UNIVERSITI PUTRA MALAYSIA

INVESTIGATING THE USE AND ASSOCIATED CONSTRAINTS OF URBAN NETWORKS AMONG THE KLANG VALLEY RESIDENTS, MALAYSIA

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By

PATHEEBAA A/P PANEERCHELVAM

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements of the Degree of Doctor of Philosophy

June 2020

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DEDICATION

I devote this project to my creator God Almighty, my powerful foundation, my source of inspiration, knowledge and understanding. He has been the pillar of my power throughout this program of study and only on His wings have I grown. I also devote this research to my husband; Kalai Kumaran Thangarajo, who has inspired me all the way, and whose support has made sure that I offer it all I need to finish what I have begun. To my children, Phoojiitha Kalai Kumaran, and Hardev Kalai Kumaran, who have been affected by this quest in every way possible, my parents and my extended family. Thank you. My love for all of you cannot be quantified.God bless you.

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June 2020

Chairman : Sreetheran Maruthaveeran, PhD
Faculty : Design and Architecture

This PhD studies the topic of the use and associated constraints urban green network in Malaysian context. Although the use of urban green network has gained considerable attention in the West, only a limited number of studies have addressed this topic in a non-Western context. Moreover, none of the studies in industrialising countries have focused on environmental cues such as the element of concealments (e.g. vegetation or landscape settings which influence the users) and the presence of the disorders (e.g graffiti, trash) in influencing use of urban green network.These studies also did not look into social cues as presence of strangers, drug addicts and the like, nor on the other hand of individuals whose presence promotes sense of safety in public. In addition, not many of the past studies have examined how use of urban green network differs among different socio demographic characterizes. It was therefore seen as timely to study use and associated constraints of urban green network from an Asian perspective by looking into different demographic characteristics and different levels of environmental cues. Hence, a study was conducted at two selected urban green networks in Klang Valley, Kuala Lumpur: Kuala Lumpur South West Bicycle Corridor (KLSWBC) and Shah Alam Bicycle Lane (SABL). The study was conducted to fill the existing void and is composed of three stages of reviews: systematic, quantitative and qualitative. The socio-ecological approach was used as a framework to understand attributes influencing use of urban green networks in Klang Valley. The findings from the systematic review included an analysis of available literature with regards to authorship, journal, geographical distribution of studies, types of urban green networks, landscape stimulus used, applied methods, types of respondents involved and findings of other studies. Most of these studies highlighted that physical attributes were more influential compared to individual and social attributes when related to use of urban green networks in the Klang Valley. On-site surveys involving a total of 620 respondents consisted of residents of Klang Valley, aged 18 years old and above. With regards to the descriptive analysis of findings, most of the

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respondents agreed or provided neutral responses with respect to the constructs. The findings demonstrated that most physical attributes significantly affected use and considered as major constraints while social attributes did not influence same. Independent T- test and Analysis of Variance (ANOVA) were performed to examine relationships between individual characteristics. The findings disclosed that age and education had significant impact on use and reflected as related constraints. The semi-structured interviews provided more in-depth understanding of use and related constraints of urban green network in Klang Valley. Qualitative findings indicated attributes such as physical safety and conditions, social safety, distance and time of day generally had strong influence on use of urban green network. This study revealed theories and findings from Western studies on urban green network use can be generalized to a Malaysian context, in spite of cultural and other differences. This holds important implication for the understanding of green network use in Malaysia and possibly also other countries.

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Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KAJIAN MENGENAI PENGGUNAAN DAN KEKANGAN JARINGAN HIJAU BANDAR DI KALANGAN PENDUDUK LEMBAH KLANG, MALAYSIA

Oleh

PATHEEBAA A/P PANEERCHELVAM

Jun 2020

Pengerusi : Sreetheran Maruthaveeran, PhD
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Kajian PhD ini mengkaji tajuk berkaitan kegunaan dan kekangan yang berkaitan pada rangkaian bandar hijau dalam konteks Malaysia. Walaupun kegunaan rangkaian bandar hijau telah menerima perhatian yang besar di Barat, hanya bilangan kajian yang terhad telah menumpukan tajuk ini dalam konteks bukan Barat. Tambahan pula, tidak terdapat kajian dalam negara perindustrian yang menumpukan aspek alam sekitar seperti unsur penyembunyian (contoh: tapak tumbuh-tumbuhan atau landskap yang mempengaruhi pengguna) dan kemunculan ketidakaturan (contoh: graffiti dan sampah sarap) dalam mempengaruhi penggunan rangkaian bandar hijau. Kajian-kajian tersebut juga tidak melihat aspek sosial seperti kehadiran orang asing, penagih dadah dan sebagainya, atau selain itu, individu yang kehadirannya membawa rasa selamat dalam kalangan orang awam. Tambahan pula, tidak banyak kajian lampau yang mengkaji bagaimana penggunaan rangkaian bandar hijau berbeza dalam demografi sosial yang berbeza ciri-ciri. Maka, dilihat bahawa ini waktu yang sesuai untuk mengkaji kegunaan dan kekangan yang berkaitan pada rangkaian bandar hijau dari perskpektif orang Asian dengan melihat pada perbezaan ciri-ciri demografi dan perbezaan tahap aspek alam sekitar. Maka, satu kajian dijalankan di dua jaluran hijau bandar yang terpilih di Lembah Klang, Kuala Lumpur: Koridor Basikal Barat Daya Kuala Lumpur (KBBDKL) dan Laluan Basikal Shah Alam (LBSA). Kajian dijalankan untuk memenuhi kekosongan yang wujud dan terdiri daripada 3 tahap ulasan: sistematik, kuantitatif dan kualitatif. Pendekatan sosioekologi digunakan sebagai rangka kerja untuk memahami ciri-ciri yang mempengaruhi penggunaan rangkaian bandar hijau di Lembah Klang. Dapatan daripada ulasan sistematik merangkumi analisis literatur yang berkaitan pengarang, jurnal, taburan geografi kajian, jenis jaluran hijau bandar, rangsangan landskap yang digunakan, kaedah yang diaplikasikan, jenis responden yang terlibat dan dapatan dari kajian lain. Kebanyakan daripada kajian tersebut mengetengahkan bahawa ciri-ciri fizikal adalah lebih mempengaruhi berbanding ciri-ciri individu dan social apabila dikaitkan dengan

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penggunaan jaluran hijau bandar di Lembah Klang. Tinjauan dilakukan dengan melibatkan 620 orang responden yang merangkumi penduduk Lembah Klang berumur 18 tahun ke atas. Berkenaan dengan analisis deskriptif dapatan kajian, kebanyakan responden bersetuju atau memberi respon yang berkecuali berkaitan soalan. Dapatan kajian ini menunjukkan bahawa kebanyakan ciri-ciri fizikal mempengaruhi kegunaan dengan signifikan dan dianggap sebagai kekangan yang utama manakala ciri-ciri sosial tidak mempengaruhi dengan sama. Ujian T tidak bersandar dan Analisis Varians (ANOVA) dijalankan untuk menilai hubungan antara ciri-ciri individu. Dapatan kajian mendedahkan bahawa umur dan pendidikan mempunyai kesan yang signifikan terhadap kegunaan dan dianggap sebagai kekangan yang berkaitan. Temu bual semi struktur telah memberikan pemahaman yang lebih mendalam tentang kegunaan dan kekangan yang berkaitan pada rangkaian bandar hijau di Lembah Klang. Dapatan kualitatif menunjukkan ciri-ciri seperti keselamatan dan keadaan fizikal, keselamatan sosial, jarak dan masa dalam sehari secara umumnya mempunyai pengaruh yang kuat terhadap kegunaan rangkaian bandar hijau. Kajian ini mendedahkan bahawa teori dan dapatan dari kajian Barat tentang kegunaan rangkaian bandar hijau boleh digeneralisasi dalam konteks Malaysia, walaupun terdapat perbezaan budaya dan lain-lain. Ini memberikan implikasi yang penting untuk kegunaan pemahaman rangkaian bandar hijau di Malaysia dan kemungkinan untuk negara lain juga.

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LIST OF ABBREVIATIONS

UGS	Urban green space
KLSWBC	Kuala Lumpur South West Bicycle Corridor
SHBL	Shah Alam Bicycle Lane
TA	Thematic analysis
GN	Green network network
DBKL	Dewan Bandaraya Kuala Lumpur
MBSA	Majlis Bandaraya Shah Alam
KTM	Keretapi Tanah Melayu

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CHAPTER 1

INTRODUCTION

1.1 Urban green network in global context

Populations in cities around the world are forever growing. It has been estimated that by the year 2050, the number of city dwellers in half of the world's population is expected to increase to 70 percent (WHO, 2013). The threat to sustainable development and the prosperity of city development are being compounded by rapid global urbanization (UN, 2014). With abrupt urbanization, non-permeable and concrete surfaces of cities apparently have been replaced by green spaces, panoramic detours, and common public areas. On the surface, cities are generally characterized by towering buildings, traffic jams with noisy vehicles, as well as rivers enclosed with concrete embankments. Nevertheless, recent developments have highlighted that city dwellers crave for more human needs and wants such as being in close contact with nature, amusement and play, social connections, and aesthetic preferences (Matsuoka & Kaplan, 2008). However, many communities also concentrate on safety and well-being of their people, who are strongly affected by increasing population change and social tension. Parks are therefore incorporated and natural vegetation converted into urban landscapes, enhancing environmental and neighborhood sustainability (Swanwick *et al.,* 2003; Gobster & Westphal, 2004; El Din, 2013).

A green network generally refers to a stripe of primitive land near an urbanite set apart by city or town authorities for competitive use or environmental conservation. Green networks comprise of common types of urban green spaces (UGS). They are relatively new kind of urban park linked with mostly dismantled railways or the rehabilitated river boundaries. The parks provide a unique recreational environment through waterways, bike routes, public gardens, farm lands, footpaths to schools and other public areas (Watson *et al.,* 2003). A green network is often seen as an open-air live network that connects the city and outback to cities and countryside's surrounded by a wide ring network and offers open access to the public in its vicinity. People who have been writing about green networks claim that a green network is a slender open-space system created along either a normal, overland or along a humanly designed passage that links lawn, conservation areas, and cultural and historical places.

