in green space literature, can be compared to GIS-based network analysis methods. In this process, participants were provided with an A0 map of the city of Leicester and asked to mark their location on the map and draw the route they normally take to get to a green space. Out of the total number of 452 participants who completed the questionnaire, 260 carried out the mapping exercise. Exploring completed maps showed that 15 out of the 260 participants had more than one route to get to a green space these routes varied according to their mode of travel (i.e. routes by car, on foot and by bus). Accordingly, multi-route participants were excluded from the sample group and only the routes drawn by 245 respondents were geo-referenced, digitised and imported into GIS to be combined with questionnaire data for further analysis related to measuring physical access to green spaces. Figure 4-6 represents examples of mapping exercises completed by 245 respondents.

Figure 4-6 Examples of participatory mapping exercise completed by 245 respondents (Source:

4.3.4 Pre-processing data

In order to analyse the data, a raster base map of the city of Leicester (1: 10, 000 scale) was added to the dataset and overlaid by the other layers of data to provide more details about the actual and network routes and the locations of supply and demand points. Searching the base map showed that in some cases there was a gap between the starting point of the actual routes marked by people on the paper map and the postcode they used to locate their address. For example, in some cases the gap between starting point and postcode measured over 300 m. The explanation could be the fact that in the UK every thirty households share a similar postcode and therefore the starting point could vary between these households. To overcome the problem and define a unique supply point for each of the 245 locations of respondents, X and Y were calculated automatically in GIS environment for each of the 245 actual routes drawn by the respondents. Accordingly, GIS-based network analyses were redeveloped and rerun by substituting a new layer of supply points based on starting points rather than postcodes.

4.4 Data analysis

In order to conduct the data analysis, the SPSS software was employed to manage and analyse spatial and non-spatial data in the process of understanding people's perception of access in relation to physical distance. In this process, from a wide range of available statistical tests provided in the SPSS package, the Chi-square test was used to analyse frequencies between each two of the variables to "allow comparison between the observed frequencies in the data and the frequencies that would be expected by chance" (Brace et al., 2006 p. 370).

With reference to the explanation above of the application of the Chi-square test, the test was fitted to the purpose of this chapter in order to make a comparison between two groups of people, those who used their nearest green space and those who travelled to another green space which could meet their preferences and expectations.

Figure 4-7 shows the application of a chi-squared test in analysing data and presenting the results to describe the extent to which accessibility is perceived by respondents as proximity to green spaces. Accordingly, the actual destinations of 245 participants are compared to the ones determined by the GIS-based network analysis. Where the actual and network destinations are similar, the users are called 'local users'; conversely, where the actual and network destinations are different the users are called 'travelling users', who prefer to travel to a distant green space rather than using their local one. In this way, the last box of this flowchart shows that 61% of participants are local users in comparison to the 39% who travel to other places.

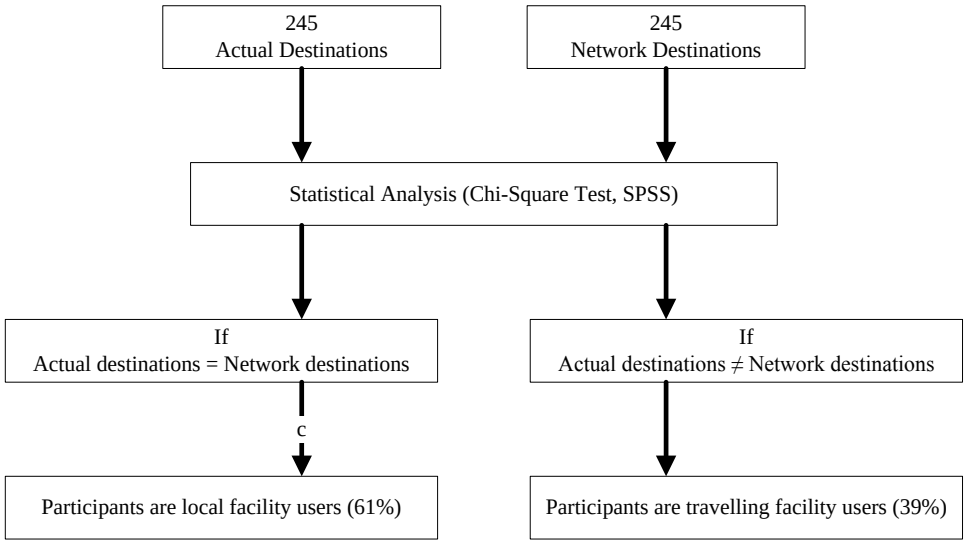


Figure 4-7 Comparing the process and results of GIS-based network analysis and participatory mapping

4.5 Results

This section shows the comparative results of GIS-based network routes and the actual routes in relation to people's perceptions of green space access. Further sections focus on addressing who are the users of green spaces, and how their perceptions of green spaces vary, in terms of frequency and duration of visits, mode of travel, travelling time and access satisfaction.

Table 4-1 addresses the 24 green spaces that are identified by GIS-based network analysis as the nearest demand points to the 245 supply points. The table also shows from the total number of supply points which are allocated to a demand point, how many of them would use the network destinations in their lived experience and how many of them have a different destination.

The first row of Table 4-1 shows Abbey Park as the nearest destination to nine supply points. In the third column, number 9 against Abbey Park explains that all the nine supply points use Abbey Park as their actual destination. Figures 4-8 and 4-9 show the locations of these nine supply points on the map and compare the actual routes that respondents take to get to Abbey Park with the nearest network routes. Although both actual and network routes end up at the same destination (Abbey Park), in their lived experience respondents take longer routes (average 924 m) in comparison with the network routes (average 730 m).

Table 4-1 Closest facilities identified by GIS-based network analysis

Nearest green space identified by network analysis		Total allocated cases	No. of cases that used closest GS	No. of cases that did not use closest GS
1	Abbey Park	9	9	-
2	Appleton Park	3	-	3
3	Aylestone Meadows	8	6	2
4	Beaumont Park	2	-	2
5	Bede Park	1	-	1
6	Brocks Hill Country Park	3	1	2
7	Braunstone Park	3	3	-
8	Castle Garden	3	-	3
9	Evington Park	23	21	2
10	Franklin Park	1	1	-
11	Hamilton Business Park	4	-	4
12	Heathly Park	2	-	2
13	Humberstone Park	5	-	5
14	Judgemeadow Spinney	15	-	15
15	Knighton Park	7	3	4
16	Leicester Riverside	15	-	15
17	Monks Rest Garden	13	4	9
18	Nature Park	1	-	1
19	Nelson Mandela Park	5	-	5
20	Shakespeare Park	1	1	-
21	Spinney Hill Park	26	17	9
22	Victoria Park	29	19	10
23	Watermead Country Park	8	8	-
24	Western Park	58	56	2
	Total	245	149	96

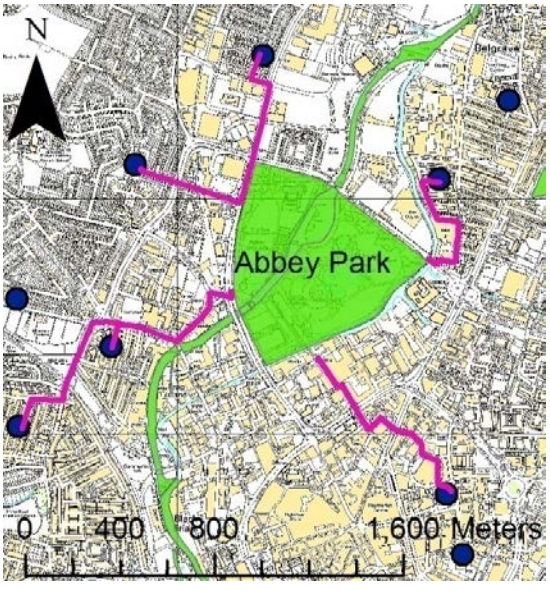


Figure 4-8 Network routes to Abbey Park

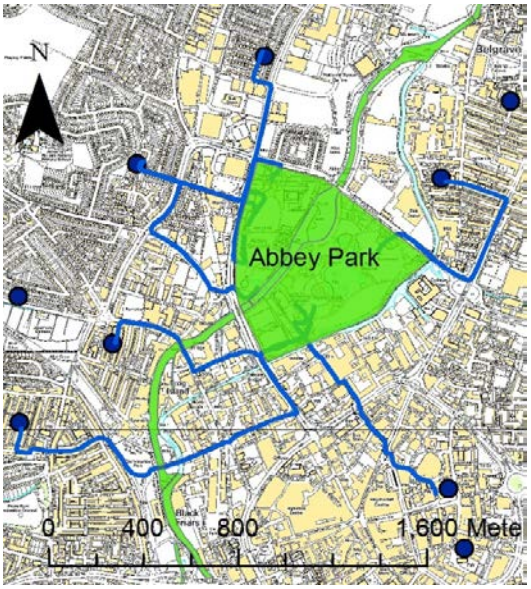


Figure 4-9 Actual routes to Abbey Park

The second example is Appleton Park. Network analysis identified Appleton Park as the nearest demand point to three supply points. However, according to the Table 4-1 in lived experience none of the three supply points use Appleton Park as their actual demand point.

Table 4-2 shows the actual demand points for these three supply points that do not use the nearest demand point identified by network analysis. According to Table 4-2 Abbey Park, Cossington Park and Monks Rest Garden are the actual destinations rather than Appleton Park. These three cases are examples of the 39% of the participants who prefer to travel to other green spaces rather than use the local facilities.

Figure 4-10 shows the locations of these cases and the nearest network routes to Appleton Park (Owing to overlapping cases and routes, only two of these three cases and routes are visible on the image). Route analysis shows that, in their lived experience, respondents opt for routes that are considerably longer than the network routes to access to green spaces. In fact, the average length of routes determined by

Table 4-2 Comparing the network and actual destinations in 96 cases where they not match

	Actual Destinations / Network Destinations	Abbey Park	Aylestone Meadows	Bede Park	Braunstone Park	Brocks Hill Park	Castle Garden	Cossington Park	Evington Park	Franklin Park	Humberstone Park	Knighton Park	Monks Rest Garden	Shakespeare Park	Spinney Hill Park	Victoria Park	Watermead Park	Western Park	Grand Total
1	**Appleton Park**	1	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	**3**
2	**Aylestone Meadows**	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	**2**
3	**Beaumont Park**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	**2**
4	**Bede Park**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	**1**
5	**Brocks Hill Country Park**	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	**2**
6	**Castle Garden**	1	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3
7	**Evington Park**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	**2**
8	**Hamilton Business Park**	1	-	-	-	-	-	-	1	-	2	-	-	-	-	-	-	-	**4**
9	**Heathly Park**	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**
10	**Humberstone Park**	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	**5**
11	**Judgemeadow Spinney**	-	-	-	-	-	-	-	2	-	-	1	-	-	-	12	-	-	**15**
12	**Knighton Park**	-	-	-	-	3	-	-	-	-	-	-	-	-	-	1	-	-	**4**
13	**Leicester Riverside**	3	2	-	-	-	1	-	-	-	-	-	-	-	-	1	5	3	**15**
14	**Monks Rest Garden**	1	-	-	-	-	-	-	5	-	2	-	-	-	-	-	1	-	**9**
15	**Nature Park**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	**1**
16	**Nelson Mandela Park**	1		-	-	-	1	-	-	-	-	-	-	-	-	3	-	-	**5**
17	**Spinney Hill Park**	1	-	-	-	-	-	-	5	-	-	-	-	-	-	2	1	-	**9**
18	**Victoria Park**	1	-	1	-	1	-	-	5	-	-	2	-	-	-	-	-	-	**10**
19	**Western Park**	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	**2**
	Total	**12**	**3**	**2**	**2**	**4**	**2**	**1**	**25**	**-**	**4**	**4**	**1**	**-**	**-**	**22**	**9**	**5**	**96**

network analysis is 799 m, compared to 1613 m, the average length of actual routes taken by the 245 respondents.

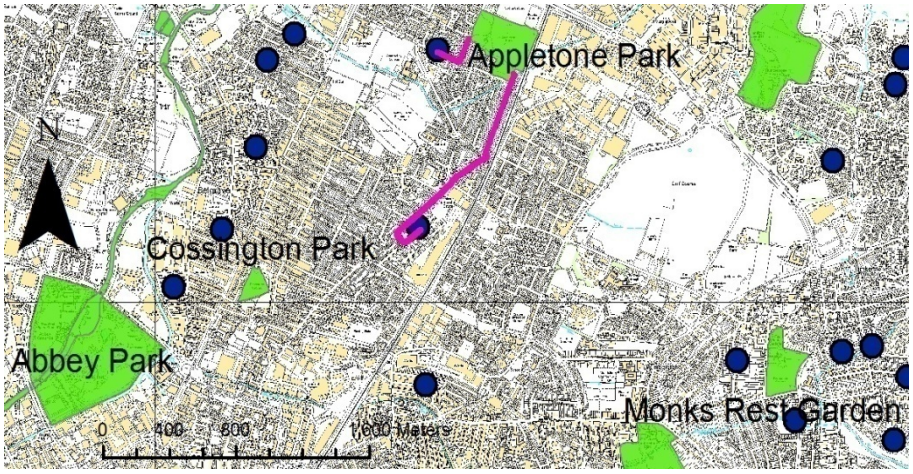


Figure 4-10 Network routes to Appleton Park

Figure 4-11 shows the locations of the same three cases and the actual routes taken by respondents to get to Abbey Park, Cossington Park and Monks Rest Garden. The average length of actual routes is 3206 m, which is almost twice the average length of the network routes (1588 m).

