RECLASSIFICATION OF URBAN OPEN GREEN SPACES FOR KUALA LUMPUR, MALAYSIA

MEHDI RAKHSHANDEHROO

FRSB 2016 5

RECLASSIFICATION OF URBAN OPEN GREEN SPACES FOR KUALA LUMPUR, MALAYSIA

By

MEHDI RAKHSHANDEHROO

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

June 2016

DEDICATION

This thesis is dedicated to:

My lovely wife for her patience and motivation;

My son who is my future;

My mother who nurtured me from childhood;

My father the most influential person in my life.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the Degree of Doctor of Philosophy

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Chairman : Mohd Johari Bin Mohd Yusof, PhD
Faculty : Design and Architecture

Urban open green spaces are not only at the top of the agenda of sustainability, but also play an important role in improving the livability of our town environments, But the steady increase in urban populations and expansion of urban areas has put pressure on existing urban open green spaces. As growth of built-up areas has continued to occupy areas referred to as open green spaces, it almost seems as if these spaces have been left undefined in order to accommodate their subsequent takeover. Therefore, recognizing or adopting a suitable classification of open green spaces is an important early stage in the procedure of conservation because different types of open green space may provide different, but partly overlapping sets of social, environmental, health and economic benefits to the citizens.

This study involved a mixed research method to combine the strengths of both quantitative and qualitative methods by merging data. This integration is a combination of the qualitative data in the form of texts with the quantitative data in the form of numeric information (tables and charts). This methodology consists of five stages: Review of literature, Semi-structured interview (preliminary study), Qualitative questionnaire (in the 2nd round), and GIS mapping. Respondents were chosen from experts to elicit their opinions and determine the items of urban open green spaces classification.

The author established a new comprehensive classification of urban open green spaces for Malaysian cities which contains 39 types, 14 categories and five classes. Any approach to the protection of open green spaces would seem to require as a first step a reasonable comprehensive understanding of the current geographical distribution of the existing green spaces within the city. The data manipulation involved was carried out in ArcGIS which thus helped to illustrate the possibilities of land parcel data for mapping open green space and of exploring visually the effects of including the further types of landuse in mapping. Therefore, the landuse data acquired from DBKL were applied as raw data to see how far the various types of

comprehensive classification could be found in parcel-based data. A comparison of a current open green space map (prepared by DBKL) and a proposed map (based on suggested classification) reveals the number and area of open green spaces of KL are increased dramatically. Therefore these results are eligible to be applied and push urban policies in monitoring and preserving these many valuable spaces.

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

MERANGKA KLASIFIKASI BAHARU KAWASAN HIJAU BANDARAN UNTUK BANDAR-BANDAR DI MALAYSIA

Oleh

MEHDI RAKHSHANDEHROO

Jun 2016

Pengerusi : Mohd Johari Bin Mohd Yusof, PhD
Fakulti : Rekabentuk dan Seni Bina

Ruang urban hijau terbuka bukan sahaja menjadi keutamaan utama dalam agenda kemampanan, tetapi juga memainkan peranan yang penting dalam meningkatkan kebolehunian persekitaran bandar kita . Tambahan pula, mereka menentukan identiti pekan dan bandar , yang mana boleh meningkatkan daya tarikan mereka untuk hidup, berkerja , pelaburan dan pelancongan tetapi peningkatan yang stabil dalam populasi urban dan perluasan kawasan bandar telah memberikan tekanan kepada ruang bandar hijau terbuka yang sedia ada.

Oleh kerana pertumbuhan kawasan terbina telah bersambung bagi menduduki kawasan-kawasan yang disebut kawasan hijau yang terbuka , ia hampir kelihatan seolah-olah ruang ini telah ditinggalkan kosong untuk menampung pengambilalihan berikutnya. Oleh itu , mengiktiraf atau menerima pakai klasifikasi yang sesuai bagi kawasan hijau terbuka adalah peringkat awal yang penting dalam prosedur pemuliharaan kerana jenis ruang hijau terbuka boleh menyediakan sesuatu berbeza, tetapi sebahagiannya bertindih bagi set sosial, alam sekitar , kesihatan dan faedah ekonomi kepada rakyat.

Kajian ini melibatkan kaedah penyelidikan campuran untuk menggabungkan kekuatan kedua-dua kaedah kuantitatif dan kualitatif dengan menggabungkan data. Integrasi ini adalah gabungan data kualitatif dalam bentuk teks dengan data kuantitatif dalam bentuk maklumat berangka (jadual dan carta).

Metodologi ini terdiri daripada lima peringkat: Tinjauan literatur, temu bual separa berstruktur (kajian rintis) , soal selidik Kualitatif (dalam pusingan ke-2), dan pemetaan GIS. Responden dipilih daripada pakar untuk mendapatkan pandangan mereka dan menentukan item klasifikasi bagi kawasan bandar terbuka hijau

Pengkaji telah menubuhkan klasifikasi menyeluruh yang baru bagi ruang bandar hijau terbuka untuk bandar-bandar di Malaysia yang mengandungi 39 jenis, 14 kategori dan lima kelas. Mana-mana pendekatan untuk melindungi kawasan hijau terbuka sangat diperlukan sebagai langkah pertama pemahaman yang menyeluruh

dan munasabah bagi taburan geografi semasa kawasan hijau yang sedia ada di dalam bandar.

Manipulasi data yang terlibat telah dijalankan di ArcGIS yang mana telah membantu untuk menggambarkan kemungkinan data petak tanah untuk pemetaan kawasan hijau terbuka dan meneroka secara visual kesan-kesan termasuk kelas tambahan bagi penggunaan tanah dalam pemetaan. Oleh itu, data penggunaan tanah yang diperoleh daripada DBKL telah digunakan sebagai data mentah untuk melihat sejauh mana pelbagai jenis klasifikasi menyeluruh boleh didapati dalam data berasaskan petak.

Perbandingan bagi peta ruang terbuka hijau semasa (yang disediakan oleh DBKL) dan peta dicadangkan (berdasarkan klasifikasi dicadangkan) mendedahkan bilangan dan kawasan ruang terbuka hijau KL boleh meningkat secara mendadak. Mudah-mudahan , keputusan ini akan digunakan untuk menolak polisi urban dalam memantau dan memelihara ruang berharga ini yang banyak.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my supervisor, Dr. Mohd Johari Mohd Yusof for his continuous support of my Ph.D study and related research, for his motivation, immense knowledge and the many hours of his time which he generously spent on me. His guidance helped me through the duration of my research and writing of this thesis.