There are typically five forms of common green networks: i) urban green networks along rivers; ii) recreational green networks with routes; iii) green corridors and pathways; iv) picturesque and historical routes and v) complete green networks (Little, 1990). In the United States and over the globe, green networkss are becoming increasingly popular (Akpinar, 2016; Bousemma *et al.,* 2018). Community assets that support the introduction of green infrastructure can be described as urban green networks.

Several researchers cited that green networks serve the community as other community properties being industrial lawn (Benedict *et al.,* 2006; Weber *et al.,* 2014; Keith *et al.,* 2018). Ecological service is also a type of green networks. As green network is linear, it is able to link urban habitats to related adversity (Bryant, 2006; Ahern, 2013) and inhabitant of crowded capital, in turn, have improved interactions with attributes (Gobster, 1995; Chon & Shafer, 2009). The existence of green networks also allows the public to participate in wellness programs for the health conscious (Wolff & Fitzhugh, 2011; Dallat *et al.,* 2013). Green networks have been cited to improve employment opportunities through direct connection between suburban parks and suburban neighborliness through the use of public transport system (Shafer *et al.,* 2000). They have been described as 'multiple purposes' and accessible space passageway which achieve essential actions while providing people with enticing cultured qualities when they delight or travel onward a green network (Shafer *et al.,* 2000). Therefore, green networks are relevant to the protection of natural resources and to a healthy lifestyle.

However, green networks pose a number of challenges among the populace of urban areas. People tend to avoid crowded green networks, which are neglected, insecure or badly maintained (Boone *et al.*, 2009). Moreover, the rewards of green spaces within a city are not always universal or accessible to all (Jennings *et al*., 2016). A study reported of less possible use of green space for less than half groups and less-income entities (Ho *et al.,* 2005; Laarson *et al*., 2014).

Urban green networks may be influenced by several variables and their relationships between them. Therefore, it is pertinent to examine factors that affect green network use and the interactions of these factors. A recent report cited social security considerations, i.e., safety for women and indigenous oppositions (Keith *et al.*, 2018), established as a matter of concern. Nevertheless, the study did not explore how other variables, such as roads, impact the use of green networks. In comparison, several other research works have illustrated environmental aspects (Liu *et al*., 2016; Gobster *et al*., 2017; Zhai & Baran, 2017), but failed to give detailed views on possible relationships with environmental qualities and between other variables (personal and social nature). This is important because city dwellers are nervous if urban green spaces (UGS) could not be had in the community. This section of the thesis describes the study's presentation as to why it is split into a few sub-sections. The present section discusses background of the study and issues that trigger the study. Secondly, the section describes the primary aim of conducting the investigation, research objectives and questions achieved from identified issues of the study. The final segment describes limitation of the study, in urban design field followed by definitions of terms and structure of thesis.

1.2 Urban green network in Malaysian context

In development strategies, there exist some threats to the introduction of a green network and have become critical to property owners, developers and scientists. In Malaysia, at the beginning of 1976, a deep passion was demonstrated in the

development of green networks. A new development plan called Structure Plan was introduced by Malaysian government through Town and Country Planning Act (Act 1976). The Plan was designed to provide a suitable framework for the definition and control of development in Malaysia. The Structure Plan consisted of two stages; (i) the preparation of statement on policies and proposals for Kuala Lumpur Structure Plan 1984 and 2020 (KLSP, 1984, 2020), (ii) the preparation of detailed implementation contained in Structure Plan for Local Plans (Sreetheran & Adnan, 2006). Within 20 years of changing circumstances and the issue of the Federal Territory of Kuala Lumpur, the Structure Plan was extensively studied. In turn, the Comprehensive Development Plan Program identified financial, cultural, physical, transportation, environmental and other problems.

There have multiple research papers focusing on how green networks can be appraised and handled to conformed societal concerns. For example, Flink *et al*. (1993) described that green networks were established for wildlife and human movement in American cities. They were presented by well-built, well-designed and well-administrated land that is a spatial asset for many agricultural, leisure, cultural and esthetic functions. The 21st century town orientated towards residents leads to the idea of balanced land use (Ahern, 2014). In Singapore, green networks were identified by neighborhood scale through parks and community gardens (Tan, 2006). In fact, it varied according to neighborhood desires and the wealth of the environment. Elements such as roads, roads, waterways, dissipated access, utilities, scenic streets and settlements are connected by green networks like urban areas, the business park, the community center, suburban housing, and urban parks. The formation of green network system such as green wedges, parks and green pathways had been suggested along rivers, roads and built-up areas by using ecological principle at regional, city and neighborhood levels (Li *et al.*, 2005).

Research in green networks are plentiful. However, it is lacking in spatially referenced social data of connectivity elements and types of preferences by communities which limited studies in urban areas in Southeast Asian countries including Malaysia (Table1.1). Green network construction has advanced gradually in the face of constant concept of green networks since KLSP 1984 and 2020 which connect major areas with small open spaces around rivers and reservoirs of drainage. In this respect, the city put forth positive ideas to encourage green network projects. In fact, the addition of more landscaped open areas that have gained the city by introducing a system of planting of trees along major roads (Sreetheran & Adnan, 2009).

Green networks originally comprised of bridge reservoirs, services reservoirs, river and irrigation reservoirs and train reservoirs as stipulated by Kuala Lumpur Structure Plan 2020 (KLSP 2020). The KLSP 2020 plans to build an integrated network of green spaces, connecting essential parks and forest reserves with waterways, roads and public services. The plan to repair and build up green networks to beautify the city. However, there are some issues in the green network connectivity, because open spaces linking to the network system is incomplete (Sreetheran & Adnan, 2009; Noraini, 2010; Mazlina, 2011). Connectivity and flexibility are important because they

allow consumers to switch from space to space and transfers from landscape components to landscape structures. A set of shaded trees, for example, guide users around pathways or highways. According to Thorne (1993) breaks which occurred along routes or corridors, resulted in loss of connectivity and suffered fragmentation.

Fragmentation has been defined as landscape's shortage of connectivity caused by anthropogenic activities and subsequent alteration of ecological process. Because of lack of connectivity elements, it created complications among users to access. Some spaces are showing redundancy effects (Quayle, 1995; Shuhana *et al.*, 2007). Sreetheran & Adnan (2009) mentioned that cities' green networks components include road reserve and utility reservations and the river and drainage reserves, and the railway reserve as a basis for the 2020 Kuala Lumpur Structure Plan (KLSP 2020).

Nevertheless, Kuala Lumpur does not have adequate green network connecting all current open spaces. Road reserves were seen as the most reliable element, since most users were in good access compared with other components. There has been little or no work done to document a detail research with clear understanding on identifications of green networks pertaining to its types of connectivity elements such as soft-traffic corridors for pedestrians, river corridors for off-street green networks, linear green spaces and reserves. There has been no factual evidence in Malaysia that determines communities' preference regarding connectivity elements in green networks.

Table 1.1 : The greenspace and research dimensions of South-east Asia
(Said et al., 2011)

Cities /Countries	**Greenspace/ city area (%)**	**Greenspace**	**Concern of research**	**Authors**
Jakarta	9.6%	0.22	-Lack of greenspace due to completion with other physical developments. -Increase environmental degradation from lack of greenspace. -Lack of awareness and sense of civic mindedness resulted in uncaring attitude of public.	Sabarini, P. (2009); Pitakasari et al. (2010); Jakarta Genaral Masterplan, 2010); Rustam (not cited0; Aldous (2010); Kuchelmester (2000)
Kuala Lumpur	15.5%	12.9	-Lack of proper planning, implementation management and reinforcement i.e. low standards of maintenance, lack of manpower and budget. -Lack of skill, knowledge, expertise and interest. -Lack of awareness and sense of civic mindedness	Mustafa & Osman (1999); Lilian et al (2002); Sreetheran at al. (2004; 2006); Yap et al (2007); Gairola and Noresah (2010)
Singapore	46.5%	20	-Overcoming connectivity issue for urban residents' ease of movement and ecosystem benefits. -Park connector was introduced for well-being	Yuen (1996); Tan (2004); Briffet et al. (2004) Aldous (2010); Tanuwidjaja (2010)
Bangkok Cambodia Manila	39% - -	5 - -	-Lack of greenspace due to completion with other physical developments. -Lack of awareness that greenspace (roads, park, gardens and water bodies are part of urban heritage9Symann, 2009)	Rustam (not cited); Kuchelmeister (2000); Fraser (2002); Regional Plan of Area Arrangement (RTRW); Andlous (2010)

1.3 Statement of issues

Urban population has been reported to rise steadily with about 60 million population alluring to towns and metropolitan areas every year, around one million a week (Lee *et al*., 2010, WHO, 2015) and continues to grow. The projection indicates that about 70 % of the world 's community will be existing in urban areas by 2050. Indeed, Asia 's urban community is projected to outstrip the rural community by 2022 (Brinkhoff, 2012; Kapsch, 2013; Lohani, 2014). Moreover, there has been an unprecedented disconnection of individual from the natural world in the past few hundred years (Katcher and Beck, 1987; Axelrod and Suedfeld, 1995). In this detachment, the transition from rural to urban surroundings has encouraged our daily interaction with nature thus diminishing.

People have also been isolated from outside substantial stimulation (Stilgoe, 2001) and daily interaction with nature by modern society (Katcher & Beck, 1987). A life spent in human environments alone is suggested to cause debilitation and contribute to a loss of endurance and well-being (Katcher & Beck, 1987; Stilgoe, 2001, Tian *et al.*, 2012). Futhermore, by being in urban surroundings, the vigilant factors of nature have been reduced for well-being enhancement and viable process (Katcher & Beck, 1987; Axelrod & Suedfeld, 1995), and as a rule, individual, association and artistic well-being has deteriorated from this neutralizations and urban myth (Maller et al., 2005, p.46). This has caused individuals with stress-related illnesses and obesity to suffer (Grahn & Stigsdotter, 2003; Lee & Moudon, 2004; Mindell & Karlsen, 2012).