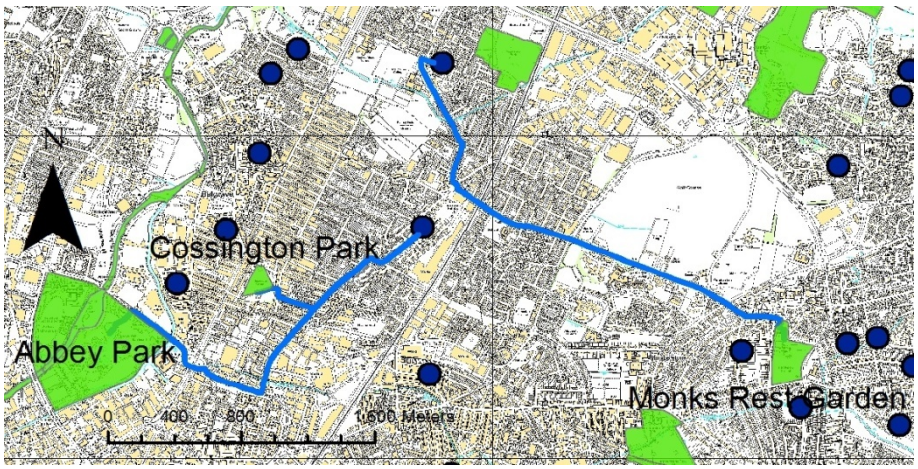


Figure 4-11 Actual routes to Abbey Park, Monks Rest Garden and Cossington Park

Figure 4-12 presents a comparative summary of Tables 4-1 and 4-2. It shows the extent to which the nearest green spaces identified by network analysis are used by respondents in their lived experience. The X axis refers to the names of twenty-four

green spaces and the Y axis shows the percentage of network destinations that match the participants' actual destinations. In order to interpret the chart there are three situations to be considered:

1- Red in the charts highlights circumstances in which all the supply points to which the five demand points – Abbey Park, Braunstone Park, Franklin Park, Shakespeare Park and Watermead Park – are allocated by network analysis as the as the nearest green spaces use the same demand points without exception in their lived experience as their actual destinations.

2- Grey in the chart identifies green spaces which although determined by network analysis as the nearest demand points to some supply points, are not always chosen by respondents in their lived experience as their actual destinations.

3- Where there is no rectangle for a green space it means that the network destination is totally different from respondents' actual destinations. Appleton Park, Bede Park and Castle Garden are examples of such green spaces.

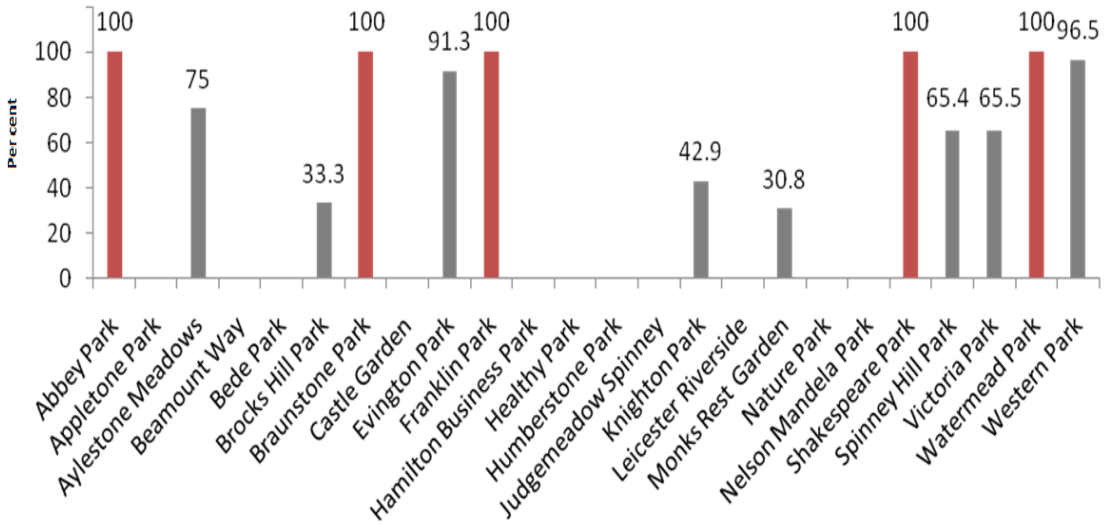


Figure 4-12 Comparing the percentage use of network destinations in respondent's lived experience

Key finding 1:

- The lived experiences of respondents regarding physical accessibility shows that they take considerably longer routes to get to green spaces than the network routes. The average length of actual routes is 1613 m, compared to 799 m, the average length of network routes determined by the network analysis.

- Comparison of actual and network demand points reveals that for the 61% of respondents accessibility is about provision of access to local facilities. For the remaining 39% who travel to other green spaces, accessibility is about more than physical proximity to a local facility. For the second group, different access-related factors including physical characteristics of green spaces (e.g. size, cleanliness, appearance, safety) and/or provision of facilities (e.g. sport facilities, playground, cafe, toilet) would be the reasons for travelling to other green spaces.

To identify the potential reasons for travelling, it is first necessary to have an image about who the travelling users are and to what extent their socio-demographic status would affect their preference to travel.

4.5.1 Who are travelling users?

Table 4-3 shows the results of a descriptive statistical analysis of the frequency of travelling to green spaces among different social groups. According to Table 4-3 White people (72.4%), employed people (45.2%) and students (32.3%) are among the users who travel most frequently within the categories of ethnicity and economic status. In terms of income and car ownership, respondents with an annual income up to £7 k and between £7 and 15 k and those who own a car are also among the users who travel most

frequently. The factor of gender (male 51 % and female 49%), however, showed no influence on respondents' intention to travel to other green spaces.

Table 4-3 Socio-economic status of travelling green space users

Economic status (%)		Ethnicity (%)		Income (%)		Car ownership (%)	
Employed	**45.2**	White	**72.4**	Up to £7k	**37.1**	Yes	**62.4**
Students	**32.3**	Mixed	**1.1**	£7-15k	**21.4**	No	**37.6**
Retired	**12.9**	Asian or Asian British	**23.0**	£15-25k	**14.3**		
Unemployed	**9.7**			£25-35k	**14.3**		
		Other Ethnic groups	**3.4**	£35-50k	**10.0**		
				Over £50k	**2.9**		

A Chi-square test was used to find if there is a statistically significant association between different social groups of respondents and frequently of travelling to green spaces. Findings only show a significant association with regard to economic status of travelling respondents (*P-Value* = 0.004, $\alpha < 0.05$). Table 4-4 shows in detail the variation between different economic groups with regard to both local facility users and travellers. According to the table, whereas employed and retired respondents who are the top local facility users, students and unemployed people are the top travelling users.

Table 4-4 Comparing economic status of travelling and local users

Do people use their nearest GS?	Economic status of people *P-Value* = **0.004**				Total
	Employed	Unemployed	Retired	Students	
No (travelling users)	46.2%	8.6%	12.9%	32.3%	100%
Yes (local users)	60.8%	2.8%	19.6%	16.8%	100%

Key finding 2:

- Students and unemployed people are the main travelling users, and employed and retired people are the top local facility users.

It can be concluded that the preference to travel to green spaces or use the local facilities is related to factors including time and the individual's mobility status.

In addition to exploring who are travelling users, it becomes important to find whether, in terms of physical access to green spaces, there is statistically a difference between travelling and local facility users regarding factors including frequency and duration of visits and mode of travel.

4.5.2 Accessibility in terms of frequency of visits

Table 4-5 reveals that there is a statistically significant difference between travelling and local users in terms of frequency of visiting green spaces (*P-value* = 0.061; $0.05 < \alpha < 0.1$). In fact, whilst travelling users mostly visit green spaces 'once a week', local facility users visit green spaces 'most days'. In addition, there is a significantly difference between travelling and local facility users in terms of 'daily' visits. For example, local facility users (13.4%) visit green spaces daily four times more than travelling users (3.1%).

Table 4-5 Comparing frequency of visits of travelling and local users

Do people use their nearest GS?	**Frequency of visit/ Pearson Chi-Square** *P-value* **= 0.061**							**Total**
	Once a year	**2-3 times a year**	**Once a month**	**Once a fortnight**	**Once a week**	**Most days**	**Every day**	
No (travelling users)	1.0%	8.3%	14.6%	16.6%	38.2%	18.1%	3.1%	100%
Yes (local users)	.0%	10.7%	16.8%	10.7%	23.5%	24.8%	13.4%	100%

Key finding 3:

- 'Once a week' is the frequency of visits most often reported by travelling users, compared to 'most days' for local facility users.
- Significantly fewer travelling users less visits green spaces daily than local facility users.

As a result, it can be concluded that, in terms of accessibility of green spaces, distance negatively influences frequency of visits among travelling users.

4.5.3 Accessibility in terms of duration of visits

The results of the Chi-square test show that there is a significant association between travelling to green spaces and the duration of visits, both on weekdays and over the weekend (*P-value* = 0.001; $\alpha < 0.05$). According to Table 4-6 compared to local facility users, travelling users stay longer on their visits to green spaces. For example, over the weekend, the percentages of travelling users who spend two to four hours and more than four hours in green spaces are 17.9% and 8.4%, respectively, in comparison with 6.7% and 0.7% of local facility users. In addition, the preference to stay for a longer time during the weekend increases among travelling users from 14.7 % to 17.9% for two to four hours and from 3.2% to 8.4% for more than four hours.

Table 4-6 Comparing duration of visit between travelling and local users

Duration of visit	**Do people use their nearest GS? Duration of visit: weekdays** *P-Value* = **0.001**		**Do people use their nearest GS? Duration of visit: weekend** *P-Value* = **0.001**	
	No (travelling users)	**Yes** (local users)	**No** (travelling users)	**Yes** (local users)
Do not visit	13.7%	14.8%	7.4%	5.4%
Less than 30 min	14.7%	17.4%	7.4%	14.1%
30min-1 hour	35.8%	40.9%	32.6%	38.3%
1-2 hours	17.9%	24.8%	26.3%	34.9%
2-4 hours	14.7%	2.0%	17.9%	6.7%
More than 4 hours	3.2%	.0%	8.4%	0.7%
Total	100%	100%	100%	100%

Key finding 4:

- Distance to green spaces is a factor that causes travelling users to prefer to stay for a longer period of time in green spaces than local facility users.

Studying the frequency and duration of visits shows that, in terms of physical access to green spaces, distance reduces the frequency of visits for less among travelling users compared to local facility users, whereas it increases the willingness of travelling users to stay for a longer time in a green space than local facility users.

4.5.4 Accessibility in terms of mode of travel

The result of the Chi-square test shows that, in terms of access to green spaces, there is a significant association between mode of travel and travelling and local facility users (*P-value* = 0.000; $\alpha < 0.05$). For example, according to Table 4-7, 78.5% of local facility users walk to get to a green space, which is almost twice the percentage of travelling users (41.1%). On the other hand, compared to 60% of travelling users who travel by car, bike or public transport to get to a green space only 21.5% of local facility users use modes of travel other than walking to green spaces.

Table 4-7 Comparing modes of travel of travelling and local users

Do people use their nearest GS?	**Mode of travel/ Pearson Chi-Square** *P-value* **= 0.000**				**Total**
	On foot	**Bike**	**Car**	**Bus**	
No (travelling users)	40.0%	14.7%	41.1%	4.2%	100%
Yes (local users)	78.5%	11.4%	9.4%	0.7%	100%

Key finding 5:

- Compared to local facility users, who mostly walk to get to a green space, travelling users mainly, use other modes of travel, including car, bike or public transport.

In relation to physical accessibility, distance is a factor that increases the preference among travelling users to use cars and other types of vehicles in order to get to a green

space. In contrast, proximity to a green space results in an increasing preference to walk to a green space rather than use a vehicle.

4.5.5 Accessibility in terms of travelling time

Respondents' actual and ideal travelling times obtained through the questionnaire are statistically analysed by the Chi-square test to show if there is any difference between travelling and local facility users in terms of travelling time to a green space. Findings presented in Table 4-8 are discussed in the form of a comparison between and within groups of users and their actual and ideal travelling times.

- ***Actual and ideal travelling time between groups***

Comparing the actual travelling times of travelling and local facility users shows that, whilst for over 90% of the local facility users it takes up to ten minutes to walk to a green space, such travelling time is only available for 65% of travelling users who do not travel on foot. In other words, time is significantly longer for travelling users than for local facility users. There is also a significant difference between travelling and local facility users for travelling times of fifteen minutes, twenty minutes, thirty minutes, and over thirty minutes. For examples, whilst 9.4% of travelling users have to travel fifteen minutes to get to a green space, only 3.4% of local facility users take a similar amount of time.

Comparison of ideal travelling times also reveals that both travelling users (92%) and local facility users (79%) ideally prefer a travelling time of up to ten minutes to get to a green space. In addition, the results show that, whilst ideally for 21% of travelling users it is acceptable to travel more than ten minutes to get to a green space, only 8 % of local facility users would be willing to travel for more than ten minutes.

Table 4-8 Comparing actual and ideal travelling times of travelling and local users

Travelling time	Do people use their nearest GS? Actual travelling time *P-Value* = **0.000**		Do people use their nearest GS? Ideal travelling time *P-Value* = **0.002**	
	No (travelling users)	**Yes** (local users)	**No** (travelling users)	**Yes** (local users)
5 min	42.7%	77.2%	52.2%	77.5%
10 min	21.9%	14.1%	27.1%	14.8%
15 min	9.4%	3.4%	9.8%	4.9%
20 min	15.6%	2.7%	6.5%	0.7%
30 min	7.3%	1.3%	3.3%	1.4%
Over 30 min	3.1%	1.3%	1.1%	0.7%
Total	100%	100%	100%	100%

- ***Actual and ideal travelling time within groups***

Comparison of actual and ideal travelling times within the group of local facility users shows that over 90% of them are happy with a travelling time of less than ten minutes. Local facility users with an actual travelling time of twenty minutes or over thirty minutes are less satisfied with the length of their journey to get to a green space and they would rather have it between ten and fifteen minutes. This finding comes from the figures presented in Table 4-8.

According to the figures, the percentage of people who have a travelling time of twenty minutes is 2.7% but only 0.7% of them are happy with this travelling time. Out of the 1.3% of respondents who have an actual travelling time of over thirty minutes, only 0.7% are happy with this travelling time in ideal circumstances.

