

THE PERFORMANCE EVALUATION CRITERIA FRAMEWORK OF GREEN
INFRASTRUCTURE FOR MALAYSIAN LOCAL AUTHORITIES

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A thesis submitted in fulfilment of the
requirements for the award of the degree of
Doctor of Philosophy (Facilities Management)

Faculty of Geoinformation and Real Estate
Universiti Teknologi Malaysia

FEBRUARY 2017

To my loved ones- beloved mother, father, wife, son and siblings.

ACKNOWLEDGEMENT

The author would like to specifically record and express by deep gratitude and sincere appreciation to:

Assoc.Professor Dr Hishamuddin bin Mohd Ali, my research supervisor for many constructive inputs and invaluable guidance. As well as their approaching, sharing and positive guidance enabled the author to remain focused on the correct track from the beginning to the very end. Without their constant support this thesis would be difficult to accomplish on schedule. To all UTM and UTHM staffs and friends, Josef, Edie, Razak, Masitah, Mat Tawi, Ummi, Juremy, Fauzi and who's assisted in the completion of this thesis, Ihfa, Abby and Lotus staffs because of your contributions and help is appreciated. To all expert panels, Professor LAr Dr Ismawi bin Zain, Assoc. Prof LAr. Dr Mohd Ramzi, Assist Prof Dr Mazlina Mansor (UIIAM), Dr Noriah Othman (UiTM), Assoc. Prof LAr, Dr Osman Tahir, LAr. Dr Mohd Yazid bin Yunus, LAr. Dr Nor Atiah Ismail (UPM), LAr. Dr Hamidah Ahmad and LAr. Dr Sapura Mohamed, LAr Ahmad Long, Dr Mohd Hisham Rasidi(UTM), LAr. Dato' Ismail bin Ngah, LAr Hamid Sudin (OTLA), LAr. Fadhilah Mohd Zain (MORPHOSIS), LAr Suzana Nazaruddin(PROVINCA), LAr. Daniel Ahmad (TBG Landscape), Mis Aw Swee Ling (ASL Jururancang), LAr Meor Saadon Sufian Meor Razali , LAr Shikah Daud, LAr Rosli Abdullah, LAr Dr Maslifah Simis (JLN) Dr Alias bin Rameli (JPBD), LAr Putri , LAr Amri (DBKL), Walter (DBKK), Pn Dory and Joe fry(DBKU), LAr. Baharudin , LAr Noriah bt Mat and Jamalludin bin Budin (Perbadanan Putrajaya), Shamsulkamal bin Salleh(Perbadanan Labuan), Ir Nazatul Shima and LAr Mutika Ally (MJB), LAr Zanariah bt Abd Kadir (MPPG), LAr Sheikh Nasir (MBMB), LAr Dr Badruzaman Jaafar (MBPJ), En Yunus Suri (MBSA), En Mohd Yusri (MPT) because the willingness to accommodate time to become an expert panel to this study. The author remain deeply indebted to you all and to those yet unnamed collaborators who also assisted the author during the course study.

ABSTRACT

Green Infrastructure (GI) is an important issue that is related to urban development. It is connected with elements such as environment, social, economic and health. Therefore, an appropriate and effective GI implementation would help create an urban development that is sustainable. Consequently, the purpose of National Landscape Policy (NLP) can be achieved. With regards to creating an effective GI development, previous researchers proposed a number of solutions related to problems faced by urban residents. However, the key players and stakeholders found that there was a lack of guidelines for the master plan to implement any performance evaluation of GI which is an issue in Malaysia. Therefore, an appropriate criteria should be developed as a measuring instrument for the performance evaluation on any GI implementation. This study has two objectives which are to identify the criteria of performance evaluation of GI to be adopted by Malaysian local authorities; and to develop the framework performance evaluation criteria of GI for Malaysian local authorities. Two research methods have been used to achieve the objectives respectively. Firstly, the qualitative approach was employed to identify key performance evaluation criteria of GI. The Delphi method was applied to analyse the semi structured interviews for a panel of 48 experts. Secondly, a quantitative approach was used to achieve the second objective which is to develop the framework performance evaluation criteria of GI for the local authorities. This approach is accomplished using the Analytical Hierarchy Process (AHP). In this method, respondents were involved in an in depth and thorough discussion of the GI performance evaluation criteria, looking specifically at its suitability for assisting this study. Based on the results of the Delphi method, a comprehensive performance evaluation criteria for local authorities GI Malaysia has been developed. This finding consist of four main criterias which are environmental, social, economic and health. The second finding is the result of AHP method, which shows that the perception of experts has produced the importance weightage to establish criteria for measuring the GI performance evaluation index required by the local authorities in Malaysia, which are environmental (37.68%), social (24.65%), economic (23.18%), and health (14.49%). From the expert evaluation, the important sub-criteria of environmental involve environmental planning, storm-water management, pollution control, air and water purification, habitat provision, climate and radiation regulation. The sub-criteria of social involve education, community activities, aesthetic and culture as well as socioeconomic. Meanwhile sub-criteria of economic involve food production, reduce cost of development and maintenance, energy saving and efficiency, tourism, land and property value. Lastly, sub-criteria of health involve phycological treatment, respiratory fitness and aerobic activities, disease and pest regulation. Furthermore, the Content Validity shows that 80% of the expert panel agreed with all the criteria derived from the findings through AHP method. The results can be used as guidelines and standards for the development of Malaysia's GI to be adopted by local authorities.