I would also like to thank my supervisory committee members: Assoc. Prof. LAr. Dr. Osman Mohd Tahir and Dr. Mohd Yazid Mohd Yunos, for their insightful comments and encouragement to strengthen my research from various perspectives.

My grateful thanks are due to other lecturers of the Faculty of Design and Architecture, UPM, who gave me the opportunity to attend their classes, workshops, seminars and answered my many questions patiently. I should also thank the faculty secretaries especially Mrs. Nursyida Mansorfor their cooperation.

Lastly, I would like to thank my classmates and friends who have motivated me not only during my Ph.D. journey but in life.

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy The members of the Supervisory Committee were as follows:

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Declaration by graduate student

I hereby confirm that:

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Declaration by Members of Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) were adhered to.

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CABE	Commission for Architecture and the Built Environment (London, England)
DBKL	Kuala Lumpur City Hall (Dewan Bandaraya Kuala Lumpur)
FDTCP	The Federal Department of Town and Country Planning, Peninsular Malaysia
IFLA	International Federation of Landscape Architects
JUPEM	National Mapping Agency, Malaysia
NRPA	National Recreation and Park Association
PPG17	Planning Policy Guidance Note 17
PPG	Planning Policy Guidance
PAN	Planning Advice Notes
UOGS	Urban Open Green Space

CHAPTER 1

INTRODUCTION

1.1 The Issue of the Research

Over the long history of human civilization, human being have always been inclined to seek peace and solace and developed an affinity with nature and a level of emotional and psychological dependency (Wuqiang et al., 2012).Human beings have appreciated greenery in their search for peace and serenity and have developed some physical and psychological affinity and dependency on nature. People depend on fresh air, natural attraction and pretty views which indicates public natural perception and social behavior. In current urban life pressure of work and study on the one hand and the growth of leisure time on the other, increase citizens' demand for open green spaces (Wuqiang, Song, & Wei, 2012; Gökyer, Bilgili, & Gökyer, 2012).

There is a growing body of empirical evidence indicating the presence of natural features such as gardens, urban parks, forests, and green belts with their particular components (trees, shrubs, water, and etc.) contribute to positive mood change (Abkar, Kamal, Mariapan, Maulan, & Sheybanic, 2010) and improve quality of life in many ways (Najafpour, Bigdeli Rad, Lamit, & Fitry, 2014). Green spaces community parks and gardens bring people together from different cultures and ages which therefore help in social sustainability, identity and neighborhood cohesion.

Planers and landscape architects have long recognized the vital role of open green space in the urban environment (Feda et al., 2014). Greening is realized to different extents in cities, subject to changing contemporary social attitude and political climate. The green city is an ideal of universal appeal that exceeds temporal, spatial and cultural divides (C.Y Jim, 2004; Hestmark, 2000). A city with high quality and large open green spaces, a healthy environment for human and wild life population, with an appropriate planning and management (Godefroid, 2001), encompass the ideal of a green city which is being challenged by the fast pace of urban population growth.

1.1.1 Urban Population

Globally, urban growth peaked in the 1950s, with the population expansion of more than three percent per year. The global urban population, between 2015 and 2030, is expected to grow at the rate of around 1.5% per year. The urban population will almost double by the middle of the 21st century and reach 6.4 billion in 2050. Most urban population increase will take place in developing countries. But in high income countries, the urban population is expected to remain mostly unchanged, although immigrants will make up more than two-thirds of the urban population over the next two decades.

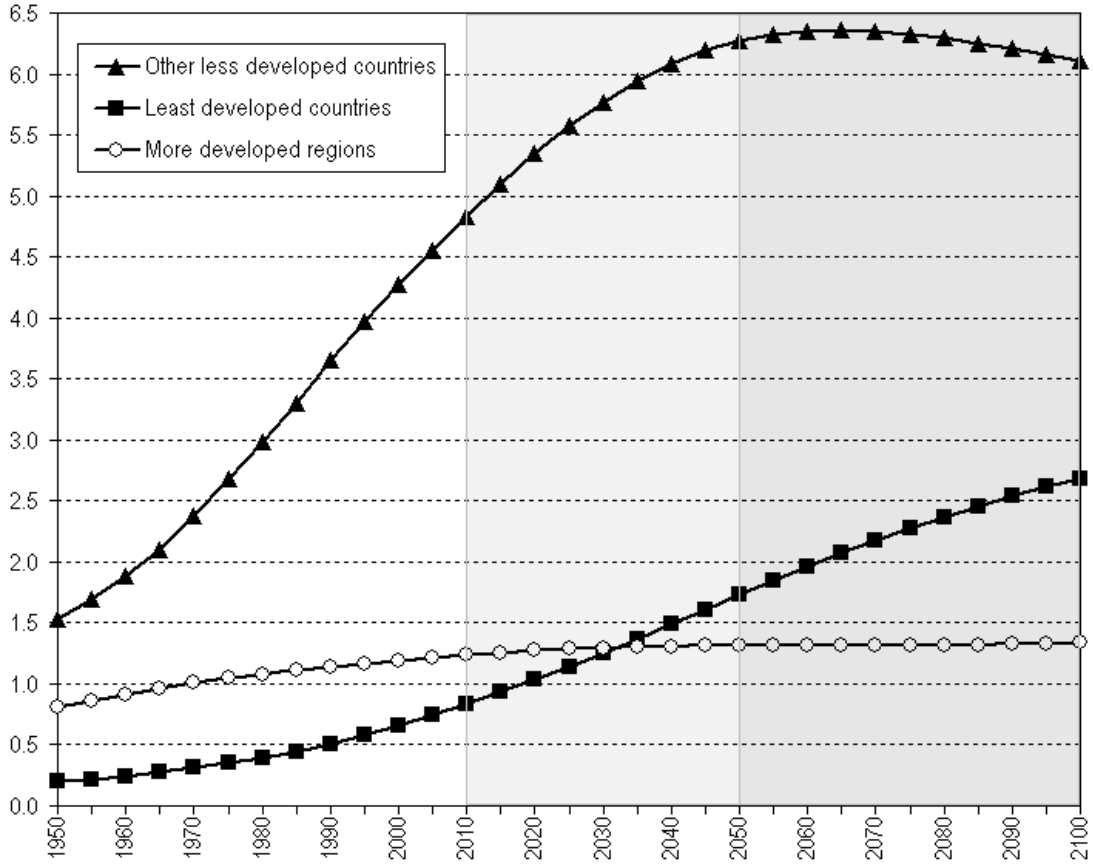

Figure 1.1 : Projected population growth rate by developing region, medium variant, 1950-2100 (billion).