Many cities around the world face characteristic disturbances, overuse of energy, extreme eco-degradation and the consequent overall humidity change. Correspondingly, national transport and infrastructure focused to facilities have turn into common replacements for governmental spending to ensure safe and tolerable cities. The influence of land-use, migration and urban planning programmes has been highlighted in recent studies (Kang & Cervero, 2009; Cervero & Kang, 2011). Many of them agreed and emphasized that building more urban green networks are an enabling and successful strategy toward a sustainable future to develop urban environments and landscapes. Yet, little consideration has been compensated to the recreational or mobile usage of the urban green network, and it has more practical or physical incorporation than individual green spaces. It also provides opportunities for formal and informal leisure time.In addition, previous literature on urban forests, green belts, green fingers or wedges, green ties, green infrastructure and environmental networks appears to concentrate not on recreational uses, but on planning for recreational uses. (Walmsley, 1995; Konijnendijk, 2000; Schrijnen, 2000; Sandström, 2002; Jim & Chen, 2003; Köhn, 2003; Frischenbruder & Pellegrino, 2004; Li *et al*., 2005; Weber *et al*., 2005; Opdam *et al*., 2006; Sandström *et al*., 2006; Walmsley, 2006). Therefore, there is pinch of awareness of the strategy for public use of urban green networks since proficiency of contesting utilize is necessary to consider the practical capacity of urban green networks in land-use planning and governance in conjunction with social and ecological systems (James *et al*., 2009).

Similarly, Malaysia's urban green networks are anticipated to function successfully for its users. Nevertheless, very little literature addresses the benefits and challenges of using the green network in Asia and Southeast Asia in particular, where the rate of use of green infrastructure including bicycle lanes is poor and there is almost no proper facility like cycling infrastructure in their cities (Shokoohi *et al*., 2018). Makinen *et al.* (2015) submits that the execution and effectiveness of transport policies depend on the urban type in the short term, and that urban planning affects transport demands in the longer term. At the same time, transport policies have an effect on the urban type, as investments in transport infrastructure shift the relative accessibility of urban places, as accessibility in Kuala Lumpur has changed over the past decades. In addition, low accessibility may be an issue for most towns and cities in Malaysia with poorly working green infrastructural networks (National Urbanization Policy, 2006). Facilities such as Malaysia's provision of cycling infrastructure quality are still implausible, detached setting, inappropriate crucifixion and shared with motorcycles (Shokoohi *et al*., 2018). Until now, local authorities have been responsible for assessing the construction of green infrastructure with differential norm guidelines. The development of the paths is both incompletely durable and separated and unconnected (JPBD, 2012). Moreover, the infrastructure and fun experience of this mode is still at its infancy. For eg, in Malaysia, due to the misunderstanding of the bicycle on the vehicle road being a blight and the problems of theft, the bike sharing scientific expertise to turn from car to bike is impotent. (Yun, 2018). The problems are that the condition of facilities does not meet the liberal attention of the specs of the cyclist in the environmental experience (Forsyth & Krizek, 2011) and also the potential cyclist. Cycling-oriented urban design can also be seen from a number of angles without losing security, convenience and a full network.

Furthermore, Kuala Lumpur does not have a decent infrastructure facility which links all the current open spaces (Sreetheran & Adnan, 2009). It is quite important to know and this is arguable since access and connections are key prerequisites for the functionality of green spaces (Natural England, 2011). A well-distributed green space in a congested urban area may affect people's quality of life (Federal Department of Town and Country Planning, 2006). However, green infrastructure and green space are not well planned in Malaysia's cities and towns. Research on open spaces in seven major cities on the Malaysian Peninsula, based on the assessment of their respective municipal plans, highlighted that the provision of open spaces was inadequate and concluded that it was not the shortage of land that contributed to just the lack of public spaces in urban areas, but rather to the inefficient use and arrangement of land (Federal Department of Town and Country Planning, 2006). This issue is thus critical and demands action, since these green areas add to the standard of living in towns (Bonaiuto *et al*., 2004; Chiesura, 2004) and these are key factors that enhance their everyday well-being are urban nature and frequent outdoor leisure opportunities for local residents (Eronen et *al*., 2002). Their benefits are primarily calculated by the quantity and quality of such places and their usability (Tyrväinen *et al*., 2005; Tyrväinen *et al*., 2005). The key problems of Malaysia's urban spaces such as accessibility and transparency can be detected (Federal Department of Town and Country Planning, 2005). Significant problems can be defined with regard to the planning and construction of Malaysia's urban areas, such as connectivity and functionality. An indication is the network or matrix of patches and corridors as

suggested by Forman (1996) on his conceptual approach to spatial arrangement of space, which is most important for social honesty (Tan, 2006). He indicated that the ideal spatial configuration should consist of three basic structures called patches-corridors matrix multiplication (Thwaites *et al*., 2005). Open areas research is diverse, but the importance of these non-park areas is less studied (Ward Thompson, 2002). Even so, the importance of these non-park areas, waste areas or remote sites should be taken into consideration (Dovey *et al*., 2000). The Federal Department of Town and Country Planning (2006, p.8) defined open space as — any land enclosed or open, wholly or partially, designated as a public botanical garden, a public park, a public sports and leisure park, a peatway or a public space. The Federal Department of Town and Country Planning (2005), however, describes green systems in urban environments rather than merely natural areas and unintended open spaces. Overall, green infrastructure comprises all natural, semi-natural and artificial multifunctional ecological networks inside, across and between metropolitan environments at all scales ranging (Tzoulas et al., 2007), which is being implemented to develop urban green space structures as a cohesive development body (Sandström, 2002). It is a term that explains the abundances of natural features in habitats such as forests, wetlands and flows that offer ecological services of equal value to the well-being (Weber *et al*., 2006). In addition, as an interconnected network of green open spaces, it consists of forests, wildlife habitats, parks and other natural areas that conserve the value and role of natural habitats and provide related benefits to the human communities, protect clean air, water and other natural resources, and enhance quality of life (Benedict & McMahon, 2002). In addition to the defined open spaces, it also includes informal spaces referred to as loose fit (Dovey *et al*., 2000). Loose-fit areas are areas that have a variety of features that are frequently unmanifested, unregulated, locations (Dovey et al., 2000), leftover spaces (Davidson, 1999) and the wasteland of urban green spaces, uncontrolled and undergoing reconstruction of land (Ward Thompson, 2002) like informal waste fields, garbage, holes, dirty places and non-park spaces (old rail sidings, holes, cems, etc.). Street is an important component of green land use infrastructure. It is said that there are more places to interact with people on the streets than in parks or squares. As just a consequence, the street is truly a sign of public open space, one that the local city will feel comfortable in using (Ward Thompson, 2002). It is therefore important to analyse the reactions of urban residents through their experience and participation in the usage of these social spaces. Therefore, in order to understand green infrastructure networks, research must not only cover the experience of using parks and open spaces, but must also include streets and open spaces as core components of green infrastructure. These places are intended to be additions of the formal parks rather than a substitution for them, and may be a new reinterpretation of the ideals of the green network (Ward Thompson, 2002) or as park chain (Tan, 2006). In comparison, there is a need to look at the network, mosaic or integrated space networks that are incorporated into the fabric of urban ecosystems, since these green infrastructure elements may have occurred either by occurrence or planned (Thwaites, 2005).

As a response, the purpose of this study is to fill the gap by identifying the characteristics of the green network and its land use components as shared space networks that can meet the functioning of physical, social and cognitive health and the well-being of citizens. As a result, meanings and social ideals have to be investigated

by the interpersonal reactions of urban residents, using their climate attitudes, which would demonstrate people's relation to their communities. Findings from this research will provide proof of the consistency of the green network in cities and assist to enhance the conditioning and design of the green network in Malaysian cities and promote community well-being.

1.4 Research questions

To examine the issues, the present study has identified the following questions:

(a) How the current status of research on the use of urban green networks and its associated constraints at global level?
(b) What is the current status of the use of urban green networks among Klang Valley residents?
(c) What are the constraints which limit the use of urban green networks in Klang Valley?
(d) Which are the factors that promote and limit the use of urban green network in Klang Valley?

1.5 Research aim

The aim of the present study was to investigate the relationship between urban green networks and social-ecological perspective. The study thus focused on acquiring knowledge of the current conditions of urban green networks use and constraints from a regional perspective. The use and constraints of urban green networks in the Klang valley area was also examined. The study also aimed at defining appropriate characteristics for the use of urban green networks and limitations behind their operation, to establish a conceptual framework.

1.6 Research objectives

The study had the following objectives:

(a) To systematically review the current state of the use and associated constraints of urban green networks.
(b) To identify the use of urban green networks among Klang Valley residents.
(c) To determine the constraints faced from using urban green networks in Klang Valley.
(d) To propose a conceptual framework for the use and associated constraints of urban green networks in Klang Valley.

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1.7 Limitation of study

One of the drawbacks of past research were focused on green spaces such as green corridors, green infrastructure benefits to the city and the environment rather than a close study of how the urban green network is used by the public. This means that researchers have struggled to obtain research evidence based on urban green network studies, especially in Malaysia, and have had to rely on previous dissertations and journal articles that are almost identical to this analysis.

1.8 Significance of study

The aim of this study is to increase awareness that the green network and its components of land use can enhance urban residents' physical, cognitive and social functioning and contribute to the well-being of the city. The properties, features and key dimensions of components and networks of green infrastructures that users and organization of urban spaces would be valued and appreciated will indeed be improved in their design and planning. A model of research on the attractive green networks in Malaysian cities correlated with human desires may be built in response to urban residents. This model stresses the importance of the quality and land usage of the green network and helps people realize the contribution of the green network to urban health and well-being and also to the quality of life of urban society. The conceptual framework can therefore be suggested to the government and therefore can contribute to enhance the standards of the green urban networks in Malaysia.

1.9 Definition of terms

Several common words with particular meanings have been used in this text. In time to attain clarification and continuity, the meanings for these terms are as follows:

(i) Urban green space

The concept of "lands containing mainly unscreened, permeable and soft materials such as soil, grass, shrubs and trees" covers: leisure, incidental, private and competitive green areas; burial and administrative areas; lakes, forest, other ecosystems and linear green areas.

(ii) Urban green network

A green network is a continuous path along a natural route, such as the river bank, the stream gorge, or the hill, or overland along the right-of-way railway to support leisure purposes.