With regard to travelling users, their preference to have a travelling time of less than ten minutes increases from 64.6% in the actual circumstances to 79.4% in an ideal circumstance. Conversely, their willingness to have a travelling time of more than ten minutes decreases from 35.4% in the actual situation to 20.7% in an ideal situation. In fact, even travelling users would ideally prefer to have a short travelling time of less than ten minutes.

Key finding 6:

- Compared to over 90% of local users, only 65% of travelling users had an actual travelling time to a green space of less than ten minutes. Ideally, compared to 21% of travelling users, only 8% of local users were happy with a travelling time of more than ten minutes.

- Comparative results among travelling users showed that their preference to have a travelling time of less than ten minutes increased from 64.6% actual to 79.4% ideal and their preference to have a travelling time of over ten minutes decreased from 35.4% actual to 20.7% in ideal circumstances.

Findings from this section highlight that, in terms of accessibility to green spaces, a short travelling time is highly appreciated by both travelling and local facility users.

4.5.6 Access satisfaction in terms of travelling to green spaces

The results of the Chi-square test are used to compare the degree of access satisfaction of travelling and local facility users. Table 4-9 shows that there is a significant difference (*P-Value* = 0.000; $\alpha < 0.05$) between the two groups of users with regard to the degree of access satisfaction compared to local facility users (17.4%), travelling users (41.7%) are more than twice as likely to dissatisfied with their access to green spaces.

Table 4-9 Comparing access satisfaction of travelling and local users

Do people use their nearest GS?	**Do people feel satisfied with their access?** *P-Value* = **0.000**		**Total**
	Yes	**No**	
No (travelling users)	58.3%	41.7%	100%
Yes (local users)	82.6%	17.4%	100%

Key finding 7:

- Compared to local facility users, travelling users are more than twice as dissatisfied with their access to green spaces.

4.5.7 The importance of facilities in terms of accessibility to green spaces

According to the recent findings, for 39% of respondents, accessibility is not conceptualised in terms of proximity between a supply and a demand point. This section indicates what would be the other important factors that cause some people to travel to other green spaces rather than using their local facilities. In this process, a Chi-square test is used to analyse statistically if provision of facilities could be the reason for those who travel to other green spaces in order to engage in different activities. Where the *P-Value* is smaller than 0.05 ($\alpha < 0.05$) it is concluded that the activity has a significant association with travelling to green spaces. Table 4-10 presents a list of activities that have a *P-Value* smaller than (0.05).

Table 4-10 Activities that show a significant association with travelling to green spaces

Do people use their nearest GS?	**Activities/ Pearson Chi-Square**								
	Relax/think *P-Value* = **0.020**		**Meet friend** *P-Value* = **0.001**		**Eat/drink** *P-Value* = **0.000**		**Picnic/ BBQ** *P-Value* = **0.030**		**Total**
	Yes	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**	
No (travelling users)	54.2%	45.8%	49.0%	51.0%	39.6%	60.4%	28.1%	71.9%	100%
Yes (local users)	43.0%	57.0%	28.9%	71.1%	15.4%	84.6%	16.8%	83.2%	100%

According to Table 4-10 from a wide range of activities in which people get involved in green spaces, only four activities – 'to relax or think' (relaxing activity), 'to meet friends', 'to eat/drink', and 'to have picnic/BBQ' (social activities) – are associated with travelling to green spaces. In response to the idea that provision of access to satisfactory facilities could be the potential reason for the 39% of respondents who do not prioritise

accessibility in terms of physical distance this section employs a Chi-square test to identify access-related facilities in terms of their contribution to some relaxing and social activities. Tables 4-11 to 4-13 show the list of access-related facilities to be analysed in association to the four relaxing and social activities mentioned above: playground, sports facilities, suitable place to walk the dog, cafe, public toilets, car park, bike park, public transport, appropriate lighting and safety.

According to Table 4-11 for 29.5% of travelling users who visit a green space as a place 'to relax or think' it is significantly important (*P-value* = 0.028; $\alpha < 0.05$) that the area provides them with an appropriate place to walk the dog.

Table 4-11 The contributory role of facilities in terms of travelling to green space 'to think or relax'

To think or relax	**Walk the dog** *P-value* **= 0.028**		**Total**
	Important	**Not important**	
No	18.1%	81.9%	100%
Yes	29.5%	70.5%	100%

Table 4-12 shows that the provision of access to facilities including public toilets and food shop/cafe is significantly important to 72.1% and 36.1% of travelling users who visit a green space as a place 'to eat/drink' and to 73.1% and 40.4% of those who travel to the area 'to have picnic/BBQ'.

Table 4-12 The contributory role of facilities in terms of travelling to green space 'to eat/drink' and 'to have picnic/BBQ'

To eat/drink	**Toilet** *P-value* **= 0.014**		**Cafe** *P-value* **= 0.023**		**Total**
	Important	**Not Important**	**Important**	**Not Important**	
No	54.3%	45.7%	22.3%	77.7%	100%
Yes	72.1%	27.9%	36.1%	63.9%	100%
Picnic/BBQ	**Toilet** *P-value* **= 0.018**		**Cafe** *P-value* **= 0.006**		
	Important	**Not Important**	**Important**	**Not Important**	
No	54.9%	45.1%	21.8%	78.2%	100%
Yes	73.1%	26.9%	40.4%	59.6%	100%

According to Table 4-13 for those travelling users who intend to use a green space as a place 'to meet friends', it is significantly important that the area provides them with sports facilities, food shop/cafe, public toilets, and social events.

Table 4-13 The contributory role of facilities in terms of travelling to a green space 'to meet friends'

To meet friends	Toilet *P-value* = **0.003**		Social events *P-value* = **0.033**		Sport *P-value* = **0.006**		Cafe *P-value* = **0.038**		Total
	Important	Not Important	Important	Not Important	Important	Not Important	Important	Not Important	
No	51.6%	48.4%	42.6%	57.4%	22.6%	77.4%	21.3%	78.7%	100%
Yes	71.1%	28.9%	56.7%	43.3%	38.9%	61.1%	33.3%	66.7%	100%

Key finding 8:

- For 39% of respondents, accessibility of green spaces is conceptualised in terms of provision of access to facilities related to relaxing and social activities rather than proximity.

- To those respondents who travel to green spaces for the purpose of using the area for a relaxing activity (e.g. 'to think or relax') provision of access to a suitable place to walk the dog is significantly important.
- To those respondents who travel to green spaces for social activities such as 'to eat or drink' and 'for a picnic/BBQ', provision of access to public toilets and food shop/cafe are significantly important.

- To those respondents who travel to green spaces for social activities such as 'to meet friends', provision of access to sports facilities, public toilets, food shop/cafe and social activities are significantly important.

From the recent findings it is concluded that not all the respondents perceive accessibility as physical distance to a green space. In fact, to some people there are more important access-related factors, including provision of access to facilities, that encourage them to travel to other green spaces rather than using their local facilities. Access to sports facilities, public toilets, food shop/cafe, a suitable place to walk the dog, and involvement in social activities are examples of factors that travelling users indicated as important facilities in relation to some relaxing and social activities.

4.6 Conclusions

This chapter focused on participatory mapping as a new method to be compared to GIS-based network analysis in terms of studying public perception of green space access, by adding value from the questionnaire method to learn more about green space users and the way they perceive the concept of accessibility.

The recent study considered destination as the key factor in comparing the results of actual and network analyses. Findings revealed that, although for 61% of the participants accessibility is mainly associated with proximity to local facilities, the remaining 39% of respondents conceptualised it in association with satisfactory provision of access to facilities, and that was their reason for travelling to another green space rather than using their local facilities. Further statistical analysis was conducted to learn more about travelling green space users, their pattern of visits, and the reasons that encourage them to travel to other facilities (see sections 4.4.1 to 4.4.7).

The key comparative results directed us towards the following conclusions:

- Access is a broad concept.
- GIS-based network analysis only uses a narrow definition of accessibility based on distance/travel time and tells us nothing about public perceptions of access.
- Mixed-methods approaches augment traditional GIS-based approaches and are more informative in terms of perception of access (crime/safety, quality, facilities, etc.).

The next chapter integrates the qualitative and quantitative findings obtained from employing a mixed-methods approach in order to create a large dataset, including both spatial and non-spatial data to study different aspects of accessibility.

Chapter 5: Public perception of green space access

5.1 Introduction

Green spaces as shared community resources make a significant contribution to human's health and wellbeing by supplying a broad range of benefits. The aesthetic benefits of properly managed urban green spaces make the areas appealing to people and enable them to take time away from the stress of modern life, whilst the social and cultural benefits of the areas promote the development of social networks and community attachment among people (Arnberger and Eder, 2012; Benton, 2008).

The early study by Wilson (1984) on the relationship between humans and the nature that surrounds them resulted in the presentation of the "biophilia hypothesis", which explained the beneficial influences of engaging with nature on human wellbeing. The hypothesis identified an instinctive bond between human beings and other living systems and explained that human identity and personal fulfilment are dependent on people's relationships with nature. Linked to the biophilia hypothesis and the findings acquired from the previous chapters (questionnaires and participatory mapping), this research employed in-depth interviews as the most practical qualitative method to carry out a thorough investigation of respondents' insights into geographical access, their access behaviour and the variations between different socio-demographic groups.

Therefore, this chapter analyses the main themes from the interviews that were undertaken and demonstrates the findings in the following order: a) perceptions of access by interviewees, b) the influence of socio-demographic variations on respondents' preference to use a particular green space, c) the pros and cons of living

adjacent to a green space, and d) people's demands for better provision of facilities in green spaces. Combining the main findings extracted from interviews illuminates people's cognitive (knowledge-related), affective (emotional) and conative (behavioural) perspectives (Walmsley and Lewis, 1984) towards green spaces and the extent to which they vary across different social groups.

5.2 Methodology

The approach used in this chapter was in-depth interviews. The in-depth interview is an open-ended discussion and conversation between two or more individuals to gain qualitative insights about people's attitudes to and experiences of certain aspects of an area under discussion. In this approach, a list of topics and questions to cover during interviews was prepared. Although there is no specification of how to formulate exact questions, the researcher needs to be highly skilled to obtain the most interesting and informative findings from interviewees and to minimise the extraneous material. Strauss and Corbin (1990) highlighted the important role of qualitative methods, including in-depth interviews, in generating data where it is necessary to acquire new perspectives or in-depth information on phenomena which are still not well known or are difficult to address quantitatively.

Nowadays there are an increasing number of studies which have used interview methods in their investigations concerning green spaces, either as a primary method or in conjunction with other qualitative and quantitative methods. For instance, Hitchings (2012) employed interview methods to identify the reasons why city professionals infrequently use parks and other green spaces around their offices. Seaman et al. (2010) used in-depth interviews in addition to photography and participatory methods to

discover the subjective reasons of urban residents for using, or not using their local public green spaces. Niemela et al. (2010) adopted the method to show the role of the ecosystem services approach in a better planning and conservation of urban green spaces. Lo and Jim (2010) interviewed 495 urban residents to identify their willingness to pay and their motives for the conservation of urban green spaces. Ward et al. (2010) used interview methods and surveys to show how people use and appreciate botanical gardens as examples of green spaces in the urban context. Bell (2005) used a combination of interviews and questionnaires in order to study the importance of green space to communities. In this research, in-depth interviews were also adopted as a complementary qualitative method, along with GIS-based network analysis, a questionnaire, and participatory mapping, to investigate geographical access, access perception, and access behaviour among respondents from different social groups.

5.2.1 Selection of interviewees

The fourteen interviewees who participated in the present study were selected from sixty local volunteers who had previously expressed their willingness to participate through filling in the questionnaire. Respondents were invited to participate by being contacted either by phone or by email. In response to the first contact, twenty-eight persons responded to the invitation. Following two or three reminders fourteen of the twenty-eight people agreed to attend a one-to-one interview during the summer of 2010.

Table 5-1 shows the demographic status of the fourteen interviewees. Despite the effort to create a sample group with the greatest possible differences between participants to obtain as wide a range of opinion as possible, there was less diversity between participants with regard to age and ethnicity than had initially been intended.

Table 5-1 Demographic data on the interviewees

No.	Age	Sex	Occupation
1	20-29	F	Employed
2	50-59	F	Employed
3	40-49	F	Employed
4	40-49	F	Unemployed
5	60-74	M	Employed
6	60-74	F	Retired
7	40-49	F	Employed
8	30-39	M	Student
9	30-39	F	Unemployed
10	60-74	M	Retired
11	30-39	F	Unemployed
12	60-74	F	Retired
13	30-39	F	Employed
14	30-39	M	Student

Before the interviews were held, respondents were fully informed about the aim and objectives of the research, the voluntary nature of their participation, and their right to anonymity. Respondents expressed their consent to the recording of the interviews and the use of the transcriptions as the primary source of data in this research and other related publications according to the university's code of ethics.

5.2.2 Context of the interviews and analysis

In order to elucidate people's perceptions and perspectives towards access behaviour the interview questions were based on the findings of the analysis of information from other sources on the following themes:

- concept of green space
- socio-demographic factors and experience of green space
- spatial and non-spatial factors and access perception
- pros and cons of provision of and access to green space
- desired green space developments

Although each one of the fourteen interviewees was asked about these themes, the sequence in which the questions were asked varied from interview to interview (see the entire list of questions in Appendix 4). Respondents were first asked, what comes to mind when they hear the term “green space”. Afterwards, they were provided with a unique definition of green space used in this study as: “spaces that are accessible to the public for everyday use”, including parks and public gardens, riversides and canals, surviving urban commons, spinnies, important sites for nature conservation and washlands.

They were subsequently questioned about their motives for using a green space, and their answered were analysed against socio-demographic factors such as age, employment status, car ownership, and having children. Access geography and access and behaviour were investigated through studying the perspectives of participants on the influence of spatial and non-spatial factors, including distance to a green space, size of a green space, safety, weather and natural phenomena. Participants were also provided with the opportunity to describe their experiences of the advantages and disadvantages of access to green space and their desires in relation to the improvements in green spaces.

In order to analyse the interviews, the labelling approach by Bauer (2005) was used. First, the fourteen interviews were transcribed line by line to identify any comments conveying participants’ attitudes and perspectives towards green space access. Second, these parts of the transcriptions were given a label to highlight the context. Different labels were compared and related ones were placed in similar categories to address the themes. Highlighted themes were discussed to identify the implications of the results.