(Source: http://esa.un.org/unpd/wpp/Analytical-Figures/ htm/ fig_3 .htm)

Figure 1.1 shows the population of more developed countries will remain mostly unchanged between 2011 to 2100, while the population of the least developed countries is projected to be more than triple at the same time. These contrasting trends are shaped because of different fertility levels in different regions. In more developed countries average fertility is estimated at 1.7 children per woman between 2005 and 2010, a number significantly below replacement level. Therefore, the average fertility does not surpass replacement level during the period from 2010-2100.

Figure 1.2 and Figure 1.3 present the percentage of urban population and agglomerations by size class in years 2011 and 2025. It is obvious that not only is the percentage of urban areas increasing fast, but also more of the population intend to live in mega cities in future. This phenomenon has a faster rhythm in developing countries (World population prospects, the 2012 revision UN).

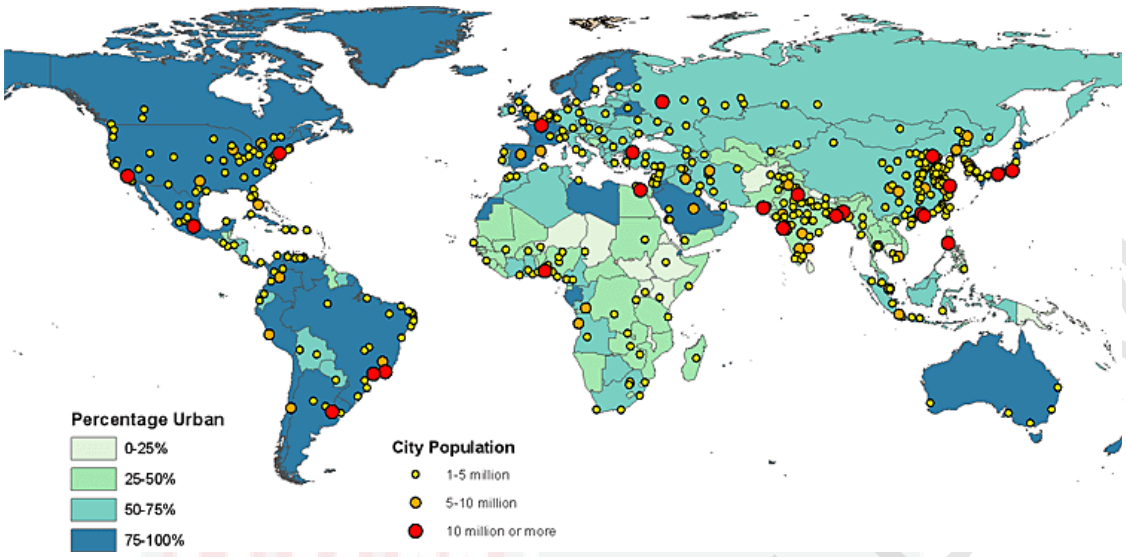

Figure 1.2 : Percentage of urban population and agglomeration by size class, 2011.

(Source: http://esa.un.org /unpd/wup/Maps/maps_urban_2011.htm)

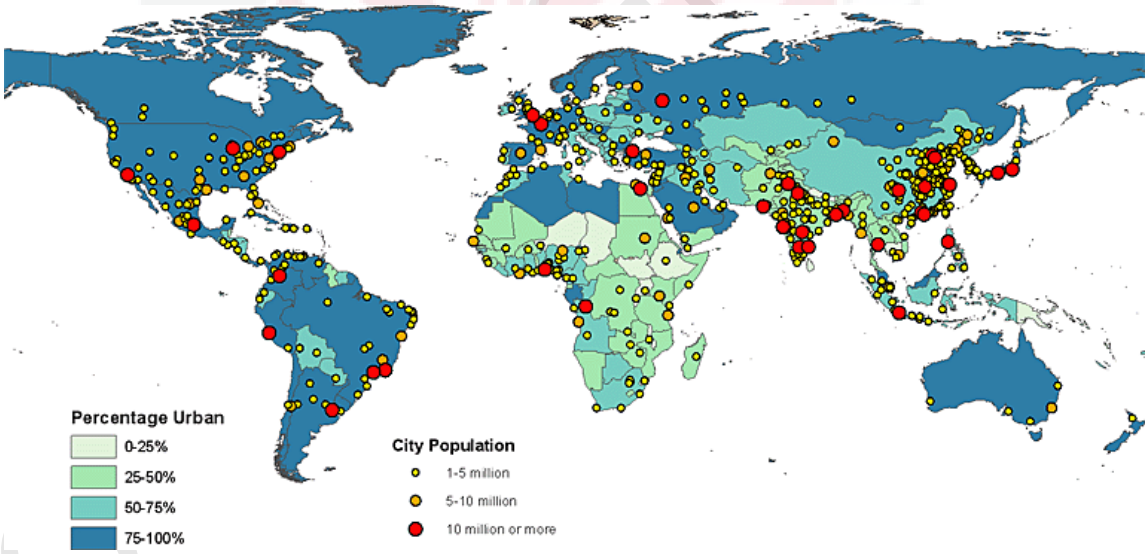

Figure 1.3 : Percentage of urban population and agglomeration by size class, 2025.

(*Source: http://esa.un.org /unpd/wup/Maps/maps_urban_2025.htm)*

The demographic transition from rural to urban is associated with a shift from agriculture-based economy, to mass industry, technology and service economies. One hundred years ago, two out of every 10 persons lived in cities, but nowadays for the first time ever, the majority of the world's population live in urban areas and this proportion continue to increase. By 2050, the proportion will grow to seven out of 10 persons. Urban population growth will take place in the main cities of developing countries. In most cities of developing countries the demands of meeting basic needs

and development objectives may overshadow environmental concerns and the sustainability of greenery (Jim, 2004).