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(iii) Socio Ecological model

The Social Ecological Model (SEM), a model of the connectivity approach to development, provides a framework for a comprehension of the various levels of a social system and relationships between people and the environment.

(iv) User (s)

Person(s) who rely on public spaces or buildings for passive and active engagement.

(v) Perceived experience

Sensation of the people to detect the physical energy in the environment when come in contact with them.

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1.10 Structure of thesis

The present thesis consists of six chapters. Each chapter explains its content as shown in the flow chart in Figure 1.1

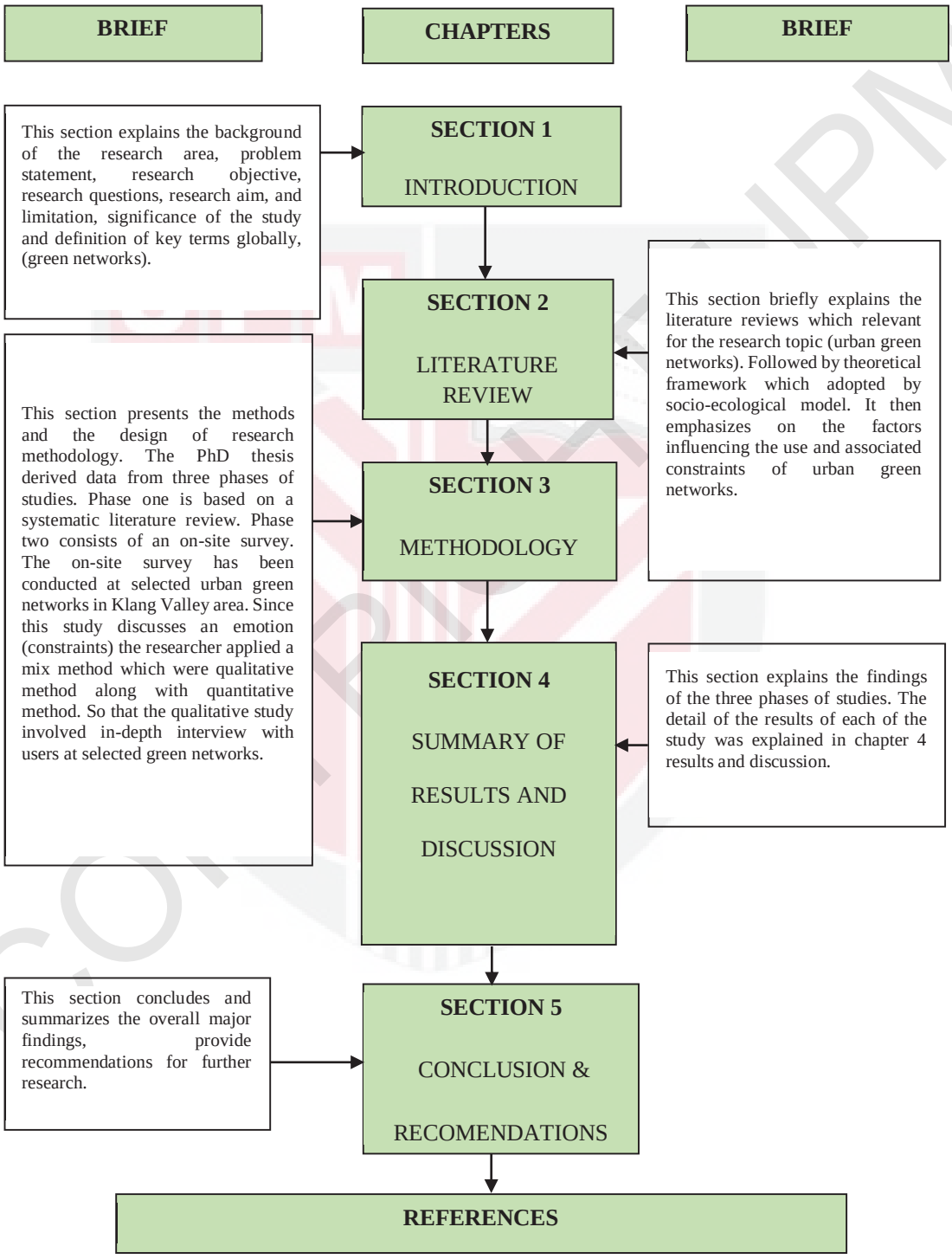

Figure 1.1 : Flow chart presenting organization structure of the thesis

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APPENDICES

Appendix 1 : Summary of findings from reviewed articles (n = 45)

Author	Region	Types	Sample characteristics		Data collection		Sampling		Data analysis	Findings
			Respondent	Gender	Data collection methods	Landscape stimulus used	Sampling method described	Sample size (N)	Data analysis approach described	
Bownsonr et al. (2000)	USA	Walking Trail	Adults (>18)	M+F	Qualitative telephone (interview)	No	Yes (random sample)	1269	Yes (BRFSS PA) Prevalence odds ratios (POR) and confidence intervals (CI)	Findings describes walking trail beneficial on promoting physical activity among segments of the community at highest risk for inactivity, in specifically women and persons in lower socioeconomic groups.
Shafer et al. (2000)	USA	Greenway	Users	M+F	Quantitative (on site survey& Mail back survey)	No	Yes (random Sample)	1004	Yes (Descriptive , importance-contribution analysis (ICA)	Greenway trails varied in user types and activities based on location and policy, and also were contributing most to people quality of life through resident health fitness, natural areas they provide, better land use and resident pride.
Troped et al. (2001)	USA	Bicycle Greenway	Adults (>18)	M+F	Quantitative (Mail survey, GIS Data)	No	Yes (random Sample)	1002	Yes (GIS Data, Simple Logistic regression, Multiple logistic regression)	Age and female gender revealed statistically significant converse associations with bikeway use compare to the male gender.
Merom et al. (2003)	Australia	Rail trail	Adults (>18)	M+F	Quantitative (Pre and post campaign Telephone survey)	No	Yes (random Sample)	405	Yes (paired t- tests, McNemar's test, One-way analysis of variance (ANOVA))	Inner cyclists, males, and those recalling any baseline bike promotion messages were more likely to be aware of the trail and was moderated in usage by proximity to the trail.
Reed et al (2004)	USA	Community Walking Trail	Adults	M+F	Quantitave (Telephone survey)	No	Yes (stratified sample)	1112	Yes (Kappa statistics)	No agreement between the awareness and presence of trails. Awareness of existing trails in this community and levels of use were low.
Gobster & Westphal (2004)	USA	Greenway	Nearby Residents, users, resource expert	M+F	Quantitative (Mail survey, GIS Data)	No	Yes (Random, Purposive sampling)	724	Yes (Descriptive, $\chi 2$ Cross tabulation, Anova)	Six interdependent "human dimensions" of greenway are identified in the studies: cleanliness, naturalness, aesthetics, safety, access, and appropriateness of development.

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Appendix 1 *(continued)*

Author	Region	Types	Sample characteristics		Data collection		Sampling		Data analysis	Findings
			Respondent	Gender	Data collection methods	Landscape stimulus used	Sampling method described	Sample size (N)	Data analysis approach described	
Lindsey & Nguyen (2004)	USA	Pedestrian and Bicycle Greenway	Users	M+F	Mix method Quantitative Qualitative (Interview)	No	Yes (random Sample)	635	Yes (Descriptive , importance-contribution analysis (ICA)	Trail traffic was higher in municipalities with larger populations and higher on weekend days than on weekdays. Peak hour traffic accounted for higher proportions of traffic on weekdays than on weekend days. Traffic at different locations on one trail in Indianapolis varied considerably.
Evenson et al. (2005)	USA	Multi Use trail	Nearby Residents (age 18-55)	M+F	Qualitative (telephone interview	No	Yes (random Sample)	366	Yes (logistic regression, Kappa statistics)	This prospective study of the building of a multi-use trail did not demonstrate an increase in physical activity among adults living near the trail.
Troped et al. (2005)	USA	Rail Trail	Users and Nonusers (age >18)	M+F	Quantitative mail survey	No	Yes (random Sample)	413	Yes (descriptive, Chie square, t-test)	More trail users (79%) performed recreational physical activity ≥ 3 d/wk, compared to nonusers (47%) Both groups shared concerns about safe access to the trail and certain trail condition.
Librett, et al. (2006)	USA	Walking and Cycling Trail	Users	M+F	Quantitative (mail survey)	No	Yes (stratified random sampling)	3717	Yes (Logistic regression analyses)	Community trails facilitate physical activity, and almost half of frequent trail users report that access to trails and other green space is important in choosing a place to live. Other than that, the demographic correlate related to frequent trail use was being male.
Lindsey et al. (2006)	USA	Urban Trail	Users	M+F	Mix method (observation, GIS, satellite imagery, US census & secondary data)	No	Yes (random Sampling)	2000	Yes (multiple regression)	Trail traffic is significantly correlated with neighbourhood characteristics. Health officials can use these findings to influence the design and location of trails and to maximize opportunities for increases in physical activity
Krizek & Johnson (2006)	USA	Bicycle Greenway	Residents (age >20)	M+F	Qualitative (telephone interview)	No	Yes (stratified sampling)	1653	Yes (chi-square, t-test, logistic regression)	Distances to retail and bicycle facilities are statistically significant predictors of choosing active modes of transport at close distances, but the relationships do not appear to be linear.