5.3 Results

The results section reflects the way interviewees from different socio-demographic backgrounds perceived green space access according to the physical characteristics of the place, available facilities, activities they could get involved in, and the benefits of access to green spaces. Each of these aspects will be discussed under the following sections:

5.3.1 What is perceived as green space by interviewees?

The first question to interviewees asked them to describe green spaces using the first words that came to mind. A review of the descriptions revealed that participants answered this question broadly in two ways. The first focused on the landscape of the place. Examples of these answers are: “places with trees, flowers and open grassland” (an employed woman in her fifties); “a nice quiet place with a bit of nature which does not have to have arranged flower beds, just as long as it is green, it has got trees and plants and it is well kept” (an employed woman in her forties); and “parks and gardens and green hedges” (an employed mother in her forties).

The second perspective, described green space not only as a landscape, but also as having the potential to provide people with enjoyment and different activities. Examples of these answers described green space as: “somewhere that is obviously green and easily accessible to all, somewhere that the general population can go and enjoy themselves and have fun and take some exercise and just generally enjoy the outdoors” (an unemployed mother in her forties); “somewhere, I can escape a bit, a pleasant open space where I can get fresh air, enjoy nature and walk my dogs. Nice places to sort of rest and recuperate” (an unemployed woman in her thirties) and “an area which is

designed for entertainment and relaxing, but also has natural scenery, natural patches in the landscape" (a student man in his thirties).

The interesting finding was that whilst employed interviewees tended to describe green spaces as landscape; unemployed interviewees and students defined the area both as landscape and according to the activities in which they could get involved. Such differences in perception would spring from the different needs and demands they had from green spaces. In fact, because they experience a busy life, employed people were more interested in green spaces as landscape, whilst unemployed interviewees and students were interested in green spaces both as places to enjoy engaging in activities and as landscape.

5.3.2 The influence of socio-demographic status on choosing a green space to visit

In order to discover public perceptions towards green space access and the way people value green spaces, interviewees were asked to share their motives for visiting a specific green space more often than other potential places. A review of the responses showed that the demographic status of interviewees, such as having children, owning a car and age, and employment status had great influence on their preference to visit a particular green space more regularly than any of the alternatives. With reference to demographic factors such as income and ethnicity, the variation within the sample was not sufficient to determine any clear association.

5.3.2.1 Families with children

Having children was identified as a factor that would influence interviewees' preferences concerning visiting green spaces. For example, families with children

reported that they considered local accessibility and provision of and access to safe and good-quality playgrounds as the key specifications for the green spaces they visit most often.

An employed mother in her forties explained that, in comparison to the two local parks in her neighbourhood, she tended to visit Franklin Park (a small local park) more often than Braunstone Park owing to its closer location and the provision of and access to a pleasant playground. “We tend to go to Franklin Park which is just round the corner because it is a little bit closer, it has got some nice children’s play areas and a community orchard”.

To an employed mother in her thirties, although local accessibility was important, the choice of place and duration of visit were highly affected by the sort of activities they intended to participate in:

> Actually in my street there is a tiny little grass area that children can run on and there are two parks (Knighton Park and Brocks Hill Park) in a five minutes’ driving distance with swings and slides and football pitches and people walking dogs. We probably go once a week to Knighton Park and Brocks Hill and we spend a lot longer time there because Brocks Hill has got a café and we do go and have a drink and Knighton Park has usually got an ice cream van so we spend a lot longer there. We go to Bradgate Park for a walk probably once a month because it is half an hour’s drive so we do not want to do that too often.

To conclude, the interview analysis showed that, although distance did not stop people from travelling to other green spaces, they would not visit green spaces far away as

regularly as they visited facilities which were close. The interview analysis also revealed that for families with children, the choice of green space varied according to the type of activities in which they wanted to participate.

5.3.2.2 Owning a car

Car ownership was considered an important and influential factor by the public when they made a decision about the green space they visited the most. The statistical results obtained from questionnaires, however, did not show any significant association between the factor of car ownership and variables such as frequency and duration of the visits and the reasons behind visiting a green space. On the other hand, analysis of the interviews revealed that interviewees who owned a car had different priorities in choosing a green space from those who did not. For example, for interviewees who owned a car, their priority in visiting a green space was not determined by spatial distance. For instance, to a retired woman in her sixties who owned a car, the green space she most preferred to visit was specified by factors such as the safety of the place, natural beauty and the sort of activities in which she was interested.

> The University Botanic Garden is a nice place to go but because you cannot take the dog in we do not tend to go there so much. We might go to Knighton Park if we want to play badminton, since it is closer to the car park and because on Sundays there are a lot of people around so you feel safe. Victoria Park is not our choice despite its close distance because there is not a lot there whilst we do not feel very safe since it is enclosed by shrubberies. We

> generally go to Evington Park to walk the dog, as it is a safe lovely park with a lot of beautiful scenery to look at.

To another retired woman in her sixties who also owned a car, choosing the most preferred green space depended on her work commitments and what was going on with the rest of her life.

> I go to Western Park every couple of months because I am part of the Letchworth Area Watch group. But if I have got two or three hours to spend I do prefer to go to Bradgate Park which only takes us ten to fifteen minutes by car and you can see the difference between a town park and a rural one. We have got the Fosse Park which is about the same distance to Western Park, but I do not go there unless because my doctor is on the other side of town and if I am walking I will probably walk through the Fosse Park.

To those people who do not own a car, the priority in choosing the green space they visit most often was given to a somewhere that was local and easily accessible, and after that to other specifications such as the size, appearance, safety and design of green space. For example, an employed woman in her fifties described the green space she visited most often on the basis of its walking distance, size, appearance and design which make the place outstanding compared to the other alternative green spaces.

> The place is the nearest of all the parks, only about ten minutes' walk and quite large. It has been beautifully planned so there are lots of trees and the design of it is pleasant. The other parks around are too small and there is nothing attractive about those at all. And

> Braunstone Park is just a huge open space where somehow I feel quite vulnerable.

Comparison of the arguments of the two groups of interviewees, those who owned a car and those who did not, showed that having a car has a great influence on people's preference concerning the green space they visited most often. In fact, to car owners, distance was not the first option to consider. They preferred to travel to green spaces where they could use a safe and pleasant place and get involved in activities in which they were interested. Conversely, those without a car considered local accessibility as the first priority in choosing which green space to visit most often.

5.3.2.3 Age and employment status

Among interviewees from different age groups and occupational backgrounds, employed people and students in their twenties and thirties were the only groups that emphasised availability of sports facilities, free access to green space and available time as the main factors that would influence their decision about visiting a green space. Questionnaire results also identified the influential role of age and employment status in relation to frequency and durations of visits and the activities in which people took part.

An employed woman in her twenties mentioned the sports facilities and the quietness of Evington Park as her personal reasons to drive there rather than use green spaces within walking distance such as Victoria Park (about ten minutes' walk) or Knighton Park (about twenty minutes' walk). She explained her intention of driving to Evington Park as follows:

> It is quieter since there are not so many people there and they have got six tennis courts. So, if we want to play tennis it's guaranteed

> that we are going to get to play tennis, and they have just put in some new outdoor gym equipment. Whilst in Knighton Park they have got a lot of area for football playing and kids to play but only two tennis courts. And they have not put any outdoor gym equipment there. In the case of Victoria Park, I think it is a bit boring and grotty because it is just a huge space of grass and there is not much there really and you feel quite exposed because the roads go round it.

A student man in his thirties explained that green space in the form of parks are not his first choice to visit. In other words, he preferred to visit the countryside to enjoy more natural scenery. However, he revealed that to take a break during working hours, he used Victoria Park as the closest green space and the one he visited most often. But after working hours and over the weekend the local green space and countryside close to his house were the places he visited most often.

> We do not normally visit parks because we like walking and enjoying natural sceneries. So it is just best driving to the countryside and walking across the land. But Victoria Park is the main green area around my work place. So I use this park for a walk during my working days.

From the view point of another student man in his thirties, the main specification for a green space is that it “should be at a walking distance in a minimum time without spending money for bus fares or motor cars”. He noted that:

> Although both Victoria Park and Spinney Hill Park are in walking distance to me, I prefer Victoria Park because of its big size, appearance and attractiveness. Spinney Hill is the other close green space to me within seven minutes' walk but I do prefer Victoria Park where there are so many football areas, so many matches, and so many people who come into parks to enjoy their time. A further reason to prefer Victoria Park is because of is its adjacency to the University which it is an educational institute so I feel that no risk is there compared to other green spaces.

In conclusion, the interview analysis showed that the choice of place was different even among people who shared similar interests. For instance, Victoria Park was within walking distance of three interviewees who intended to use green spaces for sporting reasons. However, the employed woman in her twenties preferred to drive to another park since she found Victoria Park just a huge area of grass with nothing interesting whilst both students men interviewees in their thirties regarded Victoria Park as a big pleasant green space to play and watch games and walk in during break times because it is close to the University. Therefore, the key implication is that people do prefer to visit green spaces that meet their preferences rather than just using the most easily accessible ones.

5.3.3 The influence of green space specifications on the pattern of usage

Analysis of the interviews showed that among different interviewees there was an association between pattern of usage and factors including spatial distance to a green space, size, and safety of place, and weather. This section discusses these factors in more detail by quoting some of the interviewees' responses.

5.3.3.1 Spatial distance

As part of the research, participants were first asked through the questionnaire about the importance of physical distance to a green space. Results showed that, although 61% of participants identified that walking distance to a green space is important to them, statistical analysis did not specify any significant association between the proximity to a green space and the variables of frequency and duration of visits (see Chapter 3). Hence, participatory mapping was used as a complementary approach to determine to what extent accessibility was conceptualised by participants as physical distance. This time, the statistical analysis showed that for 61.0% of the participants, who were mainly retired and employed people, local accessibility was important, compared to 39.0% who regarded the provision of and access to facilities as more important than spatial distance (see Chapter 4). In-depth interviews were therefore used as the final approach to study perceptions of access from the perspectives of spatial distance and provision of and access to facilities.

The results of the interview analysis revealed that walking distance to a green space was a dependent variable which was influenced not only by demographic variables including economic status, car ownership and having children, but also by the personal reasons such as the purpose of visits, the provision of facilities, the price of petrol and the difficulties of driving for elderly people. For example, an employed woman in her twenties noted that, since she owned a car, she conceptualised green space access according to the facilities available in an area rather than spatial distance:

> I never feel like I have to think about accessibility because we have got a car and it is easy to get to the place we like because I think facilities are much more important than distance to me. But I would

> not want to travel too far, probably not more than about twenty minutes.

A retired woman in her sixties and an employed mother in her forties both emphasised the importance of local accessibility and the influence it would have on the frequency of their visits.

> Local accessibility is important especially with the increase price of petrol and as I get older. If we did not have the car it would be quite difficult to get to our favourite place, because we would have to probably get two buses to get there. Somewhere between five and ten minutes' walk away would be nice and I think I would use it once or twice a week (Retired woman in her sixties).

An employed mother in her forties noted that:

> I would like to have a green space fairly close because I do not necessarily like having to get into a car and drive to a green space. It is probably more important to have lots of little green spaces that are more accessible than having somewhere that you have to get into a car to get there. For me a place within ten and fifteen minutes' walk is ideal and if the weather is nice I would go a few times a week.

The above examples all addressed the fact that from the perspective of different interviewees a walking distance of between five and fifteen minutes satisfied people's perception of local accessibility to a green space. Such a distance made them happy to visit green space between two or three times per week. From the perspective of those interviewees who preferred travelling to other green spaces rather than using local

facilities, a driving time of fifteen to twenty minutes was acceptable. They argued that although travelling to other places would reduce the frequency of their visits, they would stay for a longer time. For example, an unemployed woman in her thirties who preferred local accessibility for the purpose of dog walking, explained that the frequency and duration of visits depended on spatial distance to a green space:

> I do prefer a doorstep place because it saves having to get into the car and drive. But it is also nice to have a change to the routine and to travel out to a place probably within fifteen and twenty minutes maybe for every sort of two or three weeks or once a month. Depending on the weather and the sort of activities I will probably stay for an hour to two hours. Whilst regarding the local one, I maybe use it three or four times a week and of course stay less.

The key point concerning distance is that accessibility in the sense of spatial distance to a green space was important to some interviewees, including families with children and dog owners, who had a specific reason for their regular visits. On the other hand, those who did not have such reasons for their visits but were interested in enjoying green spaces perceived accessibility in the sense of provision of and access to facilities. In this context, owning a car was a facilitating factor that let such people travel easily to their preferred green spaces.

5.3.3.2 Size

Following the discussion of distance, accessibility was described according to the size of a green space by about 51.0% of respondents who completed the questionnaire. However, statistical analysis did not prove any significant association between the size

of a green space and a participant's most preferred green space (see Chapter 3). In-depth interviews, therefore, were used to discover interviewees' perceptions on the size of green spaces. Analysis of interviews pointed out that interviewees had two very different perspectives concerning the size of a green space and the reasons to use a green space.

The first perspective described the factor of size as important as the participant would not visit a green space if the area was "not large enough to have a lot of different facilities in and you do not feel you are just sitting next to a complete stranger there" (an employed woman in her twenties). An employed mother in her thirties related the importance of green space size to the activities they would engage in and the duration of time they would stay. "If you are going for children and the area is small they will only play on it, whilst if it is a larger place with different areas obviously you will go over to visit it and obviously stay longer and it gives you more to do." The size of a green space was described by an employed woman in her fifties as important as she believed: "There is nothing attractive about a small green space and you even do not even feel that you can burn off any energy there."

The second perspective was the opposite of the first, since this time interviewees believed that "it is not the size of a green space which is important, it is what is there that is important" (a retired woman in her sixties). An employed woman in her forties argued that "as far as it is a green space to go to the size does not matter to me." An employed mother in her forties stated:

> I do not think that is as important as having lots of little pockets of green space that people can go to. I like the big parks, because they are more mature and have got big trees, but for me it is just sort of

> getting somewhere that is a park, which is nice, no matter what size it is.