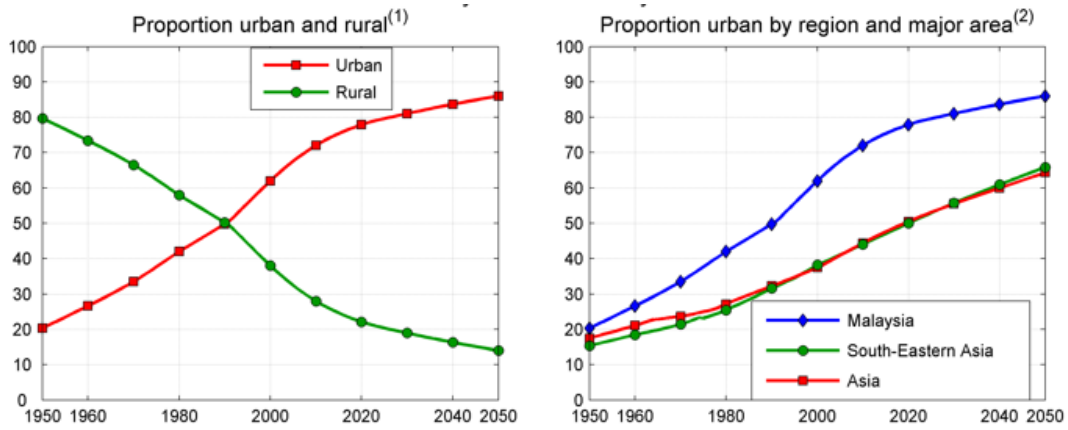

Figure 1.4 : Urban and rural pupuation in Malaysia by different ciriteria.
(Source: United nations department of economic and social affaires, population division: world urbanization prospects, the 2011 revision, New York, Updated: 25 April 2012, http://esa.un.org/unpd/wup/country-profiles/ country-profiles_1.htm, The size classes explained in the legend)

As is happening in many parts of the world the percentage of urban population in Malaysia is increasing, and at a rate that is faster than in the other parts of the world. Figure 1.4 explains the Malaysian context in two parts. Part one illustrates proportions of urban and rural populations in Malaysia from 1950 to 2050, and in per cent of the total population, it means from 1950 to 2050 the percentage of urban population will increase from 20 to more than 80%. Part Two illustrates proportion of urban population in Malaysia compared to South-east Asia and all Asia. The proportions are expressed in per cent of the population between 1950 and 2050 (World population prospects, the 2012 revision UN).

1.1.2 Significance of Open Green Space

Increasing demands from residents for better housing and lifestyle, which is supported by the prosperous and speculative real estate industry, have physically transformed urban space and led to new ways of planning, designing and management of the cities (M. Zérah & Landy, 2012). But in the process of transforming rural areas into urban areas, lifestyle changes with urbanization. While small open green spaces at a micro level, dominated by mass of concrete, an unnatural environment is created due to rapid urbanization (Gökyer et al., 2012). Since nature and landscape are crucially important to our quality of life (Woolley, 2003) and the majority of the population are going to settle down in urban areas, urban open green spaces are often at the center of the debate on urban sustainable design.

At the same time, changing lifestyles and a growing retirement-age population together with the desire for increased leisure activities, have placed increased demands on open green spaces, recreational lands and existing parks. As increasing numbers of baby boomers retire (especially in developed countries), the demand for facilities and programs targeted at senior citizens will grow. One of the greatest qualities of urban open green space is that one person's use of it does not restrict others from using or enjoying it (F. Li, Wang, Paulussen, & Liu, 2005). For instance when communities want to provide adequate facilities so over-weight people can have the opportunity to exercise (Enger, 2005).

Several international conventions, agreements and a variety of studies have addressed the issue of sustainable urban development. Jabareen (2006) identified seven significant concepts which are related to sustainable urban design. These are density, suitable transport, compactness, diversity, passive solar design, greening and mixed land use.

Open green space provides vital ecosystem services and public benefits so, in response to rapid land conversion (Wu, 2014), there is an emerging global consensus that open green spaces within cities and urban areas should be protected for the many amenities (Neil Stuart, Robert L. Hodgart, Mohd Johari Mohd Yusof, 2013). The green city is an ideal of global appeal, a city with high quality of vast open green spaces demonstrates a healthy environment for humans, good planning and management, vegetation and wildlife populations (Godefroid, 2001), and bestows pride on its government and citizenry (Jim, 2004). That is why over the past three decades research on urban open green space has flourished. There is now a considerable body of scholarly work on urban open green space, covering topics such as design, use of green space, green space values, environmental equity and so on (Byrne & Sipe, 2010).

The design, management, protection and provision of open green space is not only at the top of the agenda of sustainability, but it also plays important roles in enhancing the livability, further more they can define the identity of cities and towns, and improve the attraction for investment, living, working and also tourism, so they can positively contribute to the competitiveness of cities. They also offer a wide range of activities and diverse land uses (Baycan-Levent et al,, 2008). The quality and quantity of urban areas are mainly dependent on design, maintenance and management of public, open and green spaces. Open green spaces are not only a significant component in a residential area, but also in retail, leisure, commercial and other business developments (Tüzin Baycan-Levent & Nijkamp, 2009; Gökyer, 2012). On the other hand it should be noticed the Malaysian government has a vision of becoming the 'most beautiful garden nation' by 2020 and prepared a strategy to fulfil this goal.

When it comes to the benefits of urban open green space, we should be concerned with the services provided to promote human or societal well-being, either directly or indirectly. Benefit is defined as something that promotes well-being (Merriam-Webster, 2012) and well-being is defined as a positive social and mental state. It is enhanced by conditions that include supportive personal relationships, good health, healthy and attractive environment, financial and personal security, strong and

inclusive communities, and rewarding employment (Cláudia & José, 2012). A variety of benefits of urban open green spaces can be categorized in economic, social and environment terms and will be discussed thoroughly in the next chapter.

In order to find the research trend on the topic of open green spaces, the online Web of Science (the Tomson Reuters) was investigated on 17 March 2015. Proper keywords were chosen by literature review and preliminary study. These keywords were: "green space*", "greenspace*", "open space*", "green infrastructure" and "public space*" which were applied to search articles from Web of Science core collection in terms of topic (including four section: titles, abstract, author keywords, and keyword plus) within the publication year limited from 2001 to 2014, indices: SCI-EXPANDED, CPCI-SSH, SSCI, A&HCI and CPCI. 6106 publications met the selection criteria. However, these 6106 documents contained some documents not closely related to this thesis topic, therefore the result was refined by: "web of science categories: urban studies". A total 823 documents were therefore found, with 8612 times cited and with h-index 46. By using "Citation report tool" of this web site, the following charts emerged.