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Appendix 1 *(continued)*

Author	Region	Types	Sample characteristics		Data collection		Sampling		Data analysis	Findings
			Respondent	Gender	Data collection methods	Landscape stimulus used	Sampling method described	Sample size (N)	Data analysis approach described	
Frank et al. (2006)	USA	Pathway	Residents (age >20)	M+F	Mix method (observation, secondary data, Extensive self-administrated survey, computer aided telephone interview)	No	Yes (random sampling)	7228	Yes (linear regression)	The result indicates 5% increase in walkability to be associated with a per capita 32.1% increase in time spent in physically active travel, a 0.23-point reduction in body mass index, 6.5% fewer vehicle miles travelled, 5.6% fewer grams of oxides of nitrogen (NOx) emitted, and 5.5% fewer grams of volatile organic compounds (VOC) emitted.
Brown et al. (2007)	USA	Green Walkable Route	University students Group A (age 19-39) Group B (age18-51)	M+F	Mix method (Quantitative survey, Qualitative open-ended interview)	Yes (walking experience)	Yes (random Sampling)	73	Yes (median correlation coefficient transcribed &coding system, Wilks's lambda criterion multivariate)	Participants experienced walkable route segments as noticeably safer, with a more positive social environment, fewer social and physical incivilities, and more attractive natural and built environment features.
Krizek at al. (2007)	USA	Bicycle Greenway	Users'	M+F	Quantitative (intercept survey)	No	Yes (random sampling	3,121	Yes (T-test)	The analysis demonstrates that a cogent distance decay pattern exists and that the decay function varies by trip purpose. .
Reynolds et al. (2007)	USA	Multi use Trail	Users'	M+F	Quantitative (mail survey)	Photograph	Yes (random sampling)	17,338	Yes (univariate & multivariate poison regression)	Positive associations with trail use were observed for mixed views such as streetlights, good trail condition, presence of café and other trailside facilities.
Troped et al. (2009)	USA	Bicycle Greenway	Adults	M+F	Qualitative (administered trail intercept survey)	No	Yes (random Sampling)	295	Yes (chi-square, t-test, logistic regression)	As a result, Kappa coefficients and percent agreement for 9 categorical items ranged from 0.65 to 0.96 and from 64.0% to 98.2%, respectively. Among these items, the lowest Kappas were found for perceived safety (0.65) and reported duration of visits for recreational purposes (0.67). Spearman rank correlation coefficients for travel distance to and on the trail and frequency of trail use during the past 7 days and past 4 weeks ranged from 0.62 to 0.93.

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Appendix 1 *(continued)*

Author	Region	Types	Sample characteristics		Data collection		Sampling		Data analysis	Findings
			Respondent	Gender	Data collection methods	Landscape stimulus used	Sampling method described	Sample size (N)	Data analysis approach described	
Spruijt-metz et al. (2009)	USA	Recreational Trail	Adults	M+F	Quantitative (Accelerometers measure Systematic Pedestrian and Cyclist Environmental Scan for trails measure)	No	Yes (random sampling	355	Multivariate regression analyses	Recreational trail activity was greater for participants who reported exercise and health reasons for trail use as compared with other reasons (ie, social interaction, enjoying nature, walking pets) for recreational trail use.
Town et al. (2010)	UK	Green Space Network	Users'	M+F	Qualitative (Unstructured observation, structured observation)	Photograph	Yes (simple stratified unaligned sampling strategy)	1825	Yes (Content Analysis)	The study suggests that the recreational patterns in, as well as peoples' concerns about, naturalistic urban landscapes may be a factor of high-quality maintenance and associated local aesthetic and cultural perceptions.
Reichhart & Arnberger (2010)	German	Bicycle Greenway	Landscape planning students	M+F	Quantitative (computer animated stated choice experiment)	Photograph	No	168	Yes (chi-square, t-test, logistic regression)	Respondents preferred litter-free, well designed and managed settings with gravel trails and low user numbers organized in larger groups, and shorter sight distances. Results also indicate that high-quality trail design can absorb more visitors than a less maintained trail environment.
Gordon et al. (2010)	USA	Community Trail	Residents	M+F	Mix method Qualitative (Interview) Quantitative (survey)	No	Yes (random sampling)	414	Yes (coded in SPSS 10.0 (SPSS Inc, Chicago, Ill, Chi-square, t-test)	New exercisers travelled shorter distances to access the trails and rated convenience as a primary reason for using them. Both safety and terrain issues emerged as enablers for trail use, and unsafe conditions emerged as a concern among new exercisers
Wolch et al. (2010)	UK	Urban Trail	Neighbourhood residents	M+F	Quantitative (close ended & brief open-ended survey)	Photograph	Yes (random sampling)	490	Yes (correlation, logistic regression)	Intrinsic motivation, general health status, perceived trail safety, perceived mile between home and trail and neighbourhood connectivity were significantly related to probability of trail use and extent of trail use while working class status commuting distance, and physical barriers to trail were negatively related.

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Appendix 1 *(continued)*

Author	Region	Types	Sample characteristics		Data collection		Sampling		Data analysis	Findings
			Respondent	Gender	Data collection methods	Landscape stimulus used	Sampling method described	Sample size (N)	Data analysis approach described	
Wolf and Fitzhugh (2011)	USA	Greenway	Users'	M+F	Qualitative (on site observation using infra-red trail counter)	No	Yes (random sampling)	219	Yes (Multiple regression)	An aggregated daily data can detect relationships between weather and outdoor physical activity (PA). and max temperature had the greatest influence on daily PA with trail counts increasing.
Coutts & Miles (2011)	USA	Greenway	Residents	M+F	Qualitative (Field observation using GPS & GIS)	No	Yes (random sampling)	420	Yes (mixed-model regression analysis)	The result revealed that the racial composition of the neighbourhoods' greenway users passed through did not predict the race of users on a given segment
Maslow et al. (2012)	USA	Rail trail	Adults (Students)	M+F	Quantitative (intercept survey)	No	Yes (random sampling)	431	Yes (descriptive, logistic regression)	Adults who used the trail in the cool months, travelled to the trail by a motorized vehicle, used the trail with others, and had some graduate school education visited the trail less often. Younger adults, men, whites, and those with some graduate school education was more likely to engage in vigorous activities on the trail. Adults who travelled to the trail by a motorized vehicle spent more time engaged in PA on the trail.
Price et al. (2012)	USA	Greenway	Users'	M+F	Quantitative (intercept survey)	No	Yes (random)	1148	Yes (mixed-model regression analysis)	Significant associations were identified between greenway trail user demographic characteristics and how trail users learned about the trail and trail characteristics liked by trail users.
Moore et al. (2012)	USA	Hiking trail	University students	M+F	Mix method (qualitative, on -site observation, quantitative written questionnaire)	Yes (walking experience)	Yes (convince sampling)	75	Yes (Regression)	Results signified all but 1 impact type had an overall negative effect on user experience, with mud, standing water, and litter having the most detrimental effects on hikers' experiences.
Deenihan et al. (2013)	UK	Greenway	Cycling tourist	M+F	Quantitative (Secondary data)	No	No	14,800	Yes (multinomial logit regression)	The finding explains providing infrastructure like Great Western Greenway (GWG) to the country could prove to be important at reducing pollution, obesity and traffic congestion. Not only are tourists using this facility, but it is being used as a sustain- able travel mode for locals.

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Appendix 1 *(continued)*

Author	Region	Types	Sample characteristics		Data collection		Sampling		Data analysis	Findings
			Respondent	Gender	Data collection methods	Landscape stimulus used	Sampling method described	Sample size (N)	Data analysis approach described	
Deyo et al. (2014)	USA	Trail	Tribal representatives and resource managers	M+F	Qualitative (Semi structured Interview)	No	Yes (purposive and snowball sampling)	21	Yes (Multiple rounds of code)	Study found that trails help strengthens and preserve cultural identity and natural heritage; directly address some of the most pervasive social challenges that American Indian communities face; and spur the creation of constructive partnerships with individuals, organizations, and various levels of government.
Weber et al. (2014)	German	Greenway	Urban residents	M+F	Mix Method (Quantitative on-site questionnaire Qualitative Interview)	No	Yes (random sampling)	108	Yes (content analysis, chi-squared test)	Finding explain wild urban roadside vegetation met with high approval, although planted and maintained vegetation was preferred.
Verli & Arnberger (2015)	UK	Recreational Trail	Forestry and landscape architecture university students and retirees	M+F	Mix method (Quantitative questionnaire survey, on – site observation)	Photograph	Yes (systematic random sampling)	82	Yes (Chi-square tests, Mann–Whitney U tests, Kruskal–Wallis H tests, Correlation)	Findings describe that some impacts such as muddy trail sections and informal trails were perceived to a much greater extent than assessors had objectively measured them.
Hughey et al. (2015)	USA	Community trail	Local residents	M+F	Quantitative (digit-dialling survey of residential phone numbers)	No	Yes (random sampling)	899	Yes (chi-squared test)	Trail promotion efforts should be tailored to targeted user segments. Reasons for trail non-use differed significantly by gender income, not a race or education. this study provides valuable information about diverse residents' reason for not using a prominent community trail that can guide future intervention.
Rodríguez et al. (2015)	USA	Greenway	Adolescent girls	F	Qualitative (Observation (longitudinal follow-up study simultaneously- an off-the-shelf Foretrex and ActiGraph model 7164 accelerometer, Neighbourhood Places Log (NPL)	No	Yes (random sampling)	303	Yes (path size formula, sample enumeration approach)	The result shows among aesthetics, destinations, functionality, and safety variables, shorter distance had the strongest positive association with route choice, whereas the presence of a greenway or trail, higher safety, presence of sidewalks, and availability of destinations along a route were also consistently positively associated with route choice at both sites.

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Appendix 1 *(continued)*

Author	Region	Types	Sample characteristics		Data collection		Sampling		Data analysis	Findings
			Respondent	Gender	Data collection methods	Landscape stimulus used	Sampling method described	Sample size (N)	Data analysis approach described	
Akpinar (2016)	Turkey	Greenway	Users'	M+F	Mix Method (Quantitative questionnaire, Qualitative Interview)	Photograph	Yes (random sampling)	417	Yes (multivariate linear regression)	The finding indicates six influencing factors, lighting, drinking water and restroom facilities, well-design, cleanliness, safety, and parking lot, were important factors relating to duration of use and greenways are more than "luxury" and provide important health, recreational and leisure activities for Turkish people.
Mieno et al. (2016)	Japan	Urban Trail	Mix Method (Quantitative questionnaire (Likert scale & Qualitative Interview)	M+F	Mix Method (Quantitative questionnaire (Likert scale & Qualitative Interview)	Photograph (computer manipulated image)	Yes (random sampling)	256	Yes (linear regression)	One group consisted of more elders whose motivation was to enjoy the natural environment and tended to tolerated crowded condition and disliked plant pickers, who harvest wild vegetables alongside the trail.
Honold et al. (2016)	German	Greenway	Residents	M+F	Mix method (Qualitative semi structured interviews, Quantitative photo rating, online survey, PA activity)	Photograph	Yes (purposive sampling)	32	Yes (Hair cortisol analysis, Descriptive, correlation, One -way ANOVA ,ANOVAs $\chi 2$ tests)	Participants whose homes had views of high amounts of diverse kinds of vegetation had significantly lower cortisol levels. Moreover, participants who regularly used a vegetated trail along a canal had significantly lower cortisol levels and reported significantly higher life satisfaction than less frequent users. In addition, vegetated routes or paths played an important role in the restorative activities and daily commutes of participants.
Liu et al. (2016)	China	Greenway	Users'	M+F	Quantitative (on site observation using motion VGI is a kind of crowdsourcing geographic information)	No	No	941	Yes (geocoded into ArcGIS 10, regression	The finding reveals that greenway in green and well-developed areas supports physical activities better. Location, green quality and network form are necessary for greenways and should be integrated into greenway plan.