In conclusion, interviewees perceived accessibility in relation to the size of a green space in two different ways. To the first group, a green space was accessible on the basis of its big size and its ability to offer people different attractive facilities. In contrast, the second group conveyed that accessibility is not about the size of a green space it is about what the areas offer to people and how approachable they are to people.

5.3.3.3 Safety

According to the questionnaire results, feeling safe in a green space was rated by 81.1% of the participants as an important influence on their opinion as to which green space they most visited. However, the statistical analysis did not show any significant association between feeling safe in a green space and the frequency and duration of the participants' visits. Therefore, during each interview, interviewees were asked to explain to what extent feeling safe in a green space would affect their perceptions towards green space access.

Analysing interviews showed that feeling safe in a green space was an important factor to almost every one of the interviewees from different socio-demographic backgrounds. In their statement interviewees mentioned the potential risk of experiencing anti-social behaviour, inappropriate lighting and poor weather condition as the influential factors in association to feeling safe in a green space. In terms of feeling unsafe in and around green space due to the potential risk of experiencing anti-social behaviour an unemployed mother in her forties stated: "I do not feel safe when the motorbikes are around parks as they worry the dogs and the children. The fact is that they are not in

control and they are abusive and unpleasant generally." The association between inadequate lighting and feeling unsafe in a green space was explained by a student man in his thirties: "I do prefer going to green space during daytime before it gets dark due to safety concerns. In my judgement lighting in green space is a must for safety reasons and I think if lights are available it will enhance the safety."

Poor weather was the last factor mentioned by the interviewees in relation to safety in green spaces. Interviewees stated, with reference to very cold days and stormy days as well as snowy days that going to a green space can face them with difficulties in terms of mobility and health conditions. A retired woman in her sixties explained that when the weather is poor less number of people tend to visit a green space and in order to feel safe in the place you need a to have certain number of people: "The issue with not very good weather is that probably there would be fewer people about so you do not feel quite safe. And I think you need to have a certain number of people around because safety is important".

Another employed mother in her forties, however, had a different perspective about feeling safe in a green space. She believed that:

> "If you do not feel safe in the place it would not make any difference whether it is dark or light. So the idea of bringing back former park-keepers will be a solution to make people feel safer in a green space. You would have a presence, a little bit of authority, without you necessarily needing to see the police going round."

In conclusion, the results highlighted an interesting finding: that although feeling safe in green space was important to almost all interviewees, they perceived safety in different ways and attributed a lack of safety to different factors, including, the potential risk of

anti-social behaviour, inappropriate lighting, poor weather and the absence of a sense authority in the form of park-keepers.

5.3.3.4 Seasonality and Weather

Despite the findings of questionnaire analysis that showed no significant association of seasonality and the frequency of the visits, the interview analysis showed that people described poor weather conditions as a factor that would influence their perceptions of green space access in relation to the frequency and duration of their visits. For example, a retired woman in her sixties linked the influence of poor weather conditions to the frequency of her visits by saying: “When it is rainy and cold I would go less. But I use it more during spring and summer when it is sunny.”

Families with children, however, had a different reflection, since they needed to visit green spaces even during poor weather. Therefore they found it more convenient to change the duration of their visits rather than the frequency. An employed mother in her forties explained that they still needed to visit green space in cold and rainy weather but they would stay for a shorter time when the weather was not very good and longer if it improved: “The weather definitely affects us but more about duration of stay than frequency. Apart from the weather, you just need to go to a green space to safely ride your bikes or walk the dog or just to come and have a play.”

On the other hand, the poor weather had no influence on the regular green space users with specific purposes such as improving health, walking the dog or to enjoying the beauty of the surroundings. An employed woman in her forties, who visited her local park for the purpose of improving her health, believed that not using a park during poor weather is a waste of the beautiful nature. “I go to the park in both winter and summer: I

have even been in a snow storm. I think why would I live in such close distance if I do not use the park? It would be a bit wasteful of beautiful nature." An unemployed woman in her thirties who used green space for the purpose of walking the dogs explained: "Weather would not really make much difference because we have to walk the dogs, but we are less likely to go out to country parks if it is raining and wet."

The results of this section explain the influence of the weather and seasonality on people's behavioural patterns of usage. Apart from regular users who was not influenced by seasonality and the weather, elderly people and families with children had different reflection. Elderly people used green spaces less frequent during cold and rainy days because of their mobility problems or health concerns, but family with children preferred to alter duration of their visit for shorter time during cold seasons instead changing the frequency of visits. The difference between behavioural patterns of usage is because families believed that children need and love to play in open spaces.

5.3.4 The advantages of provision of and access to green spaces

According to the interviewees, the benefits of provision of and access to green spaces are a combination of different physical, psychological, social, visual, educational and environmental aspects. Reviewing the benefits noted by participants also showed how well they understood the value of urban green spaces and the direct benefits which they have for their style and quality of life. For example, from the viewpoint of an employed man in his sixties, green spaces were important for their aesthetic, social and educational benefits:

> Leisure is seen as a very important benefit of green space to people and of course it is healthy. When you go to green space you feel

> more relaxed and more at ease with yourself. I also think the areas are socially very beneficial and even offer valuable educational benefits.

A retired woman in her sixties also highlighted the advantages of access to green spaces which are more in relation to the social benefits and community involvement:

> One of the benefits of green space is about building up community and getting people involved and helping out with things such as planting and keeping up the community work and being prepared to work with volunteers. I also think having social events and an outdoor gym in our local park have been amazing in doing that and encouraging more young people to use the Park.

To an unemployed mother in her forties, the educational benefits of green space were very important. “I believe green space has the potential of providing people with educational benefits because there is an enormous space there and there are so many things that people would learn about.” A student man in his thirties, however, had a different and more critical perspective about the social and educational benefits of green space in the UK. According to him:

> Green spaces are basically beneficial for mental and physical welfare, because they give you a chance to walk especially if you do not want to do proper sports every day or have no time for that. But I do not think there is any link between green space and social issues because we have started walking for about two years in our local countryside, but we have not yet had like a proper conversation with other users. From the educational aspect,

> however, yes, I think, they have an obvious potential. But, unfortunately, the areas do not offer a wide range of such activities.

According to this interviewee, who came from one of the biggest cities in the world where it is a treat to have such green spaces on the doorstep, green spaces in the UK have been somehow wasted since they have not been used to their full potential with regard to their social or educational benefits.

5.3.5 The disadvantages of provision of and access to green spaces

Despite the advantages of local access to green spaces, there are disadvantages for people who live in proximity to these places. The main disadvantages mentioned by people in the neighbourhood of green spaces included noise disturbance from motorbikes, messing around green spaces, claims of strangers entering private gardens and general disturbance. According to an employed woman in her forties:

> If you live close to the roads around parks you normally have problems with the noise in parks and people climbing into your garden from the park. You are disturbed by it if there is a big event going on in the parks. Also you can hear, unfortunately, the motorbikes sometimes, not very often now because the Police are a bit more on top of it.

Another example of the disadvantages of living in proximity to a green space was addressed by an unemployed woman in her thirties, concerning the potential risk of having anti-social behaviour in the neighbourhood. “Having a green space on the doorstep sometimes has problems with sort of people messing around at night like anti-social behaviour.” In conclusion, living close to a green space is not always about

taking advantage of the area. In fact, living in proximity to green spaces caused some problems in neighbourhoods, which varied from noise disturbance to the potential risk of anti-social behaviour.

5.3.6 What types of improvements do people demand in green spaces?

Interviewees reported that they were generally demanding improvements in the provision of and access to facilities such as public toilets, cafés, well-equipped playgrounds, sports facilities, bins, benches, and even the enhancement of maintenance works regarding the appearance of green spaces and flower beds.

In addition to the interviewees who talked about the importance of the appearance of green spaces and the availability of welfare facilities participants were also asked through the questionnaire about the appearance of green space and the availability of facilities. In fact, 89.7% of 452 participants believed that the appearance of a green space is important to them. Provision of access to facilities such as public toilets and a cafe in a green space was also important to 55.6% and 25.8% of the participants, respectively. From the viewpoint of some of the interviewees, except for certain types of facilities, the public's demands for facilities in green spaces would change as their personal situations changed. An employed woman in her fifties exemplified how her demands for facilities have changed over time:

> At the moment for me personally the importance of access to sports facilities and playgrounds is fair. But put me back a few years and I would have thought that was very important. Now I like to be out where it is fresh and you can feel the air and hear the sounds of the birds.

The necessity of provision of access to well-maintained toilets was an example of certain facilities that the public highlighted as a necessity in green spaces. An employed mother in her forties explained:

> Access to toilets as long as they are maintained and looked after is a must especially if you have got smaller children. To stop or minimise the anti-social behaviour you can either ask for an entrance fee or use the new public toilet designs. I also look for adequate play areas and seating areas. I think these are the main important factors to encourage people to come into green spaces.

With reference to the interviews, there are some basic facilities that must be provided in a green space to encourage people to use the areas. The importance of access to public toilets was an example of these types of facilities which was also underlined by over 50 % of all participants through the questionnaire. However, access to shops and cafes in green spaces was a challenging issue among different interviewees. For example, whilst an employed man in his sixties believed: “It would be rather nice to see a cafe at our local park to provide a new focus for people to meet” an employed woman in her forties stated: ”I personally do not agree with the idea of shops and cafes in parks because I am concerned about rubbish, but it is OK if people bring their own food and have some sort of picnic.”

Therefore, it can be concluded that people who use neighbourhood parks would like to have access to a cafe at their local park for the purpose of spending more time in their community whilst some others did not because they were concerned about litter and messing around.

5.4 Conclusions:

With reference to the aim of this chapter, a mixed-methods approach, including in-depth interviews along with a questionnaire, GIS and participatory mapping was applied to discover the perceptions of different social groups in terms of access to green spaces and the way green space users use and value the areas, and to identify influential factors related to access and access perceptions and behaviour towards green spaces. The method provided the opportunity of holding useful one-to-one discussions with people regarding the three challenging issues of green space definition, green space access and factors that would influence public perceptions towards access.

The interview analysis showed that there was an association between the employment status of interviewees and their definition of green space. For instance, from the standpoint of employed interviewees, green spaces were defined on the basis of landscape, quietness, and flora whilst from the perspectives of other groups including unemployed people and students, green spaces were areas where they could enjoy both the landscape and activities they wanted to interested to engage in.

Building upon the findings of the interview analysis, Figure 5-1 shows the three influential factors that interviewees highlighted as important in relation to their perceptions of access. The linkage between three influential factors – motives for visiting green spaces, socio-demographic status of visitors, and specifications of location – can be regarded as a triangle to reflect people's perceptions of access. A change in any of the three angles influences the concept of access, mainly through the frequency or duration of visits.

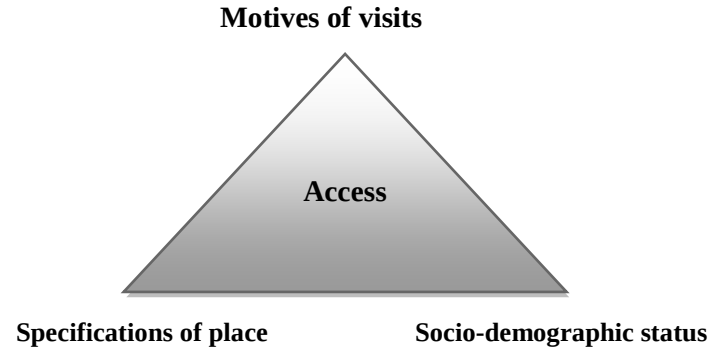


Figure 5-1 Three influential factors related to perceptions of access

Motives for visiting a green space encompassed different purposes that interviewees mentioned to explain their visits, which varied from involvement in relaxing, physical and social activities to using a green space as a shortcut to get somewhere else. Owning a car, having children, age and employment status were included in the category of socio-demographic status category and spatial distance, size of area, lighting, fear of crime and seasonal changes were including among specifications of locations. A summary of the way they would affect people's perceptions towards access is presented below:

- **Reasons for visit**

According to interviewees, choosing a green space destination was associated with the purpose of their visit.

- **Socio-demographic background**

The socio-demographic background of interviewees, including having children, owning a car, age and employment status, had a great influence on their perceptions of green space access. From the perspective of families with children, accessibility was defined by provision of and access to safe local facilities with playgrounds of adequate quality.

They also noted that, although distance would not stop them from travelling to other green spaces they would not visit distant green spaces as regularly as local facilities.

Green space access was perceived differently by car owners and users who did not own cars. Conversely to users without cars, to those who owned a car accessibility was not only about spatial distance to a green space. To these people, accessibility was about being in a place that meets their demands in relation to the reasons for their visit. Therefore, they would rather travel to green spaces that were safe and pleasant to get involved in activities in which they were interested.

The age and employment status of interviewees influenced their perceptions towards access to green space. According to the interview analysis, employed people and students in their twenties and thirties were the only groups that perceived access to green spaces in terms of getting to a place in a minimum time without spending money on bus fares or cars and as somewhere that offered them sports facilities.

- **Specifications of place**

Interviewees referred to the spatial distance to a green space, the size and safety of the place as the specifications of place that would influence perceptions of green space access.

Accessibility in the sense of proximity to a green space was mainly important to interviewees, including families with children and dog owners, who had specific reasons for their visits. To this group, accessibility was defined as a walking distance of between five and fifteen minutes to a green space. To those interviewees who did not have a specific reason for their visits, accessibility was mainly defined in terms of provision of and access to facilities rather than spatial distance, and they would rather

travel between fifteen and twenty minutes to get to a green space that offered them the type of facilities they were looking for.

Interviewees perceived accessibility in relation to the size of a green space in two different ways. From the standpoint of some interviewees, a green space needed to be fairly large to be perceived as accessible since only big places could offer people different interesting facilities. On the other hand, other interviewees believed accessibility was not about the size of a green space, but about what the areas would offer to people and how easily areas could be approached by people.