ABSTRAK

Infrastruktur Hijau (GI) adalah merupakan isu yang penting berhubungkait dengan pembangunan bandar. Ia begitu berkait dengan beberapa elemen seperti alam sekitar, sosial, ekonomi dan kesihatan. Oleh itu, pelaksanaan GI yang bersesuaian dan efektif mampu membantu mewujudkan pembangunan bandar yang mampan. Dengan itu, tujuan penubuhan dasar landskap negara (DLN) boleh dicapai. Berhubung dengan mewujudkan pembangunan GI yang berkesan, penyelidik sebelum ini mencadangkan beberapa penyelesaian berkaitan dengan masalah yang dihadapi oleh penduduk bandar. Walau bagaimanapun, pemain utama dan pihak berkepentingan mendapati bahawa terdapat kekurangan garis panduan bagi pelan induk untuk melaksanakan sebarang penilaian prestasi GI yang merupakan isu di Malaysia. Oleh itu, kriteria yang sesuai perlu dibangunkan sebagai alat pengukur untuk penilaian prestasi dalam pelaksanaan GI. Kajian ini mempunyai dua objektif iaitu untuk mengenal pasti kriteria penilaian prestasi GI yang akan diguna pakai oleh pihak berkuasa tempatan Malaysia; dan untuk membangunkan rangka kriteria penilaian prestasi GI bagi pihak berkuasa tempatan Malaysia. Dua kaedah telah digunakan untuk mencapai objektif-objektif kajian. Pertama, pendekatan kualitatif telah digunakan untuk mengenal pasti kriteria penilaian prestasi utama GI. Kaedah Delphi telah digunakan untuk menganalisis masalah dalam kajian ini dan kaedah yang digunakan adalah kaedah temu bual separa berstruktur yang melibatkan seramai 48 panel pakar. Kedua, pendekatan kuantitatif telah digunakan untuk mencapai objektif kedua iaitu untuk membangunkan rangka kriteria penilaian prestasi GI bagi pihak berkuasa tempatan. Pendekatan ini dicapai dengan menggunakan proses hirarki analitik. Dalam kaedah ini, responden yang terlibat membincangkan dengan lebih mendalam dan terperinci kriteria penilaian prestasi GI, bagi mencari kesesuaian khusus untuk membantu kajian ini. Berdasarkan keputusan kaedah Delphi, kriteria penilaian prestasi secara menyeluruh GI Malaysia bagi pihak berkuasa tempatan telah dibangunkan. Dapatan kajian ini merangkumi empat kriteria utama iaitu alam sekitar, sosial, ekonomi dan kesihatan. Penemuan kedua adalah hasil daripada kaedah AHP, yang menunjukkan bahawa persepsi pakar-pakar telah menghasilkan pemberat kepentingan bagi mewujudkan kriteria untuk mengukur indeks penilaian prestasi GI yang dikehendaki oleh pihak berkuasa tempatan di Malaysia, iaitu alam sekitar (37.68%), sosial (24.65%), ekonomi (23.18%), dan kesihatan (14.49%). Daripada penilaian pakar, sub-kriteria penting bagi alam sekitar melibatkan perancangan alam sekitar, pengurusan air hujan, kawalan pencemaran, pembersihan udara dan air, penyediaan habitat, kawalan iklim dan radiasi. Sub-kriteria sosial melibatkan pendidikan, aktiviti kemasyarakatan, estetik dan budaya serta sosio-ekonomi. Manakala, kriteria ekonomi melibatkan pengeluaran makanan, pengurangan kos pembangunan dan penyelenggaraan, penjimatan dan kecekapan tenaga, pelancongan dan nilai hartanah. Akhir sekali, sub-kriteria kesihatan melibatkan rawatan psikologi, kecergasan pernafasan dan aktiviti aerobik, pengawalan penyakit dan serangga perosak. Disamping itu, kesahihan kandungan menunjukkan bahawa 80% daripada panel pakar bersetuju dengan semua kriteria yang diperolehi daripada penemuan melalui kaedah AHP. Hasil dapatan ini boleh digunakan sebagai garis panduan dan piawaian bagi pembangunan GI Malaysia bagi digunapakai oleh pihak berkuasa tempatan.