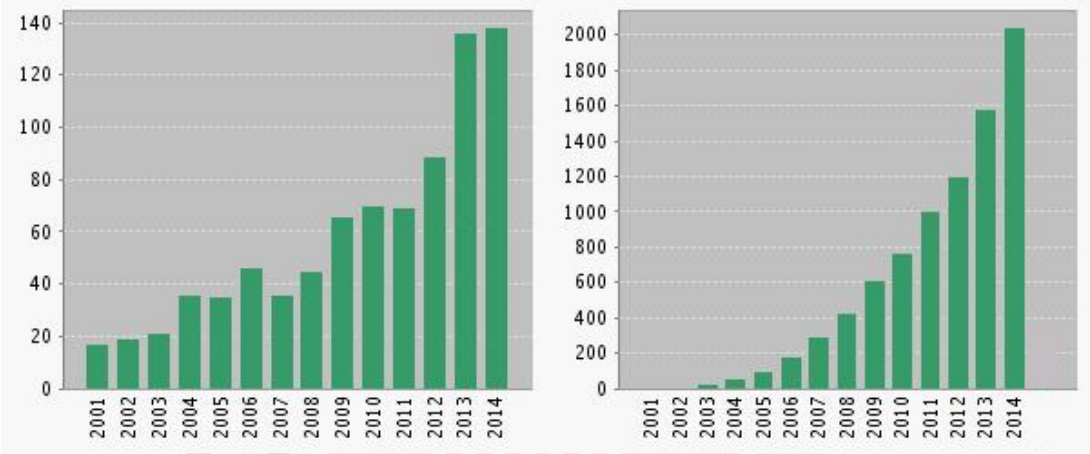

Figure 1.5 : Published items (left) and citations (right) about urban open green spaces from 2001 to 2014. ***(Source: Web of Science)***

On the left side of Figure 1.5 it is indicated that from 2001 to 2014 the number of papers increased continuously from near 20 to almost 140. The increased number of publications in the last two years was noticeable. The right side of the same figure displays citations of source items, indexed within the Web of Science core collection and explains the citation rate has dramatically increased from 2003 to 2014. All in all, total linear trend indicates a crucial increasing consideration for the topic of urban open green space among researchers and authors.

1.1.2.1 Sustainable Development

Fletcher (2004) states that open green space protection is the main issue of sustainable development. In order to achieve the objectives of sustainable development, some of these spaces should be allocated to public use.

The residents have very clear ideas on how much open green space is really important in residential areas in order to provide them with a sustainable residential environment (Hussain, Tukiman, Zen, & Shahli, 2014) so developers are required to provide greenery in each development undertaken. This is important for the fact that people need UOGS to perform outdoor activities while green areas are necessary to act as a buffer zone and green belt area.

Identifying important urban open green spaces and instituting an agenda for its protection prior to development can preserve productive urban farms and gardens, ensure vast recreational land and services for residents, and maintain the region's or community's natural, historic or cultural characters (Ahern, 1991).Open green space provision indirectly provides a balance between development and environmental needs. Therefore, it is clear that preservation of open green spaces is one of the right ways to achieve sustainable development, and preservation of such spaces is highly important to accomplish a better quality of life.

1.1.3 Research Gap

The main target of this research would be the creation of a new detailed and comprehensive classification for green spaces, despite the usual classification which is arranged according to particular criteria, as the author intended to integrate different criteria and develop a better and more practical classification.

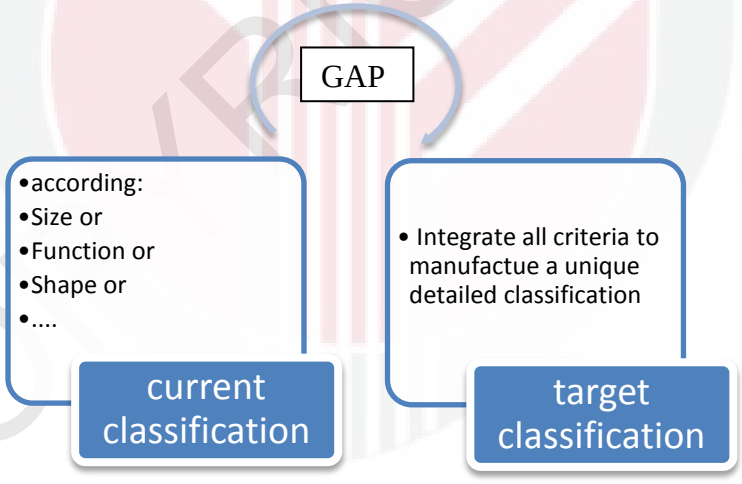

Figure 1.6 : First gap

On the other hand, this this research leads to bridge the gap which exists between the acreage of open green spaces in the current master (structure) plans, compared to the acreage of open green spaces that the cities target in their standards and policies.

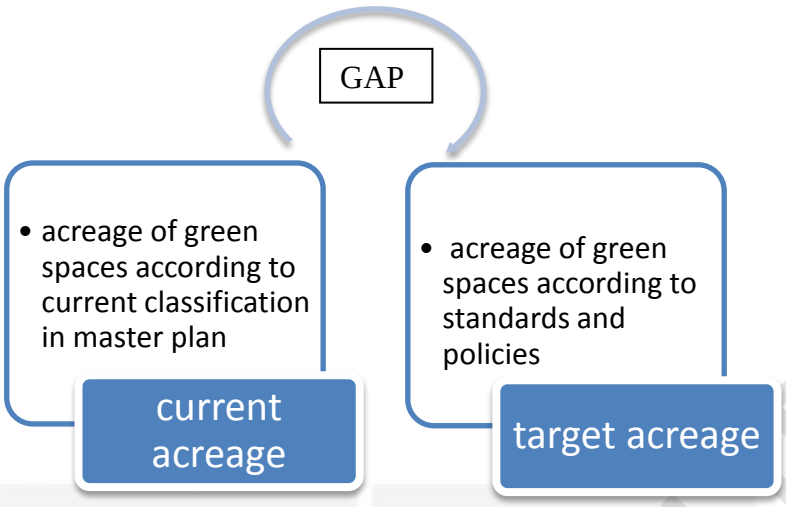

Figure 1.7 : Second gap

The last gap is a distinction between developed and developing countries. While the majority of problems like: rising urban population, urban expansion and open green space depletion usually take place in developing cities, they normally use developed cities' typology with some minor modification.