Feeling safe in a green space was directly related to people's perceptions regarding accessibility. Interviewees from different socio-economic backgrounds believed their perception of access would be negatively influenced by the factors including inappropriate lighting, the potential risk of anti-social behaviour, and poor weather. An employed mother in her forties believed that for green space to be perceived as a safe place it is essential to bring back park-keepers to demonstrate a sense of authority in areas without necessarily needing to see the police going round the place.

In addition to the contribution of distance, size and safety of the place interviewees also highlighted the importance of improving the current facilities in green spaces as an additional factor that would influence their perceptions regarding green space access. Generally, interviewees were demanding improvements concerning the provision of and access to facilities such as public toilets, sports facilities, cafés, well-equipped playgrounds, bins, benches, and maintenance works to expand biodiversity in green spaces to increase the potential of the area to offer people with different types of benefits particularly in educational terms.

In support of the need to improve green space and available facilities a student man in his thirties who came from one of the biggest cities in the world, believed that green spaces in the UK have not been designed to be used to their full potential to offer different benefits to the public and somehow are being wasted. In general, improvements in facilities could not only provide people with easier access to green spaces to save the journeys of those who travelled to other green spaces to find facilities and scenery which met their expectations which they did not find in their local green spaces, but also increase people's willingness to visit the area more often and take short-term and/or long-terms advantage of green space access.

Poor weather conditions were also stated by elderly people and families with children as a factor that would influence their perception of access in relation to the frequency and duration of their visits. Whereas elderly people made less frequent visits during bad weather conditions, families with children were still interested in visiting green spaces so they arranged their visits to be less frequent but stayed longer in the area. Regular park users with a specific purpose for their visits such as to improve their health or to walk the dog were the only group of users who reported that poor weather conditions had no influence on their pattern of usage and perception towards green space access.

A review of the results showed that using in-depth interviews was a successful method of presenting a comprehensive reflection of people's attitudes towards the definition and accessibility of green spaces which were not fully covered by the application of statistical and spatial analyses. The method allowed people to discuss their perspectives on access to green space openly and in their own terms and produced large amounts of valuable and comparable qualitative data that could not be obtained without the public's participation. It therefore becomes more important that future research needs to

investigate mixed-methods approaches more deeply to take advantage of the use of qualitative GIS in exploring people's perceptions regarding accessibility of public services. In conclusion, it needs to be noted that a larger sample group with more variety of participants from different ethnic and income backgrounds could produce more comparable findings about people's perceptions of access.

Chapter 6: Discussion

6.1 Introduction

Building upon the aim of the present research – analysing the spatial and behavioural factors related to green space access, access behaviours and the geography of access – this thesis took qualitative GIS as a mixed-methods approach to consider access on spatial, social and behavioural dimensions across different social groups in the city of Leicester in the UK.

The mixed-methods approach included a questionnaire survey of green space users, spatial analysis of the information they provided, participatory mapping in which the questionnaire respondents mapped their routes to a green space, and in-depth interviews; these methods were employed to provide a rich vein of contextual information for a multi-dimensional analysis of accessibility. In addition, this research analysed the importance of proximity and augmented the standard distance-based measures of access with data on perceptions of green space accessibility (see Chapters 3, 4 and 5).

This chapter seeks to integrate all the findings obtained by employing a mixed-methods approach and to link them to the existing literature. In this process, the next section (6.2) discusses the key findings and implications to access, in terms of the geography of access and access behaviour, frequency and duration of visits, and activities performed in green spaces. Section 6.3 intensively analyses the application of the mixed-methods approach in this research and discusses the strengths and limitations of the research. The

contribution of the present research in the literature and potential directions for future work are the final subjects discussed in section 6.4 of this chapter.

6.2 Integration of results

In order to present a final conclusion in terms of accessibility to green spaces, this section integrates the main recurring themes and implications obtained from applying a mixed-methods approach.

6.2.1 Geography of access and access perceptions and behaviour

With reference to the spatial definition of accessibility as the distance between a demand and a supply point, GIS-based network analysis was used to measure accessibility to green spaces, in addition to a comparative approach to participatory mapping to analyse perceptions of access. In this process, the present study referred to the distance benchmark recommended by Natural England – the government's advisor on the natural environment – as the criterion for measuring distribution of access to green space within 300 m in the city of Leicester.

Natural England's benchmark recommends that to make the most of green spaces no one should live further than 300 m from the nearest green space (Wray et al., 2005). Findings on the distribution of access showed that access to green spaces within 300 m was available to only 15% of the total population in the city of Leicester, compared to 36% of households in Sheffield (Barbosa et al., 2007), 29% of people in Essex (Essex Wildlife Trust, 2009) and 66.9% of Danish respondents (Schipperijn et al., 2010).

The second criterion for measuring the distribution of access is the recommendation by the EEA that people should within fifteen minutes' walking distance from a green space to make the most of green spaces. With reference to the EEA's benchmark, the provision of access to green spaces within fifteen minutes (which is roughly equivalent to the time it takes to walk 900 m in a straight line) was available to 60% of Leicester's population, compared to almost all the residents of European cities including Brussels, Copenhagen, Gothenburg, Madrid, Milan and Paris (Stanners and Bourdeau, 1995).

Van Herzele and Wiedemann (2003), however, argued that access criteria and benchmarks should be determined according to the functionality of a green space rather than recommending a general benchmark for all types of green spaces. For example, they claimed that, to make the best advantage of a neighbourhood park, the area should be accessible within five minutes' walk, equal to a maximum distance of 400 m from a residential location. According to their recommendation, neighbourhood parks were only available to 21% of the population in Leicester.

The fact that only 15% of the total population of the city of Leicester live within 300 m of a green space indicates that distance to green spaces is a limiting factor for the majority of Leicester's residents. However, it needs to be considered that the significant difference between the provision of, and access to, green spaces in Leicester and in other cities could be because of various factors, including the following: the way green spaces were defined in the present research as publicly accessible areas, which therefore excluded golf courses, agricultural land, school playing fields and allotments from the analysis, since the areas were not accessible to the general public for everyday use; the way the study area was defined in the present research, since it was limited to the green spaces inside the boundary of the city of Leicester and did not include the areas outside;

employing a GIS-based network approach in measuring geography of access to green spaces, in contrast to those academic works that mostly used a straight line as the measuring method; and manually digitising access points to each green space polygon to maximise the accuracy of the analysis. Any one or a combination of all the reasons could explain the low percentage of provision of and access to green spaces within less than 300 m and fifteen minutes' walk in the city of Leicester.

In order to understand people's perceptions of access in relation to distance, GIS-based findings were incorporated into a questionnaire (see Chapter 3). Results showed that 56% of the respondents reported that they would ideally prefer to live within 300 m of a green space. The significant difference between the 15% of people who had access to a green space within 300 m in comparison with 56% who would have preferred such access could be considered as a potential indicator of people's dissatisfaction with the provision of access. Questionnaire analysis revealed dissatisfaction among 31% of the respondents who travelled by public transport to get to a green space and those who wanted to spend more than four hours in the area.

Using qualitative GIS as a mixed-methods approach in this research study provided the opportunity of having a further source of information to analyse what could be the potential motives of those people who considered distance as an important factor in terms of accessibility and who preferred to live in close proximity to a green space. Analysis of in-depth interviews highlighted that interviewees' motives for living in proximity to green spaces varied between different social groups. The increasing price of petrol, getting older and mobility problems were examples of reasons for green space users who perceived accessibility in terms of proximity to facilities. Families with children, dog owners and those who had a specific reason for using green spaces stated

that, although distance was not the only factor they considered in terms of accessibility and it would not stop them visiting green spaces, they preferred to have easy access to local facilities to increase the chance of using the area more often. Despite the fact that questionnaire analysis did not show any association between variable such as changing seasons and fear of crime in relation to people's access perceptions and behaviour, interview analysis showed that the access behaviour changed among interviewees under the influence of factors such as changing seasons, fear of crime, lighting of the area and the potential risk of experiencing crime and anti-social behaviours.

The fact that GIS analysis provided only a narrow definition of access related to distance was the reason to pursue the analysis of accessibility by incorporating participatory mapping into GIS and analysing maps in order to find out more about access perceptions, the perspectives of people on factors related to access, and the way potential factors would vary for different social groups. In this process, the complementary analysis of the questionnaire and in-depth interviews added value to the findings.

Comparison of actual destinations with the network ones revealed that 39% of the total number of 245 respondents who completed the participatory mapping did not visit their local green spaces as their preferred facilities but travelled to other green spaces. Results also showed that, on average, compared to the shortest network routes, people actually took longer routes to get to a green space. Such findings highlight the influential role of factors other than distance associated with access. In this analysis, the spatial dataset of actual routes was joined to the descriptive dataset of questionnaire responses through the respondents' postcodes. Interview analysis was also used to add further information that could not be discovered through GIS analysis, participatory

mapping and the questionnaire. Questionnaire analysis showed better provision of and access to facilities as the motive for the 39% of respondents who did not use their local facilities. Further analysis also reflected that the demand for better provision of and access to facilities was associated with the relaxing and social activities of green space users. For example, for those who intended to use a green space as a place for taking part in relaxing activities the provision, of and access to a suitable place to walk the dog was significantly important. For those who used a green space to get involved in social activities, the provision of and access to facilities including public toilets, cafe/food shop, and sports facilities was significantly important (see Chapter 4).

It is also needs to be considered that, although some people prefer to travel to other green spaces to use the better access provided to some types of facilities, in general, parks in the city of Leicester offer an adequate level of facilities. To support this statement, one can refer to the findings of the questionnaire analysis, participatory mapping and interview analysis, which show that people were happy with the quality of children's playgrounds in their local parks, since using a well-equipped playground was not reported by any respondents as a reason for travelling to other green spaces. Meanwhile, it is important to consider that there are further grounds for improving green space in the city of Leicester both from the point of view of conservation, and in order to improve provision of access to different types of facilities that would encourage people to get more involved in outdoor activities.

Analysis of in-depth interviews also supported the findings from social and spatial analysis and showed the demand for better provision of and access to facilities including public toilets, café/food shop, sports facilities, bins, benches and playgrounds as the reasons for those who travelled to other green spaces. Interviewees from different demographic status groups also highlighted the importance of provision of and access to

adequate facilities or amenities in green spaces in encouraging people to visit green spaces more often and to take the physical and psychological benefits of being there. With reference to the importance of provision of and access to facilities, Özgüner (2011) stated that people consider the improvement in cleaning and maintenance, better provision of car parks and benches, and trees and flower beds as the factors that encourage people to visit green spaces more often. Van Herzele and Wiedemann (2003) also showed people's perspectives regarding the importance of provision of and access to facilities such as better playgrounds, green fields, benches, toilets and picnic equipments in green spaces.

Questionnaire analysis showed that there was variation between different social groups in terms of travelling to other green spaces or using local facilities. Employed and retired people were among the groups who used local facilities, whilst students and unemployed people were considered as travelling users (*P-Value* = 0.004; $\alpha < 0.05$). These results could be realistically explained according to the circumstances of the two groups. A time limit could be considered as the main reason for employed people to use local facilities. Mobility problems as well as a greater sense of community attachment among retired people could also be possible reason for them to use local facilities. Conversely, time availability could be the possible reason why unemployed people travel to green spaces where the area meets their demands. The willingness to participate in a variety of activities and the benefits from the available facilities could explain the intention of students to travel to other green spaces. Owning a car was the other factor that caused variation between people with regard to travelling to green spaces or using the local facilities (*P-value* = 0.000; $\alpha < 0.05$).

Building upon the discussion of the findings, this present study came to the conclusion that accessibility has a broad definition that is not limited to the spatial distance between a demand and a supply point. Accessibility is also in associated with people's perceptions and attitudes. Therefore, to have a holistic understanding it is significantly important to apply a qualitative GIS as a mixed-methods approach to analyse accessibility in terms of both spatial distance and perception.

6.2.2 Frequency and duration of visits

Frequency and duration of visits were studied as two influential factors reflecting the way green spaces were used by the respondents. Burgess et al. (1988) stated that people mostly value those open spaces that positively contribute to the qualities of their neighbourhood.

Green spaces in the city of Leicester were visited at least once a month by more than 80% the respondents, which was consistent with the 80% reported by Özgüner (2011) and around 90% by Scottish Government Social Research (2009). However, only 8% of the respondents in the present research visited green spaces every day which was significantly in contrast to the 43.0% of the respondents reported by Schipperijn et al. (2010) and the 21.0% by Scottish Government Social Research (2009). The lower percentage of daily visits reported by the present research in comparison to other studies could be due to the individual circumstances of the random study group, or to deficiencies in the Leicester Green Space Strategy in terms of facilitating green space access within less than 300 m for the majority of the population, designing green spaces so that they receive public attention, and/or equipping green spaces with adequate facilities to motivate more people to pay a daily visit to green spaces.

Questionnaire analysis showed that there was a variation between social groups regarding the frequency of their visits. This variation was recognisable between respondents from different occupational and age groups. The most common green space users were retired people and those aged 60-74, who visited green spaces 'almost every day' then unemployed people, on a regular basis of 'once a week'. The variation between social groups in terms of preferences and behaviour regarding recreational areas such as parks has been investigated in the literature by a substantial body of research. For instance, the contribution of age and race in relation to people's preferences to visit parks was specified by Payne et al. (2002), who reported that people over 50 years old were less likely to visit a park than the younger groups. Yilmaz et al. (2007), reported university graduates aged 19-24 as the most willing park users in their study. The reason why retired people and those aged 60-74 visited green spaces more often could be either their personal motivations, such as dog walking, improving their health and enjoying the beauty of the surrounding area or the efficient work of social groups such as the 'Friends' of the local parks in organising different types of activities and events that could meet the expectations of this specific group of users.

Participatory maps were analysed in relation to frequency of visits to identify how distance would affect access behaviour among green space users. Results revealed that distance reduced the frequency of visits (*P-value* = 0.061; $0.05 < \alpha < 0.1$). Compared to travelling users who visited green spaces on a regular basis of 'once a week', local facility users visited green spaces 'most days'. Besides, visits on a regular basis of 'every day' were significantly more frequent among local facility users (13.4%) than travelling users (3.1%). The negative association between distance and frequency of visits was also highlighted in the works by Grahn and Stigsdotter (2003) and Hansen-møller and Oustrup (2004). The result of a study by Schipperijn et al. (2010) showed

that daily visits declined from 15.4% to 7.8% in a comparison between those who lived within 100 m of a green space and those who lived more than 100 m away.