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Appendix 1 *(continued)*

Author	Region	Types	Sample characteristics		Data collection		Sampling		Data analysis	Findings
			Respondent	Gender	Data collection methods	Landscape stimulus used	Sampling method described	Sample size (N)	Data analysis approach described	
Zhai & Baran (2017)	China	Pathway	Senior users'	M+F	Qualitative (on site observation &face to face interview)	Photograph	Yes (random sampling)	7319 (observation) 46 (interview)	Yes (descriptive ANOVA post hoc test (LSD), correlation, content analysis)	The finding describes that seniors prefer pathways that have soft or even pavement (plastic track, and bricks), benches, flowers, and light fixtures. They also attracted to pathways that are long, between 3–3.9 meters wide, and without connection with activity zones. Moreover, the result suggests that other pathway design characteristics, such as being along a water body, having shade, providing lateral visibility and visual connection with water, and without visual connection with landmarks may also encourage senior walking.
Greer et al. (2017)	USA	Urban Trail	Users'	M+F	Mix Method (on site observation using motion detection cameras, Online Survey)	Photograph	No	7511	Yes (Kruskal-Wallis test)	The finding explains enforcement was an effective tool in reducing and sustaining the amount of unauthorized uses in the open space reserve (66%).
Gobster et al. (2017)	USA	Bicycle Trail	Senior users'	M+F	Qualitative (on site observation using equipment called TrailMaster TM1550 16,000-count capacity active infrared counters)	Photograph	Yes (random sampling)	50	Multiple regression, Regression Bivariate correlations	Most users were pedestrians, but proportions varied by day of the week and time of day. A regression model using weekdays and weekends, location on the trail, and temperature variables explained 80% of the daily use variation. Model extrapolation with historical weather averages estimated annual traffic volumes at 1.46 million and 1.3 million for the two sites, and a combined total annual miles traveled of 3.7 million (5.95 million km).
Molla et al. (2017)	USA	Green infrastructure	Focused group (Green infrastructure visitors)	M+F	Mix method Quantitative (structured questionnaires), Qualitative (key informant interview)	No	Yes (random sampling)	400	Descriptive statistics ANOVA Tukey Post-Hoc Test	Green corridors in Hawassa, urban parks in Wolayita Sodo and Bodity Stadium in Bodity town was the most frequently visited GI types. Recreational, physical and social activities were the main reasons for visiting urban green infrastructure in the study area. This study also confirmed that availability of facilities, attractiveness, safety and other public services make a difference in the frequency of visits of green infrastructure in the study area.

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Appendix 1 *(continued)*

Author	Region	Types	Sample characteristics		Data collection		Sampling		Data analysis	Findings
			Respondent	Gender	Data collection methods	Landscape stimulus used	Sampling method described	Sample size (N)	Data analysis approach described	
Weber et al. (2017)	USA	Greenway	Neighbourhood residents	M+F	Quantitative Door to door questionnaire survey	No	Yes (systematic random sampling)	381	T-test	The top five most important neighbourhood concerns were crime, property taxes, vandalism, property values, and places for outdoor recreation. The BeltLine was perceived by residents to be improving property values, places for outdoor recreation, and social spaces for gathering, while slightly increasing litter, crime, vandalism, and property taxes.
Sever & Verbič, (2018)	UK	Recreational Trail	Users'	M+F	Quantitative Face to face Survey	Photograph	Yes (random sampling)	498	LR test chi-square statistic pseudo t- test	Non-visual sensory experiences of nature, namely fresh air and soundscape were generally more important to trail users than visual experiences. Crowding was detected as an important characteristic of trail experience; however, trail users were willing to tolerate relatively high levels of crowding.
Keith et al. (2018)	USA	Greenway	Users'	M+F	Mix method Observation and Quantitative Intercept survey	No	Yes (stratified random sampling)	934	Descriptive Regression Chi-square tests, t-tests	Result reveals that exercising and escaping the stress of city life were the top motivations for visiting both trails, and safety and security were rated as top concerns among visitors (particularly women and racial/ethnic minorities). Both trails attracted substantial numbers of racial/ethnic minorities, with Hispanics and other non-white users representing about 55% of Leon Creek Greenway and 32% of Eastside Trail visitors. Social nature-based motivations were more common among these user groups.
Sever & Verbič, (2018)	UK	Recreational Trail	Users'	M+F	Quantitative Face to face Survey	Photograph	Yes (random sampling)	498	LR test chi-square statistic pseudo t- test	Non-visual sensory experiences of nature, namely fresh air and soundscape were generally more important to trail users than visual experiences. Crowding was detected as an important characteristic of trail experience; however, trail users were willing to tolerate relatively high levels of crowding.

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Appendix 1 *(continued)*

Author	Region	Types	Sample characteristics		Data collection		Sampling		Data analysis	Findings
			Respondent	Gender	Data collection methods	Landscape stimulus used	Sampling method described	Sample size (N)	Data analysis approach described	
Keith et al. (2018)	USA	Greenway	Users'	M+F	Mix method Observation and Quantitative Intercept survey	No	Yes (stratified random sampling)	934	Descriptive Regression Chi-square tests, t-tests	Result reveals that exercising and escaping the stress of city life were the top motivations for visiting both trails, and safety and security were rated as top concerns among visitors (particularly women and racial/ethnic minorities). Both trails attracted substantial numbers of racial/ethnic minorities, with Hispanics and other non-white users representing about 55% of Leon Creek Greenway and 32% of Eastside Trail visitors. Social nature-based motivations were more common among these user groups.
Palardy et al. (2018)	USA	Greenway	Neighbourhood residents	M+F	Quantitative survey	No	Yes (systematic census-guided random sampling	498	chi-square statistic	The results explained 62% of the variance in support for the Atlanta BeltLine with four of the five antecedents being significant. Implications suggest that support for greenways is more than just a function of frequency of use, but a complicated mix of use and perceptions of the trail's economic benefits and empowerment.

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Appendix 2 : Quality ratings

Author	Preamble	Introduction	Design	Sampling	Data Collection	Ethical Matters	Results	Discussion	Total score	Corresponding (%)
Bownsonr et al.(2000)	4	4	3	5	4	2	3	4	29	73%
Shaferet al.(2000)	2	3	3	5	4	2	4	3	26	65%
Troped et al.(2001)	3	2	4	5	5	2	5	4	30	75%
Merom et al.(2003)	4	3	3	5	4	0	4	4	27	68%
Reed et al. (2004)	4	4	3	4	4	2	3	4	28	70%
Gobster & Westphal (2004)	3	4	4	4	3	3	4	3	28	70%
Lindsey & Nguyen (2004)	3	4	3	5	4	3	4	3	29	73%
Evenson et al.(2005)	4	4	3	4	4	2	3	4	28	70%
Troped et al.(2005)	4	3	4	3	4	3	4	4	29	73%
Librett, et al. (2006)	3	3	3	4	4	1	3	3	24	60%
Lindsey et al. (2006)	3	3	3	3	5	1	4	3	25	63%
Krizek & Johnson (2006)	2	3	4	4	4	1	4	4	26	65%
Frank et al. (2006)	3	3	4	3	4	3	4	3	27	68%
Brown et al. (2007)	3	5	4	3	3	0	4	3	25	63%
Krizek at al. (2007)	3	4	3	3	4	2	3	4	27	65%
Reynolds et al. (2007)	4	4	4	4	4	2	4	4	30	75%
Troped et al. (2009)	5	3	4	4	4	3	4	4	31	78%
Spruijt-metz et al. (2009)	4	4	4	4	4	2	4	4	30	75%
Town et al. (2010)	5	4	4	3	4	0	4	4	28	70%
Reichhart & Arnberger (2010)	4	4	4	3	4	2	4	4	29	73%
Gordon et al. (2010)	4	4	4	4	4	2	4	3	29	73%
Wolch et al. (2010)	2	3	4	4	4	1	3	3	24	60%
Wolf & Fitzhugh (2011)	3	2	3	3	4	1	4	4	24	60%
Coutts & Miles (2011)	3	4	3	3	4	1	4	4	26	65%
Maslow et al. (2012)	3	4	3	4	4	2	4	4	28	70%
Price et al. (2012)	4	4	3	4	4	2	4	4	29	73%
Moore et al. (2012)	4	3	3	3	4	1	4	4	26	65%
Deenihan et al. (2013)	3	4	3	3	3	1	4	3	24	60%
Deyo et al. (2014)	3	4	3	4	4	1	4	3	26	65%
Weber et al. (2014)	4	3	3	3	3	2	4	4	26	65%
Verli & Arnberger (2015)	4	5	3	4	4	3	4	4	31	78%

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Author	Preamble	Introduction	Design	Sampling	Data Collection	Ethical Matters	Results	Discussion	Total score	Corresponding (%)
Hughey et al. (2015)	4	4	3	3	4	2	2	4	26	65%
Rodríguez et al. (2015)	3	4	3	3	4	3	4	4	28	70%
Akpinar (2016)	4	4	3	4	4	1	4	4	28	70%
Mieno et al. (2016)	4	4	3	4	4	2	4	4	29	73%
Honold et al. (2016)	4	4	4	3	4	3	4	4	30	75%
Liu et al. (2016)	4	4	3	2	4	2	4	4	27	65%
Zhai & Baran (2017)	4	4	4	3	4	1	4	4	28	70%
Greer et al. (2017)	4	5	3	4	4	2	4	3	29	73%
Gobster et al. (2017)	4	4	3	4	4	2	3	4	28	70%
Molla et al. (2017)	4	3	4	4	4	3	4	3	29	73%
Weber et al. (2017)	4	4	3	4	4	3	4	4	29	73%
Sever & Verbič, (2018)	5	4	4	3	4	1	4	4	29	73%
Keith et al. (2018)	4	4	3	4	4	2	4	4	29	73%
Palardy et al. (2018)	4	4	4	3	4	2	3	4	28	70%

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Appendix 3 : Quantitative survey questionnaire.