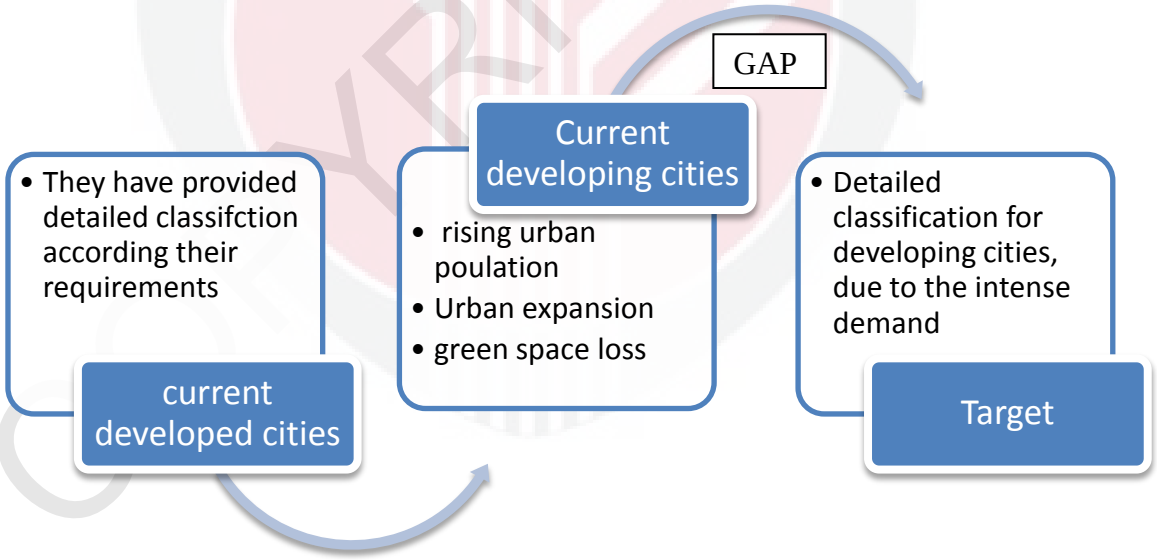

Figure 1.8 : Third gap

1.2 Problem Statement

Ecosystems are changing from the natural landscape to the global scales because of population growth and urbanization (Barnosky, 2012): on the other hand human activities are driving these changes and are threatening many of the ecological

services that are essential to society (Chapin III et al., 2011). The most fundamental human activities involve how we manage landuse and shape our cities (Steiner, 2014).

There are several issues related to urban open green spaces and its classification. The recent growth in urban population, expansion of urban areas, (UN-Habitat, 2012) changing lifestyle and approaches to develop existing sites through compact city concepts (Dempsey, 2005) put strong pressure on existing urban open green spaces for economic profits, and therefore causing the loss of these spaces (Jansson & Lindgren, 2012).

The rapid increase in the urban population especially in developing countries places further pressure on the developing sector, leading to decrease of the amount of accessible open green space (Zhou & Wang, 2011) and cause unbalanced priorities.

Statistics show that urban open green spaces are depleting at a faster rate in urban areas across the world. For example, a study conducted on changes in landuse in 25 European cities found between 7.3 and 41% of lands reserved for open green spaces have been lost to different landuses. Similarly, in USA, a study on landuse change in 274 metropolitan areas revealed a loss of about 1.4 million hectares of open green spaces to different land developments (McDonald, Forman, & Kareiva, 2010). In Africa, the situation is worse. Studies on several African countries revealed that there is intense pressure on open green spaces for different human activities resulting in persistent deterioration of these spaces especially in urban areas where the pressure is more profound (Mensah, 2014).

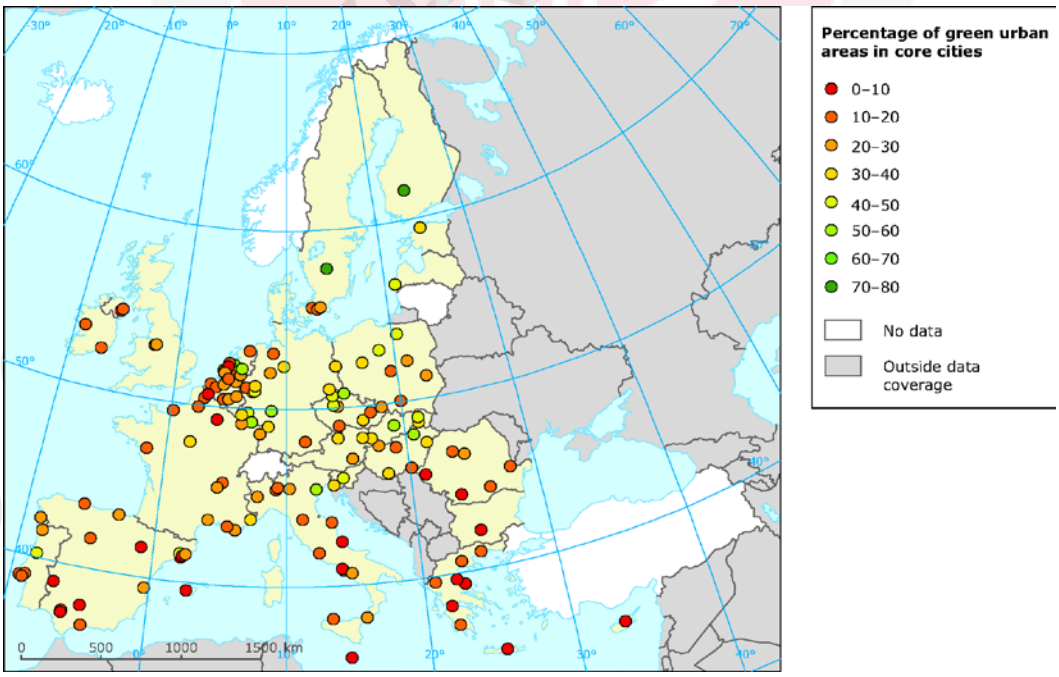

Figure 1.9 : Share of green urban areas in European cities.
(Source: European Environment Agency (EEA) http://www.eea.europa.eu/data-and-maps/figures/share-of-green-urban-areas)

The compact city takes place when a high proportion of land surface is covered by buildings, structures and other man-made surfaces (Burton, 2002). Many cities contains areas with high development density in down town or old urban core. Some other cities develop new compact area or redevelop exiting zones to a higher density that is why in developed countries more people choose to live in the urban fringe or rural areas (Wu, 2014).Urbanization gradually changes personal identities and human life as people adopt their behavior to cities (Spencer, 2014).