With regard to duration of visits, the questionnaire analysis also identified a variation between different groups of green space users. In contrast to retired people, who spent 'one to two hours' in a green space, students spent 'less than thirty minutes'. However, there are few research studies on duration of visits related to the socio-demographic status of people that can be compared with the present findings.

In terms of studying access behaviour among green space users, the questionnaires and participatory maps were analysed in relation to the impact of distance on duration of visits. The results showed that distance directly influences duration of visits (*P-value* = 0.001; $\alpha < 0.05$). For example, unlike local facility users, travelling users stayed longer during their visits to green spaces. The findings are reasonably acceptable because people who travelled to other green spaces might have specific reasons for their visits that could make their visits longer.

Building upon the integrated findings of the questionnaire and participatory mapping that highlighted distance as an influential factor related to frequency and duration of visits, the interview analysis was completed to add value to the present findings by reflecting perception-related factors that interviewees described as influential on their access behaviour in terms of the frequency and duration of their visits. Analysis of interviews identified a combination of environmental factors (i.e. seasonality and poor weather) and lighting, as well as age, having children and specific motives for using green spaces, as the influential factors related to frequency and duration of visits. For example, people aged 60-74 and families with no children visited less frequently according to the season and in poor weather conditions. Families with children,

however, had a dissimilar reaction. They found it important to keep visiting green spaces even during poor weather; as a result they visited less frequently but for a longer duration.

Natural obstacles including the season and poor weather, however, had no influence on those who had specific reasons (e.g. walking the dog and health improvement) for their visits. Inadequate lighting, by increasing the potential fear of experiencing crime and anti-social behaviour, were the other factors that interviewees highlighted as influencing the frequency and duration of their visits. The fear of experiencing crime was reported by CABE (2003) as the reason why 30% of people, in particular elderly people and those from minority ethnic groups, had no intention to use parks. Wilbur et al. (2002) also reported similar findings related to the fear of experiencing crime as an environmental barrier to African-American women from using local neighbourhood parks. Harrison et al. (2007) also reported that people who felt safe in their neighbourhood were physically more active than those did not feel safe.

In conclusion, the present findings have once again highlighted the significant contribution of adopting a qualitative GIS as a mixed-methods approach in studying the frequency and duration of visits in relation to access behaviour.

6.2.4 Activities by social groups

The activities which people valued and performed in green spaces were investigated in the present study to reflect the access perceptions of different social groups. Van Herzele and Wiedemann (2003) specified the contributory impact of the quality and amount of green spaces on people's patterns of activities. The findings of a study by Chiesura (2004) stated that people were only interested in activities that fulfilled their

needs and expectations. Francis (2003), Wong and Domroes (2005), and Rishbeth (2004) highlighted the importance of learning about people's activities in green spaces in order to design and manage the areas in a way that meets the needs of different social and cultural groups.

Analysis of the questionnaire showed that, among a vast range of different social, physical and relaxing activities, green spaces in the present study were highly valued for the following purposes: 'to get fresh air' (70.0%), 'to take a walk' (68.2%), 'to keep fit' (48.2%), 'to enjoy flowers/trees' (48.2%), and 'to think/relax' (47.3%). Similar activities were also reported as highly valued activities by Chiesura (2004): 'to relax' (73.0%) and 'to listen and observe nature' (54.4%); by Schipperijn et al. (2010): 'to get fresh air' (87.2%), 'to reduce stress and relax' (58.3%), and 'to exercise and keep in shape' (54.7%); and by Scottish Government Social Research (2009): 'to walk' (42%) and 'to enjoy open space' (15%). The similarity between people's motivations in taking part in activities in the present research and the others research studies gives rise to the assumption that the way people perceived accessibility in terms of participating in activities was very similar among people from different geographical locations.

Questionnaire analysis was also used to show if there were variations between different social groups in relation to participation in activities. Variations were identified between different age, occupational, ethnic and income groups in relation to some specific activities. For instance, in terms of age, occupation and activities, students and those aged 18-29 years mainly valued green spaces for participating in social/sports activities; employed people and those aged 30-49 years specifically valued the area for family-oriented activities; and retired people and those aged 60-74 valued the area for participating in relaxing and health-oriented activities.

With regard to the influence of ethnicity, the results showed that Asian or Asian British respondents valued green space highly for family and sport-oriented activities and Black and Black British respondents for sport-oriented activities; while the White ethnic group was the only group who valued green space for the relaxing purpose of dog walking. Gobster (2002) found that whilst minority groups were more likely to participate in social activities such as picnicking and socialising, Whites were involved more in individual activities such as walking, bicycling, jogging and walking the dog.

In the present research, the large numbers of White people using green spaces for dog walking in comparison with other ethnic groups can be explained by considering the traditional and religious concerns of minority families about keeping a dog in their house. Özgüner (2011) and Rishbeth, (2001) also reported dog walking as a significantly less popular activity among minorities. The key finding of the interview analysis highlighted that motivation to participate in activities influenced the choice of green space's destination. For instance, according to a family with children, a school's garden was an easily accessible green space with a playground that could be used during school days, a local park was suitable for taking a walk, and a country park was the destination for children's and family outings.

6.3 Discussion of methods

Studying the definition of access showed that, in the green space literature, access has been broadly investigated by measuring straight-line distance or GIS-based network analysis as a spatial distance between the location of a facility (green space) and users (Lindsey et al., 2001), and/or by measuring the equity of distribution of facilities across

different social groups (Comber et al., 2008; Tsou et al., 2005; Zhu et al., 2006; Nicholls and Shafer, 2001; Van Herzele and Wiedemann, 2003).

Recently, a growing number of studies have used qualitative methods in the context of a GIS technique called qualitative GIS to conceptualise access on the basis of public attitudes and perspectives. Building upon these examples of new dimensions and methods in accessibility studies, this research developed a mixed-methods approach with the ambition of reflecting perceptions of access along the dimensions of spatial distance and social geography. In this process, the present research study adopted a combination of quantitative and qualitative methods, including GIS-based network analysis, participatory mapping, questionnaire and in-depth interviews to address the spatial and non-spatial factors that could influence the perception of access across different social groups.

Data collection was scheduled during the summer to benefit from the warm weather and the school holidays under the assumption that there would be more people around who might be willing to participate in this research. In total, the research dataset was created from 452 questionnaires plus 245 participatory maps and 14 in-depth interviews. At the next step, the 245 participatory maps were imported to GIS and joined by unique postcodes to their specific questionnaire respondents to complete the spatial analysis of people's perceptions regarding accessibility.

A significant finding of this research was that accessibility is not simply about spatial distance; it has a multi-dimensional definition that needs to be studied from the perspectives of both spatial and social geography. The research also identified the significant role of adopting qualitative GIS as a mixed-methods approach in creating a comprehensive dataset of both spatial data (GIS data structures) and non-spatial data

(qualitative background and context) in studying different sides of perceptions of access.

The novel way of using participatory mapping in this research as a comparative approach to GIS-based network analysis was important in empowering the participatory role of communities in reflecting their perceptions of access and place in answers to questions including who green space users were, how members of different socio-demographic groups perceived and valued green space access, and the extent to which they were satisfied with their access as measured by both distance and time in comparison to the UK distance-based benchmark.

On the other hand, there were difficulties in conducting mixed-methods research, including the high risk of facing problems concerning the process of data collection and the misinterpretation of data. For example, the limitation of using the questionnaire method related to the use of three different approaches in distributing the questionnaires. The highest percentage of participation was achieved by on-site participation, where people completed the questionnaire while they were in the green space. On-line and postal questionnaires did not achieve a high percentage of participation, and did not include participatory mapping. With regard to accuracy in responding to the questions, the study found a high percentage of missing responses to the questions about annual income and ethnicity. This limitation could influence the recorded demographic status of respondents.

Concerning the interview method, the limitation was about receiving a positive response from participants to attend the interviews session. A lack of enthusiasm to complete this part of the research influenced the variety in the study group, particularly with regard to income and ethnicity.

In completing the participatory mapping, difficulty was mainly experienced by elderly people who found it difficult and time-consuming to show their origin and destination on the base map to draw their routes. Furthermore, people who did the on-line survey had no chance to complete this stage of participation. This created a sub-group of 245 responses to participatory mapping in comparison to the total number of 452 questionnaire responses. The limitation in digitising participatory maps concerned the difference between the starting point that people marked on the base map and the actual place that their postcodes indicated. To overcome the problem, the starting point marked by people was used as an alternative to their postcode in running the network analysis. Consideration of the strong points and limitations addressed by this research could be useful in designing future studies which will use qualitative GIS as a mixed-methods approach in showing multi-dimensional perceptions of access.

In order to adopt the methods using photography method was also considered in relation to people's perception of green space. The method was used by Chen et al. (2009) to assess the aesthetic quality and multiple functions of urban green space from the user's perspective. However, in view of the fact that participation in the present study included filling in a questionnaire and completing a mapping exercise as well as taking part in in-depth interviews, asking for one more task to be completed could have negatively influenced the willingness to participate since respondents could find the tasks complicated and time-consuming. In addition, photography could not be used as an alternative to current methods, including participatory mapping since it could not provide the complementary findings obtained from using the mapping approach.

6.4 Research contribution and future work

The current research has demonstrated the contribution of qualitative GIS as a mixed-methods approach in studying the perception of access from the perspective of spatial distribution and social geography. This research adopted GIS-based network analysis in addition to participatory mapping, questionnaire and in-depth interviews to comprehensively investigate different dimensions of access from the perspectives of different social groups. In this process, network analysis quantified access in terms of spatial distance, participatory mapping created a visual dataset of the individual's actual destinations and approach routes to green spaces, questionnaires generated a descriptive dataset for a statistical study of the factors that would influence people's perceptions regarding access, and, finally, in-depth interviews reflected the attitudes of a group of respondents concerning specific dimensions of access which were not holistically explored by the other three methods. Results proved that:

- Mixed-methods approaches augment statistical analysis, both spatial and non-spatial, by considering accessibility along different dimensions.

- The mixed-methods approach showed that accessibility is not just related to simple proximity between two spatial locations, but is a broad concept that cannot be investigated using quantitative or qualitative methods alone.
- The mixed-methods approach identified that access and access perceptions are related to a number of different but significant factors, including spatial, environmental and socio-demographic factors and are reflected in respondents' preferences.

A number of conclusions can be drawn from the issues raised during the discussion of the present research study:

- The findings of this research could be used to inform spatial planning decisions. For example, the research highlighted the critical importance attributed to facilities by different social groups. Such information could be used to support or prioritise planning for new greens spaces or redevelopment of existing urban infrastructures.

- Future work could extend the analysis of people's access behaviour in terms of the routes they take, frequency of visits, and perceptions, for example in relation to safety, in order to determine the siting, form and character of green spaces.

- Research could extend the large integrated dataset generated through this research, and, for example, develop GIS-based MCA to determine the most suitable locations for creating new urban green spaces.

- Future work is also needed to investigate further people's access distance preferences so that they can benefit from improved green space access.

- This research could also be linked with other ongoing survey and data collection activities in order to support more integrated analysis of socio-economic factors and access behaviour and benefits: for example, the influence of income and ethnicity on perceptions of access and the extent to which such demographic factors influence preferences on the use of public green spaces.

Chapter 7: Conclusion

The present research attempted to examine qualitative GIS as a mixed-methods approach to support a multi-dimensional analysis of access to urban green spaces in terms of distance and travel time as well as the perceptions and behaviour of different social groups.

A review of the literature (see Chapter 2) showed that accessibility has been investigated on the basis of distance or travel time and equity of access to public facilities by using different approaches. In this process, GIS applications have been extensively used within the last two decades in accessibility analysis, because of the advanced computing power of GIS for processing, managing, and analysing spatial data and interpreting and mapping the analytical results (McLaffety, 2003; Zhou et al., 2003). However, despite the steady growth of the quantitative applications of GIS in the spatial analysis of accessibility, less research has been designed to date in the green space literature with the objective of analysing people's perception of access and the extent to which it influences access behaviour. The core objective of understanding people's perceptions of access to public facilities was reported by Van Herzele and Wiedemann (2003) as an important source of information in urban planning and management to improve the quality of life in urban contexts. The importance of analysing access in association with people's diversity was also highlighted by Payne et al. (2002) in terms of providing local authorities with the opportunity of adapting green space strategies in ways that can meet the needs of different social groups. Therefore, learning about the attitudes, perceptions and requirements of different social groups regarding access to urban green spaces is as important as the spatial analysis of access

in relation to environmental justice, individuals' wellbeing and the quality of life. In response to the current gap in the literature concerning the investigation of the spatial analysis of access to urban green spaces in relation to the social analysis of perceptions of access and access behaviour, the present study was designed to add new knowledge and findings to the literature by employing a mixed-methods approach, including GIS-based network analysis, questionnaire, participatory mapping and in-depth interview. In the present research, a mixed-methods approach was used in order to incorporate GIS into qualitative methods and generate large sets of spatial and non-spatial data to provide complementary explanations of spatial and social concepts of access to urban green spaces and the way they vary among people from different social groups. Elwood and Cope (2009) highlighted the importance of employing qualitative GIS as a mixed-methods approach in geographic research into questions that require investigation of the interaction between human and physical processes.

The present research, uses the mixed-methods approach in the spatial and social analysis of access to urban green spaces in the city of Leicester in order to answer the five research questions presented in Chapter 1. The questions which the findings of the present research need to answer are as follows:

1- **How accessible is urban green space in the city of Leicester and to what extent are people satisfieded with it?**

The answer is that, in terms of distance, access to urban green spaces within 300 m was only available to 15% of the total population of Leicester. In terms of travelling time, 31% of the respondents to the questionnaires were dissatisfied with their travelling time. Dissatisfaction was significant among the respondents aged 50-59, those who travel by

bus, and those who intended to spend more than four hours in green spaces (GIS-based network analysis and questionnaire analysis).