Research Site : 1 / 2 No/ Bil: _____
Kawasan Kajian : 1 / 2

INVESTIGATION ON THE USABILITY AND CONTRAINTS OF URBAN GREEN NETWORKS AMONG KLANG VALLEY RESIDENTS

KAJIAN TERHADAP KEBOLEHGUNAAN DAN KEKANGAN TERHADAP RANGKAIAN HIJAU BANDAR DALAM KALANGAN PENDUDUK LEMBAH KLANG

QUESTIONNAIRE FORM

BORANG SOAL SELIDIK

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Dear Respondent,

I am conducting a research entitled "**INVESTIGATION ON THE USABILITY AND CONTRAINTS OF URBAN GREEN NETWORKS AMONG KLANG VALLEY RESIDENTS**" as partial fulfilment of the requirements for the degree of Doctor of Philosophy in Landscape Architecture, UPM. Urban green networks are linear open spaces that are managed for conservation, recreation, and/or alternative transportation uses. In this connection, I request you to fill-up this form which is part of the survey. Your responses will help the city manage the green networks for your use and enjoyment. Please take a few minutes to complete this questionnaire. Your help is voluntary, and responses are anonymous and confidential. The success of the survey depends very much on the reliability of your answer; hence please answer all questions as honestly as possible.

Yours sincerely,

Pa Theebaa Paneerchelvam
PhD Student
Faculty of Design and Architecture
University Putra Malaysia
43400 Serdang,
Selangor Darul Ehsan

Para Responden,

Saya sedang menjalankan kajian bertajuk "**KAJIAN TERHADAP KEBOLEHGUNAAN DAN KEKANGAN TERHADAP RANGKAIAN HIJAU BANDAR DALAM KALANGAN PENDUDUK LEMBAH KLANG**" sebagai memenuhi sebahagian daripada keperluan untuk ijazah Doktor Falsafah dalam Seni Bina Landskap, UPM. Rangkaian hijau ini adalah ruang terbuka linear yang diuruskan untuk pemuliharaan, rekreasi, dan / atau kegunaan pengangkutan alternatif. Sehubungan ini, saya meminta anda mengisi borang ini yang merupakan sebahagian daripada satu kaji selidik. Maklum balas anda akan membantu bandar ini menguruskan rangkaian hijau untuk kegunaan dan kesenangan anda. Sila luangkan beberapa minit untuk menjawab soal selidik ini. Bantuan anda adalah secara sukarela, dan maklum balas adalah tidak bernama dan rahsia. Kejayaan kaji selidik ini bergantung kepada kebolehpercayaan jawapan anda. Oleh itu, sila jawab semua soalan dengan sejujur yang mungkin.

Yang benar,

Pa Theebaa Paneerchelvam
Pelajar PhD
Fakulti Reka bentuk dan Senibina
Universiti Putra Malaysia
43400 Serdang,
Selangor Darul Ehsan

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SECTION A: DEMOGRAPHIC INFORMATION
BAHAGIAN A: MAKLUMAT DEMOGRAFI

This section of the questionnaire refers to your background information. Although we are aware of the sensitivity of the questions in this section, the information will allow us to compare groups of respondents.
Bahagian soal selidik ini merujuk kepada maklumat latar belakang anda. Walaupun kami sedar bahawa soalan-soalan dalam bahagian ini agak sensitif, maklumat yang diperoleh akan membolehkan kami membuat perbandingan antara kumpulan-kumpulan responden.

1. Phone number (just in case further inquiry): _____

   *Nombor telefon (jika kenyataan lanjut diperlukan):*_____

2. Year you were born: _____

   Tahun anda dilahirkan:_____

3. Gender / *Jantina*
   ☐ Male / *Lelaki*
   ☐ Female / *Perempuan*

4. Ethnicity / Bangsa
   ☐ Malay / *Melayu*
   ☐ Chinese / Cina
   ☐ Indian / *India*
   ☐ Others / *Lain- Lain* (specify/ *nyatakan*): _____

5. Education level / *Tahap pendidikan*
   ☐ No formal education / *Tidak mendapat pendidikan formal*
   ☐ Primary / *Sekolah rendah*
   ☐ Secondary / *Sekolah menengah*
   ☐ Certificate / *Sijil*
   ☐ Diploma / *Diploma*
   ☐ Degree/ Master/ PhD / *Sarjana Muda/ Sarjana/ Doktor Falsafah*

6. Occupation / *Pekerjaan*
   ☐ Government servant / *Penjawat awam*
   ☐ Private / *Pekerja swasta*
   ☐ Self-employment / *Kerja sendiri*
   ☐ Student / *Pelajar*
   ☐ Not working / Tidak berkerja
   ☐ Others / Lain-lain (specify/ nyatakan):

   _____

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7. What is your monthly income (RM)? / *Apakah pendapatan bulanan anda (RM)?*
   ☐ Below 1000 / *kurang daripada 1000*
   ☐ In between 1000 -2000/ *di antara 1000- 2000*
   ☐ In between 2001 -3000 / *di antara 2001- 3000*
   ☐ In between 3001 -4000 / *di antara 3001- 4000*
   ☐ Above 4001 / *lebih daripada 4001*

8. Are you staying around this area? / *Adakah anda menetap di kawasan ini?*
   ☐ Yes / Ya
   ☐ No / *Tidak* (specify which area / *nyatakan kawasan mana*):

   _____

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SECTION B: USABILITY PATTERN
BAHAGIAN B: CORAK KEGUNAAN

1. How many times have you visited this green network in the past month?
   Sudah berapa kali anda melawat rangkaian hijau ini dalam tempoh sebulan yang lepas, termasuklah hari ini?
   ☐ 1-2 times per year / *1-2 kali setahun*
   ☐ 1-2 times per month / *1-2 kali sebulan*
   ☐ 1-2 times per week / *1-2 kali seminggu*
   ☐ Daily/ *setiap hari*
   ☐ Never / *Tidak pernah* (*if never go to question 9/ *jika tidak pernah pergi ke soalan 9*)

2. How does your use of this green network change during six-month period?
   Please tick (√) ONE
   Bagaimana kadar perubahan penggunaan rangkaian hijau ini dalam tempoh enam Enam bulan terdahulu?
   Sila tandakan (√) pada SATU pilihan
   ☐ Decreases / *Berkurangan* (Specify why / *Nyatakan mengapa*)_____
   ☐ Does not change / *Tidak berubah*
   ☐ Increases / *Meningkat*

3. When do you mainly visit this green network?
   Bilakah anda sering melawat rangkaian hijau ini ?
   ☐ Weekend / *Hujung minggu*
   ☐ Weekdays / *Hari biasa*
   ☐ Holidays / *Cuti umum*
   ☐ Special events / *Acara khas*
   ☐ Others / *Lain-lain*: _____

4. When is your preferred time to visit this green network?
   Bilakah waktu kegemaran anda untuk melawat rangkaian hijau ini?
   ☐ Morning / *Pagi*
   ☐ Afternoon / *Tengah hari*
   ☐ Evening / *Petang*
   ☐ Night / *Malam*
   ☐ Others / *Lain-lain:* _____

   Please state the reason / *Sila nyatakan alasan* _____

5. How much time will you spend on the green network today?
   Berapa lama anda akan luangkan di rangkaian hijau pada hari ini?
   ☐ 30 minutes / 30 minit
   ☐ more than 30 minutes / *lebih daripada 30 minit*
   ☐ one hour / *satu jam*
   ☐ more than one hour / *lebih daripada satu jam*
   ☐ 2 hours / *dua jam*
   ☐ more than two hours / *lebih daripada dua jam*

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6. With whom you come to this green network?
Dengan siapa anda datang untuk rangkain hijau ini?
☐ Alone / *Seorang*
☐ Family members / *Ahli keluarga*
☐ Friends / *Kawan-kawan*
☐ Others / *Lain- lain* (specify / *nyatakan*):
_____

7. How would you normally "travel" to this green network?
Bagaimanakah selalunya anda datang ke rangkaian hijau ini?
☐ On foot / *Berjalan*
☐ Bicycle / *Berbasikal*
☐ Motorcycle/ *Motorsikal*
☐ Car / *Kereta*
☐ Public transport / *Kenderaan awam*
☐ Others / *Lain- lain* (specify / *nyatakan*): _____

8. Aproximately **HOW LONG** does your journey take to this green network?
BERAPA LAMA *tempoh perjalanan anda ke rangkaian hijau ini?*

(specify / *nyatakan*): _____

9. Please check **ONE** the activity you participated in during your visit to the green network today or if you never what is your preferred activity?
*Sila tandakan **SATU** aktiviti yang anda ingin sertai sewaktu anda di rangkaian hijau pada hari ini.Jika anda tidak pernah apa aktiviti pilihan anda?*
☐ To get fresh air / *Untuk menikmati udara segar*
☐ To reduce stress and relax / *Untuk mengurangkan tekanan dan santai*
☐ To exercise, keep in shape / *Untuk bersenam, kekal sihat*
☐ To do something together with family or friends /
Untuk beraktiviti bersama keluarga atau kawan
☐ To enjoy nature / *Untuk menikmati alam sekitar*
☐ Jogging / *Berlari anak*
☐ Cycling / *Berbasikal*
☐ skateboarding / *Bermain papan selaju*
☐ Walking / *Berjalan*
☐ Dog walking / *Membawa anjing peliharaan berjalan-jalan*
☐ To obtain quiet and peace without any noise /
Untuk menikmati suasana sunyi dan tenang
☐ To take shortcut / *Jalan pintas*
☐ To travel to other places / *Untuk menuju ke tempat lain*
(Specify where / *nyatakan di mana*): _____
☐ To meet people / *untuk bertemu orang lain*
☐ Others / *Lain-lain* (Specify / *nytakan*): _____