Urban planning is continuously faced with a conflict between pro-developmental approach and pro-environmental approach. It seems the environment is almost sacrificed in order to benefit urban development, mostly because open green spaces are seen as extravagant visual attribute of the city but not a necessary part. It has been thought there is not any financial value connected to the open greenspace, because it is difficult to quantify and measure it in terms of the economic benefits (Cilliers, 2010; Commissie Van Ek, 2009).

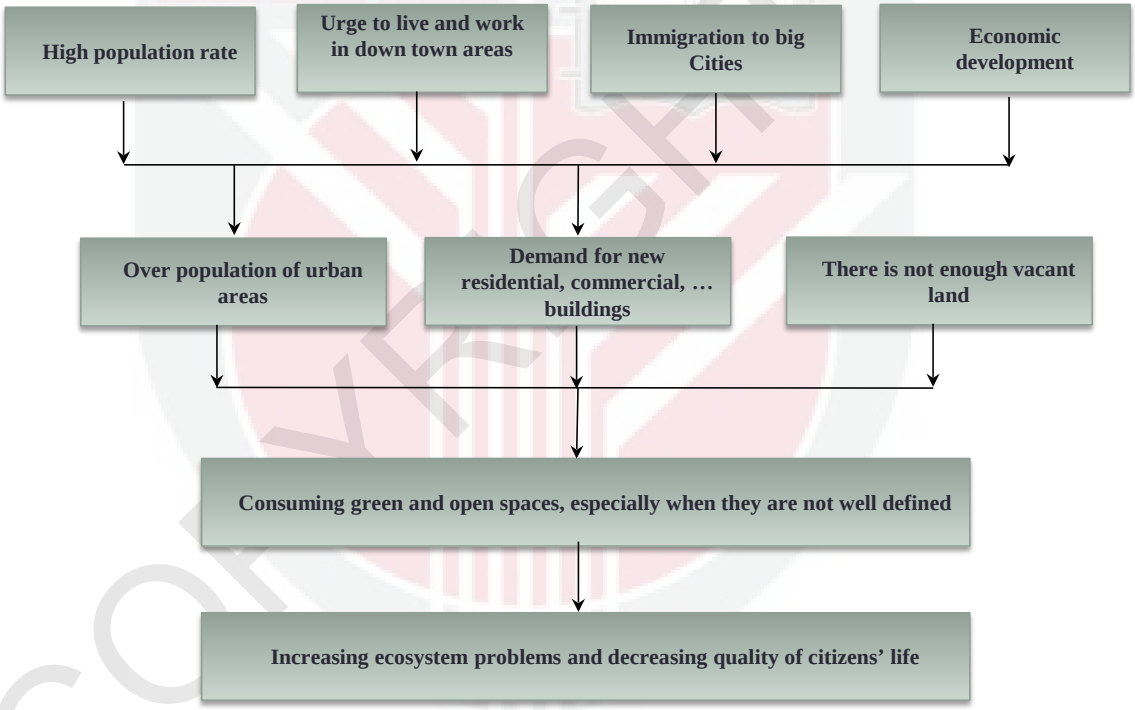

Figure 1.10 : Diagram of the problem statements

All relevant problem statement are summarized in Figure 1.10, hence the evidence shows that in the most urban policies and master plans, urban open green spaces have not been clearly or coherently defined and categorized. It remains as a general concept compared to more precise terms like recreational areas or parks used both in master plans and town plans. Because the growth of gray spaces has continued to dominate open green spaces, it seems UOGS has been deliberately left undefined in order to accommodate their subsequent takeover. Yet, we need to remember that one of the aims of the master plans has focused on the preservation of the main urban open green spaces.

The reality is that city development often takes place at the expense of open green spaces ~~(Jim, 1990)~~. This is mainly due to the perceptions of local authorities regarding the functionality and value of environmental areas, in comparison with urban areas. This problem is ever increasing as urban open green spaces are being lost to housing and commercial developments due to increasing urbanization. This widespread loss is a global concern (M.-H. Zérah & Landy, 2013).

1.3 Classification

The evidence shows that in the most urban policies and master plans, UOGS has not been clearly or coherently defined and categorized. It remains as a general concept compared to more precise terms like recreational areas or parks used both in master plans and town plans. As built up growth area has continued to occupy areas indicated in red as open green spaces, it seems theses precious spaces have been undefined in order to accommodate their occupation. Yet, there is a need to remember that aims of the master plans have focused on preserving main urban open green spaces.

When classification (as the first step of urban policy and planning) is fragmented and incoherent, urban open green space will be sacrificed in order to allow for urban development, because city councils and municipalities allow the construction of new residential, commercial etc. buildings.

1.3.1.1 Necessity of Reclassification

Some developing countries like Malaysia target to provide two hectares of open green space for every 1,000 residents as achieved by developed countries (e.g.: Toronto, Melbourne and New York). However, the application and implementation of open green space policies should be standardized and the guidelines should focus on all types of development rates undergone by each city. On the other hand, policy should be responsive to pressures of growth and the willingness to change the green areas or vacant land to residential, commercial, etc.

As discussed, the definition of open green spaces and a wise detailed classification are crucial to establish urban policies which should be applied to preserve, maintain, all urban open green spaces. This kind of a uniform definition and classification of open green spaces would allow the city municipalities to preserve adequate amount of open green spaces while enabling the continuation of their housing developments and to promote themselves as green cities. It is recommended that the cities need to define the coherent overall acreage of their open green spaces. In order to achieve this goal, it is necessary to create an accurate concept, including the whole variety of different kinds of open green spaces in accordance with their size and function disregarding their given maintenance, recreation, or protected status. The new classification should be based on multi-criteria, paying attention, for instance, to their use, vegetation, and value as nature. Secondly, due to the fact that open green space remains an extremely difficult and varied concept both in professional and academic

discussion, it is important to investigate not only the points of view of researchers from universities, but also the ideas of city officers and municipalities.