2- **What factors are important in relation to green space access and how do they vary for different social groups?**

In terms of access-related factors, questionnaire analysis did not show any significant relationship between the potential factors, including walking distance, size, appearance, safety, and different types of facilities and the frequency and duration of visits. However, analysis demonstrated there was some variation between different age and occupational groups with regard to the frequency and duration of visits. For example, respondents in the 60-74 age group and those who were 'retired' visited green spaces 'most days' more than other age and occupational groups, and 'unemployed' respondents visited green spaces 'once a week' more often than other occupational groups. With reference to the duration of the visits, whilst 'students' spent the least amount of time, 'less than 30 minutes', in green spaces, 'retired' respondents spent '1 to 2 hours' in those areas (questionnaire analysis).

3- **What are people's motives for using green space and to what extent do they vary for different social groups?**

Participating in different types of activities was the main reason for visiting green spaces. These activities were categorised into four groups: including physical activities, relaxing activities, social activities and others. The highest participation was reported for physical and relaxing activities followed by social activities and others (e.g. taking a shortcut to get somewhere else, doing photography, or reading). Questionnaire analysis

showed that there were variations between different age, occupational, ethnic and income groups with regard to their motives for visiting green space. Each specific activity was analysed with regard to different social groups and the results were thoroughly discussed in Chapter 3. A summary of findings is presented in Table 3-4 on page 65.

4- How does participatory mapping contribute to a better understanding of green space access?

Participatory mapping was used as a comparative approach to GIS-based network analysis to provide a holistic understanding of access perception and the way green space is used and experienced by people. The comparative findings showed that in comparison with the network routes (on average 799 m in lenght), in their lived experience respondents took longer routes (on average 1613 m) to get to a green space. In addition, according to the comparative results, 39% of the respondents did not visit the green spaces identified as closest by the network analysis as their preferred green spaces. The present research refers to this group comprising 39% of the respondents, as ‘travelling users’, in contrast to the 61% of ‘local facility users’ (GIS-based network analysis and participatory mapping analysis).

Accordingly, more analysis was undertaken to find out who are travelling and local users and what are their preferences in choosing the green space that they visit most often. Results revealed that students and unemployed people were the main travelling users who conceptualised accessibility in terms of provision of access to facilities related to relaxing and social activities rather than physical distance to a green space. Provision of access to public toilets, food shop/cafe, sports facilities, and social

activities were the main reasons for travelling to other green spaces (participatory mapping analysis and questionnaire analysis). Further analysis also indicated that perception of access influenced access behaviour among travelling users and local facility users in terms of the frequency and duration of visits, mode of travel, travelling time and access satisfaction (participatory mapping analysis and questionnaire analysis).

5- How do access perceptions relate to distance and the use of green space?

In order to discover people's perceptions of access to green space and access behaviour, the in-depth interviews provided a complementary understanding that was not thoroughly covered by the other parallel methods, including questionnaire and participatory mapping.

According to the interview analysis, distance was important to some interviewees, including families with children and dog owners, who had a specific reason for their regular visits. In addition, findings indicated that the occupational status of interviewees had an influence on their understanding of green space. For instance, from the standpoint of employed people who experienced a busy life, green space was described as landscape, whilst students and unemployed interviewees described green space firstly in relation to the activities in which they could get involved and secondly as landscape. Demographic factors such as having children, car ownership and age had a great influence on the interviewees' preference to visit a particular green space more regularly than any of the alternatives (see Chapter 5).

The questionnaire analysis only specified distance as an important access-related factor and did not specify any association between socio-demographic factors (e.g. age, car ownership, having children), environmental factors (e.g. weather, size of place, safety of

place), or personal reasons (e.g. the purpose of visits, the provision of facilities, the price of petrol and the difficulties of driving for elderly people) and people's perception of access to green space and access behaviour; however, the interview analysis highlighted the influential contribution of access-related factors mentioned above in terms of people's perception of access and the way it influenced their behaviour (see Chapters 3 and 5).

The complementary findings of the present research showed the core contribution of using qualitative GIS as a mixed-methods approach in providing a holistic understanding of access to urban green spaces on both spatial and social dimensions. To conclude, the key message from the present research is:

> Access is a broad and multi-dimensional concept that cannot be thoroughly investigated using only a GIS-based approach since this provides a narrow definition of access and defines it in terms of travel time and distance. This tells us nothing related to access perceptions and behaviours. Alternative the mixed-methods approach demonstrated here support a multi-dimensional concept of access and produces complementary information and knowledge relating to access geographies, factors influencing access and access perceptions and behaviours.

Appendices

Appendix 1: Information sheet

Dear participant:

This questionnaire has been designed in order to generate the primary source of data in a doctoral research project at the University of Leicester. The research aims to identify the way people use public green spaces in the City of Leicester. Public green spaces in this research are defined as any type of publicly accessible open spaces where people do not need to pay any admission fee to use the area (i.e. urban parks, riverside recreational areas, woodland, meadows, spinneys, etc.).

Participation in this research is voluntary and provides you with the opportunity of assessing the quality of your local green spaces anonymously and adding comments on how well you feel they are being maintained and what improvements you would like to see in these areas. There are no financial or direct personal benefits from taking part in this research; however, the results are likely to be of use to local authorities and community groups in taking further required actions according to your assessment.

The research will reserve your right of anonymous participation and treat your information completely confidentially. Your information will be used only for the purpose of this study and no third party is involved in this research. Your co-operation plays a key role in the successful completion of this study and will be highly appreciated.

For further information about this research please contact me or my supervisor (Dr. Lex Comber) using the following details:

Supervisor: Dr Lex Comber (Senior Lecturer in Geographic Information)
Telephone: 0116 252 3812
Email: ajc36@le.ac.uk
Address: Department of Geography, University of Leicester, Leicester, LE1 7RH
Web-address: www.le.ac.uk/gg/staff/academic_comber.html

Researcher: Fariba Sotoudehnia
Mobile: 0795 563 ****
Email address: fs69@le.ac.uk
Address: Department of Geography, University of Leicester, Leicester, LE1 7RH
Web-address: www2.le.ac.uk/departments/geography/people/fariba-sotoudehnia

Appendix 2: Questionnaire

Part A: Name or address of a green space

Please, first write your postcode then think about the public green space (i.e. park, riverside recreational area, woodland, meadow, etc.) you most often visit and write the name of the place.

Your postcode: _____

The name of the green space you normally visit:
_____

Part B: Visit details

(Please answer questions B1-B13 in relation to the green space you named above)

B1) How often do you visit the green space? (Please tick one only)

Never visit ☐ Once a year ☐ 2 or 3 times a year ☐ Once a month ☐ Once a fortnight ☐
Once a week ☐ Most days ☐ Every day ☐

B2) Please specify what time (i.e. am and/or pm) you normally visit the green space and why you prefer this time.

_____

B3) When you visit the green space, where do you usually travel from? (Please tick one box only)

Home ☐ Work ☐ Shops ☐ School ☐ College / University ☐
Other (please write in): _____

B4) How would you normally travel to the green space? (Please tick one box only)

On foot ☐ Bike ☐ Motorbike ☐ Car ☐ Bus ☐ Taxi ☐
Other (please write in):_____

B5) Approximately how long does your usual journey take? (Please tick one box only)

Less than 5 minutes ☐ 6 - 10 minutes ☐ 11 – 15 minutes ☐ 16 – 20 minutes ☐

21 - 30 minutes ☐ 31- 45 minutes ☐ 46-60 minutes ☐ More than 1 hour ☐

B6) Ideally, how long would you like your journey to take to your preferred green space?

..... minutes

B7) Do you normally visit the green space alone or in a group? (Please tick one box only)

Alone ☐ In a group ☐ Both (equally) ☐

B8) When you visit the green space as part of a group, who normally accompanies you? (Please tick as many as appropriate)

Partner ☐ Children ☐ Other family ☐ Friends ☐

Team/Club members ☐ School group ☐ Other (please write in): _____

B9) Including yourself, how many people would normally accompany you when you visit the green space as part of a group? (Enter typical numbers for each age group)

Children (aged 0–12)	Teenagers (aged 13–17)	Adults (aged 18–65)	Retired (aged 65+)
.....	.....	.....	.....

B10) How often do you visit the green space per season? (Please tick one box for autumn/winter and one for spring/summer)

	Autumn/Winter	**Spring/Summer**
Seldom or never during this season	☐	☐
Once every six months	☐	☐
Once every three months	☐	☐
Once a month	☐	☐
Once a fortnight	☐	☐
Once or twice a week	☐	☐
Most days	☐	☐
Every day	☐	☐

B11) How long does your visit normally take? (Please tick one box for weekdays and one for weekends)

Duration	**Weekday**	**Weekend**
Do not visit	☐	☐
Less than 30 minutes	☐	☐
30 minutes – 1 hour	☐	☐
1 – 2 hours	☐	☐
2 – 4 hours	☐	☐
More than 4 hours	☐	☐

B12) Ideally, how close do you want to live to a green space? (Please tick one box only)

100 metres ☐	400 metres ☐	700 metres ☐	1 kilometre ☐
200 metres ☐	500 metres ☐	800 metres ☐	2 kilometres ☐
300 metres ☐	600 metres ☐	900 metres ☐	More than 2 kilometres ☐

B13) From the following activities, which ones do you normally get involved in when you visit the green space? (Please tick as many as appropriate)

Get some fresh air	☐	Walk the dog	☐
Enjoy flowers/trees	☐	Meet friends	☐
Relax or think	☐	Enjoy family outing	☐
Enjoy the beauty of nature	☐	Eat/drink	☐
For peace and quiet	☐	Attend events	☐
See and feed birds/wildlife	☐	Picnic/BBQ	☐
For a walk	☐	Enjoy entertainment	☐
To keep fit	☐	Voluntary activities	☐
To improve health	☐	Guided walk/talk	☐
Use playground	☐	For educational walk	☐
Play sports/games	☐	Take a shortcut to get somewhere else	☐
Watch sports/games	☐	Other (please write in) _____	
Ride a bike	☐		

Part C: Green space details

Please specify how you evaluate the importance of the following environmental characteristics and provision of the following facilities in terms of accessibility to green spaces. (Please rate all the 15 parameters.)

	The importance of the environmental factors and provision of access to facilities	Important	Fairly important	Not important	Do not know
1	Appearance				
2	Size				
3	Distance				
4	Cleanliness				
5	Provision of access to sport facilities				
6	Provision of access to playground				
7	Provision of access to shops				
8	Provision of access to public toilet				
9	Provision of access to places to walk the dog				
10	Provision of access to car park				
11	Provision of access to bike park				
12	Provision of access by public transport				
13	Adequate lighting				
14	Feeling safe				
15	Organising social events in green spaces				

Part D: Respondents' details

D1) What is your age?

18-19☐ 20-29☐ 30-39☐ 40-49☐ 50-59☐ 60-74☐ 75 or over☐

D2) What is your gender? Female ☐ Male ☐

D3) What is your ethnic group?

White ☐ Mixed ☐ Asian/Asian British ☐ Black/Black British ☐ Other ethnic group ☐

D4) What is your current employment status?

Employed ☐ Unemployed ☐ Retired ☐ Student ☐ Other ☐

D5) Do you own a car? Yes ☐ No ☐

D6) What is your annual income? (optional)

Less than £5 k ☐	£5-7 k ☐	£7-15 k ☐	£15-25 k ☐
£25-35 k ☐	£35-50 k ☐	£50-75 k ☐	over £75k ☐

Part E: Feedback

E1) Please leave your feedback in relation to the main themes or subjects covered in this questionnaire and in particular any potential access-related factors that are important to you.

_____

_____

_____

E2) Please leave your contact details if you are interested in attending an in-depth interview session – which will take no more than 30 minutes – to share your viewpoints regarding green space and the way you experience the area.

Name: _____

Telephone No. (if you would be happy to be contacted by telephone):

_____

Email address (if you would be happy to be contacted by email):

_____

Appendices

Appendix 3: Interviewee's constant form

Project: Perceptions of green space accessibility and green space quality among different socio-economic groups

Section A: Participant's contact details and time and location of participation

Interviewee name: _____

Group/organisation/affiliation: _____

Interviewee contact via: _____

Date of interview: _____

Venue of interview: _____

Section B: Interviewee's agreement on the conditions of participation

I confirm that I have read the information sheet provided by Fariba Sotoudehnia regarding green space research. I have had the opportunity of asking questions related to the aim of the research and I have been answered satisfactorily. ☐

I understand that my participation is voluntary and I am free to withdraw consent at any time, without giving a reason, or to decline to answer any particular question I do not wish to answer. ☐

I understand that data collected will be used only by the researcher confidentially and anonymously for the academic purposes described and will not be transferred to any third party. ☐

I grant permission **unconditionally** to Fariba Sotoudehnia for my participation (map task, questionnaire and in-depth interview) to be quoted in her academic research and publication. ☐

OR

I grant permission to Fariba Sotoudehnia for my participation (map task, questionnaire and in-depth interview) to be quoted in her academic research and publication **IF** I check how I am quoted before publication and have the right to alter it. For this purpose please contact me via: ☐

_____

Signed: _____

Appendices

Appendix 4: Interview questions

1. What are your first words to describe a green space?
2. How many green spaces do you have in your neighbourhood?
3. Do you normally use your local green space?
4. What are your motives for visiting a green space?
5. How often do you visit your preferred green space?
6. Is local access to green spaces important to you?
7. How does proximity to a green space affect the frequency of your visit?
8. What factors do you consider important with regard to your preferred green space?
9. What do you think are the benefits of green spaces?
10. What could be the disadvantages of living in proximity to green spaces?
11. Are there any other comments you would like to add to this conversation?

Appendices

Appendix 5: List of conference presentations and publications

Sotoudehnia, F., & Comber, A. 2012. Sketch mapping: A comparative approach to GIS-based network analysis in measuring accessibility, *In*: Whyatt, D., & Rowlingson, B. (eds), *Proceedings of the GIS Research UK, 20th Annual Conference, Vol, 1- Presentations. The University of Lancaster,* pp. 331–336. ISBN: 978-1-86220-294-8.

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