10. Where are you usually going when you use the green network? (Check **ONE** that apply)
*Ke mana kebiasaannya tempat tujuan anda ketika anda menggunakan rangkaian hijau? (Tanda pada **SATU** yang berkenaan)*
☐ Park / *Taman*
☐ Work / *Ke tempat kerja*
☐ Restaurant, store, etc. / *Restoran, kedai, dll*
☐ School / *Sekolah*
☐ Religious place / *Tempat beribadat*

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☐ Shopping Mall/ Pusat membeli belah
☐ Other / Lain-lain (specify / nyatakan): _____

11. How **IMPORTANT** are the following factors to you during your visit to the green network? (Circle ONE response for each item)
*Apakah tahap **KEPENTINGAN** faktor-faktor berikut kepada anda ketika anda melawat rangkaian hijau? (Bulatkan SATU pilihan untuk setiap item)*

No	Items / *Item*	**Not at All Important** /*Tidak Penting*	**Slightly Important** / *Kurang Penting*	**Moderately Important** / *Agak Penting*	**Very Important** / *Sederhana Penting*	**Extremely Important** / *Sangat Penting*
11 (a)	**Spending time with family and/or friends** / *Meluangkan masa bersama keluarga dan/atau kawan*	1	2	3	4	5
11(b)	**Resting, relaxing, and escaping city life** / *Berehat, santai, dan mengelak dari kesibukan bandar*	1	2	3	4	5
11(c)	**Exercising and being physically active** / *Bersenam dan aktif secara fizikal*	1	2	3	4	5
11(d)	**Discovering and experiencing nature** / *Meneroka dan menikmati alam sekitar*	1	2	3	4	5
11(e)	**Getting to and from places I want to be** / *Menuju dan pulang dari tempat yang saya kehendaki*	1	2	3	4	5
11(f)	**Accessibility of the green network**) / *Mudah untuk menggunakan rangkaian hijau*	1	2	3	4	5
11(g)	**Condition and maintenance of green network** / *Keadaan dan pengurusan rangkaian hijau*	1	2	3	4	5
11(h)	**Connections to attractions/points of interest** / Menghubungkan antara tempat menarik/tarikan pelancong	1	2	3	4	5
11(i)	**Safety and security along the green network** / Keselamatan dan jaminan sepanjang rangkaian hijau	1	2	3	4	5
11(j)	**Natural scenery along the green network** / Pandangan semula jadi sepanjang rangkaian hijau	1	2	3	4	5

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SECTION C: USER'S CONSTRAINTS
BAHAGIAN C: KEKANGAN PENGGUNA

1. Which are the from following constraints is a reason that **KEEPS YOU** from visiting green network? (Circle ONE response for each item)
*Antara kekangan berikut, yang manakah suatu sebab yang **MENGHALANG ANDA** daripada melawat rangkaian hijau? (Bulatkan SATU pilihan untuk setiap item)*

No	Items/ *Item*	**Not a reason /** *Bukan penyebab*	**Somewhat a reason /** *Mungkin penyebab*	**Neutral /** *Neutral*	**Minor reason /** *Penyebab*	**Major reason /** *Penyebab utama*
1 (a)	**Feeling unsafe** / *Rasa tidak selamat*	1	2	3	4	5
1 (b)	**Lack of sports facilities** / *Kekurangan kemudahan bersukan*	1	2	3	4	5
1 (c)	**Bad condition of the paths (e.g. broken path)** / *Keadaan laluan yang kurang sempurna (contoh: laluan yang retak)*	1	2	3	4	5
1 (d)	**Dense vegetation** / *Tumbuh-tumbuhan terlalu tebal*	1	2	3	4	5
1 (e)	**Poorly maintained (rubbish, grass not mown, fallen branches and twigs etc.)** / *Tidak diurus dengan baik (sampah sarap, rumput panjang, timbunan ranting dan dahan patah, dll.)*	1	2	3	4	5
1 (f)	**This area does not offer activities I want** / *Kawasan ini tidak menawarkan aktiviti yang saya mahu*	1	2	3	4	5
1 (g)	**No facilities (sitting bench, gazebo)** / *Tiada kemudahan (kerusi, gazebo)*	1	2	3	4	5
1 (h)	**No toilets** / *Tiada tandas*	1	2	3	4	5
1 (i)	**There are too many people here** / *Terlalu ramai orang di sini*	1	2	3	4	5
1 (j)	**The bus and train don't come here** / *Bas dan kereta api tidak melalui kawasan ini*	1	2	3	4	5
1 (k)	**This area does not have enough trees and grass** / *Kawasan ini kurang ditumbuhi pokok rendang dan rumput hijau*	1	2	3	4	5
1 (l)	**The weather is too hot** / *Cuaca terlalu panas*	1	2	3	4	5
1(m)	**Amount of litter/graffiti** / *Banyak sampah/grafiti*	1	2	3	4	5
1 (n)	**Poor accessibility from one place to another place** / *Sukar untuk bergerak dari satu tempat ke tempat lain*	1	2	3	4	5
1 (o)	**Not well connected** / *Kurang terhubung*	1	2	3	4	5
1 (p)	**No shade along the green network** / *Tiada tempat teduh sepanjang rangkaian hijau*	1	2	3	4	5

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1 (q)	**Not aware of existence of green network** / *Tidak tahu kewujudan rangkaian hijau*	1	2	3	4	5
1 (r)	**Not enough space to cycle/ jog/ walk** / *Kekurangan kawasan untuk berbasikal/berlari anak/berjalan*	1	2	3	4	5
1 (s)	**Presence of beggars/ drug addicts** / *Kehadiran peminta sedekah/penagih dadah*	1	2	3	4	5
1 (t)	**Presence of foreigners** / *Kehadiran ramai orang asing / Kehadiran ramai orang asing*	1	2	3	4	5
1(u)	*Crowded / Sesak*	1	2	3	4	5
1 (v)	**Physically disable** / not in good health condition / *Kurang upaya fizikal/kurang sihat*	1	2	3	4	5

Others / Lain-lain (specify / nyatakan):

THANK YOU FOR YOUR TIME & COOPERATION

TERIMA KASIH KERANA SUDI MELUANGKAN MASA & MEMBERI KERJASAMA

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Appendix 4 : Studies reporting attributes that were investigated for use and associated constraint in urban green network.

Attributes	Personal attributes							
		Gender	Age	Ethnic/race	Socio economic level	Education level	Household type	Physical limitation
1	Bownsonr et al. (2000)	*	*	*	*	*		
2	Shafer et al. (2000)	*	*	*	*	*		
3	Troped et al. (2001)	*	*	*	*	*		*
4	Merom et al. (2003)	*	*	*				
5	Reed et al. (2004)	*	*	*	*	*		
6	Gobster & Westphal, (2004)	*	*	*	*		*	
7	Lindsey & Nguyen, (2004)	*	*	*	*			
8	Evenson et al. (2005)	*	*	*	*	*		*
9	Troped et al. (2005)	*			*			
10	Librett et al., (2006)	*	*	*	*	*	*	
11	Lindsey et al., (2006)	*	*		*	*		
12	Krizek & Johnson (2006)		*		*		*	
13	Frank et al. (2006)	*	*	*	*	*	*	
14	Brown et al.2007)	*						
15	Krizek et al. (2007)	*	*	*				*
16	Reynolds et al. (2007)	*	*	*	*			
17	Spruijt-metz et al. (2009)	*	*	*	*	*	*	*
18	Troped et al. (2009)	*	*	*		*		
19	Gordon et al. (2010)	*	*	*	*	*		
20	Town et al. (2010)	*	*					
21	Reichhart & Arnberger (2010)	*	*					
22	Wolch et al. (2010)		*	*	*	*	*	
23	Wolf & Fitzhugh (2011)	*						
24	Coutts & Miles (2011)	*	*	*				
25	Maslow et al. (2012)	*	*	*		*		
26	Price & Reed (2012)	*	*	*				
27	Moore et al. (2012)	*	*					
28	Deenihan et al. (2013)	*	*					
29	Deyo et al. (2014)	*				*		

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30	Weber et al. (2014)	*	*					
31	Verli & Arnberger (2014)	*	*					
32	Hughey et al. (2015)	*	*	*		*		*
33	Rodríguez et al. (2015)	*	*					
34	Akpinar (2016)	*	*		*	*		
35	Liu et al. (2016)	*						
36	Mieno et al. (2016)	*	*					
37	Honold et al. (2016)	*	*	*	*	*	*	*
38	Greer et al. (2017)	*						
39	Zhai & Baran (2017)	*	*					
40	Gobster et al. (2017)	*		*	*			
41	Molla et al. (2017)	*	*	*	*	*	*	
42	Weber et al. (2017)	*	*	*	*	*	*	
43	Sever & Verbič (2018)	*	*			*		
44	Keith et al (2018)	*	*	*		*		*
45	Palardy et al. (2018)	*	*	*	*	*	*	
	Total	**43**	**38**	**26**	**22**	**22**	**10**	**7**

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BIODATA OF STUDENT

The student was born in Alor Setar, Kedah, on 8 October 1984. She attended her primary school in Kedah at SJKT Barathi and secondary schools at ST.Nicholas Convent. She then joined Politeknik Sultan Haji Ahmad Shah (Polisas), and completed her Diploam in Architecture. Soon after her graduation she started work as a draft person at Ng Arkitek dan Rakan-Rakan in Kedah for a year, then she continued to work in another Interior Design firm as a junior designer. In 2011, she continued to study and completed her Bachelor Degree in Interior Architecture at Limkokwing University of Creative Technology. Upon her completion, she was offered to work as a tutor in Limkokwing University of Creative Technology. After 3 years of experience in tutoring she was later promoted as a lecturer. In 2012, she pursued her Master degree (Environmental Science) and graduated in 2016 at University Putra Malaysia. While studying, she was also involved in a few interior architecture projects such as: restaurant, boutique hotels and home interiors. After her Master Degree, she enrolled herself to continue her PhD study in Design and Architecture faculty at University Putra Malaysia. Pa Theebaa is married to Kalai Kumaran with two children; a daughter and a son.

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