Overall, urban authorities should adopt an open green space classification as a first step for planning and managing and also collecting more consistent data about the quantity and quality of urban open green spaces.

1.4 Research Questions

There are many more types of open green spaces providing equivalent benefits to residents, than just the formally designated city parks and gardens, play areas, forest reserves and recreation areas, usually listed in the city's inventory of open green space and which tend to receive most attention in the master or structural plans. To develop a more comprehensive inventory of open green space, these other types of land, which also provide many of the benefits of open green space, need to be included in the classification, mapped and their contributions assessed (Hannikainen, 2013).

Three research questions are arranged as follows:

a) What is the necessity of classification of UOGS in developing cities?
b) How many types of UOGS should be recognized in a developing city like Kuala Lumpur?
c) What are the advantages of a new comprehensive classification?

1.5 Research Aims and Objectives

The main research aim would be reclassify open green spaces including every type of open green space despite their ownership, maintenance, shape, size, function, and status according to the master plans. This thesis aims to alleviate some of the ill effects of development on nature, while considering the need for human economic progress. It is accepted that the value of parkland to human health and quality of life, outdoor recreation and outdoor education, and fulfills our responsibility as stewards of our natural environment and the obligation to preserve and enhance our natural environment through the maintenance, restoration and enrichment of native flora and fauna (Figure **1.11**).

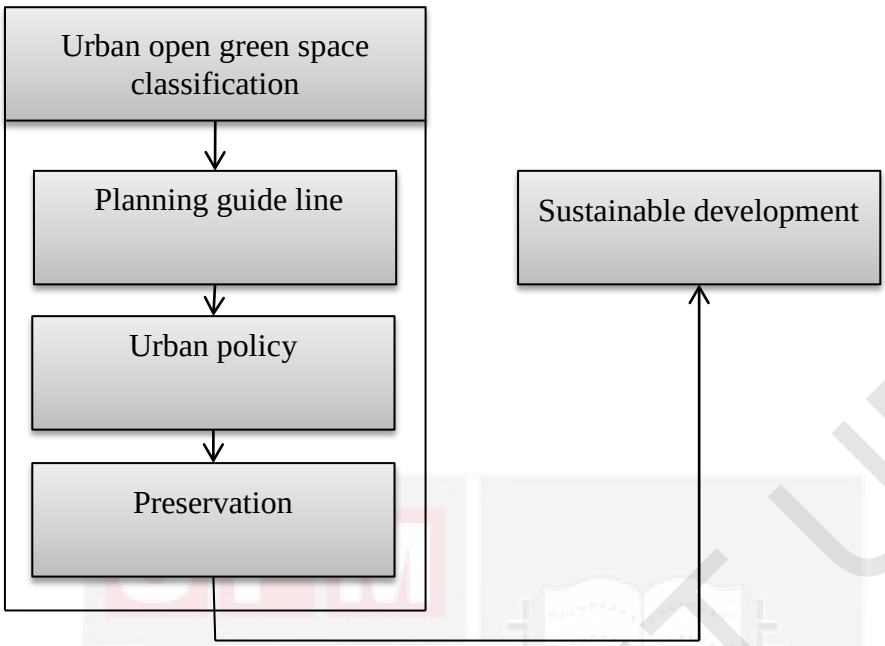

Figure 1.11 : Research aim diagram

1.5.1 Main Research Objectives

All in all, the objectives of this thesis are:

a) To explore the role and function of classification for open green spaces in urban policies as the first step of urban sustainable development and categorizing them.
b) To establish a new open green space classification, which does not ignore any potential space and covers all types .
c) To map the distribution of urban open green space using GIS and comparing it to the current state to explore their advantages.

1.6 Scope and limitations of the Study

Urban open green spaces cover a broad range of landscape elements and support many possible activities. A variety of different specialists are involved in the subject of urban open green spaces such as urban planners and designers, architects, landscape architects, etc. Furthermore, this subject may be discussed from different points of view, for instance: design (standards and instruction), policy and planning (per capita, preservation and extension), management (providing qualified spaces, maintenance and preservation), environmental psychology (place attachment and sense of place) and so on. As open green spaces in urban areas offer a wide range of functions and have value to a wide range of potential users, it was necessary to limit the scope of the research.

What this thesis focused on, is classification and the other aspect of urban open green spaces merely will be mentioned in the background. Most of the current

classifications are established in developed countries based on their criteria while there is increasing population and rapid urbanization in developing countries so Malaysia has been chosen as a target mainly because urban greening has become one of the key goals in this country's development agenda. Malaysia has a vision of becoming a 'Garden Nation' by the year 2020. This research focused specifically on Kuala Lumpur as a case study for mapping by GIS because this city is among the fastest developing cities in South-east Asia.

Kuala Lumpur's structure plan lists: city parks, play areas, recreation areas and forest reserves as green spaces, but there are other types of open green space providing a variety of benefits to citizens. To develop a comprehensive category of open green space, other types of landuse, that also provide benefits, and functions of open green space , should be considered, mapped and in future their contributions assessed (Neil Stuart, Robert L. Hodgart, Mohd Johari Mohd Yusof, 2013).

1.7 Thesis Structure

This thesis is organized in six chapters. Chapter One provides the introduction, issues and background of the study, which outlined the research context, ideas, gaps, questions, aims, objectives, significance, scope and limitation of the study.

Chapter Two is the literature review, which explains a variety of related terms of open green space and provides an appropriate definition of the term for this thesis. The benefits of open green spaces are mentioned in four subtitles and the relevant qualities of open green spaces explained. The last part investigates and discusses the classification samples in both scientific papers and urban policies in different countries which are represented in two matrixes.

Chapter Three is the research methodology; outlines the research framework, research design, choosing methods, sampling, preliminaryperliminary study, questionnaire design, data collection and analysis approaches.

Chapter Four is data analysis and results. This chapter is divided into two main parts: the first and second rounds, with each round containing both qualitative and quantitative data analysis, which is discussed to achieve the results and suggest a comprehensive classification.

In Chapter Five, Kuala Lumpur (KL) is chosen as a case study for mapping. By adopting existing landuse data, applying GIS software and according to the suggested classification, a new map of urban open green spaces of KL will be presented.

Chapter Six is the conclusion, summing up the discussion of findings, making a number of recommendations for urban open green spaces and future studies.

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