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LIST OF ABBREVIATION/NOTATION/TERMINOLOGY

AHP	-	Analytical Hierarchy Process
CIAT	-	Countryside In and Around Town
DBKL	-	Dewan Bandaraya Kuala Lumpur – Kuala Lumpur City Hall
GHG	-	Green Houses Gases
GI	-	Green Infrastructure
GIS	-	Geografic Information System
IPCC	-	Intergovernmental Panel on Climate Change
JPBD	-	Jabatan Perancangan Bandar dan Desa
MPBP	-	Majlis Perbandaran Batu Pahat – Batu Pahat Municipal Council
MBJB	-	Majlis Bandaraya Johor Bahru – Johor Bahru City Council
MBSA	-	Majlis Bandaraya Shah Alam – Shah Alam City Council
MPPG	-	Majlis Perbandaran Pasir Gudang – Pasir Gudang Municipal Council
MPT	-	Majlis Perbandaran Termerloh – Termerloh Municipal Council
NLD	-	National Landscape Departement
NLP	-	National Landscape Policy
PCSD	-	President Council on Sustainable Development
TCPD	-	Town and Country Planning Departement
RDA	-	Regional Development Agencies
RSS	-	Regional Spatial Strategy
SPSS	-	Statistical program software
TCPA	-	Town and Country Planning Act
UK	-	United Kingdom
VROM	-	Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer (Ministry of Housing, Spatial Planning and the Environment)

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Urbanization deeply affects the development of a city, especially on the quality of life of its inhabitants. Generally, urbanisation is a process that identifies the growth of the population of the developing city. Furthermore, urbanization will generate various urban environmental problems such as threats to human health, economic and urban ecosystem. The key problems of urbanisation include major air and water pollution, waste matter, waste energy consumption, limitation and reduction in green area. As a result, improvement of urban resident life is not offset by the quality of the ecological system (Mazlina, 2011a).

In Malaysia, through the Deputy Prime Minister, Malaysia has been given the sign to adopt the Green Infrastructure (GI) as a tool to create the contented urban development. GI could mean effective, economical, and enhanced community safety and quality of life. However, the GI is still in discussion by experts, because it involves several factors that have emerged in urban environment. Meanwhile, GI concept provides a more comfortable urban life, where this concept creates the green area for recreation and social interaction to create harmony, unity and health. Therefore, the National Landscape Policy (NLP) necessitates the collaboration of the government, public and private sector to realize the same vision in creating implementation of GI. Therefore, NLP (2011) stressed that an effective GI will be able to address the climate change, so that Malaysia can exhibit a personal character in this era of global competition, especially in the field of landscaping. Furthermore,

it will give the impression and concern for domestic and foreign investors in the urban field. It has caught the attention of the Secretary General of the Ministry of Housing and Local Government to keep giving concerns and interests on the development and maintenance of GI as an asset to increase the health and quality of the environment sector, particularly in the areas of urban development toward the good quality of life. Consequently, NLP (2011) will give maximum advantages to the interests of the government in a balance development in some the society levels.

In the context of GI, there are several similarities between policy practitioners and policy development. Nonetheless, the GI causes confusion for both. These issues have been much debated until the rise of the specific terms of GI. Meanwhile, Benedict & McMahon (2002) described that the GI had more repeatedly been discussed across the countries as a term pertaining to land and development. There is no clear statement about the term for GI, since everyone gives a different terminology about GI depending on the context of how the GI is used.

According to the implementation of GI in Malaysia, this is still new for scholars and researchers. However, the approach of GI in Malaysia requires efforts to determine some methods in decrypting the problems, condition and the situation in Malaysia. Therefore, this study focuses on the performance evaluation method of GI for implementation among practitioners in Malaysia. So, this method will be dedicated to local authorities in Malaysia, since the local authorities in Malaysia have a role to control the development policy and provide the developments.

1.2 Research Background

In relation to the sustainable issues, the study of GI relates to landscape of urban infrastructure, climate change, public health, ecology, design, and planning. This is agreed by Adnan (1998) and Kaplan (2012), who stated that the GI substantively has a connection between the future urban growth and the issue of conservation. This connection relates to the intersection among the planning, designing and urban infrastructure. Meanwhile, GI beneficially emphasize the limit

area of urban and sub urban, that has extensive environmental damage. Therefore, Mazlina (2010) highlighted that GI interconnection was applied to overcome the negative effects of cities and town environment developments. Other than that, the GI addresses the problems such as to reduce and delay the runoff volumes of storm-water, improve the ground water, reduce the storm-water pollutant, reduce the sewer overflow, improve the carbon absorption, improve the quality of air, reduce heat in communities, reduce energy demand, provide a recreational area, the addition of wild habitats, healthy living for the community and also the increase in the land values.

Given the importance of the sustainable development in the aspect of a healthy living environment in Malaysia, this needs to be improved further. In order to achieve these goals, the government agencies can draw up laws which are obligatory to their administrative areas. In Malaysia, the local authorities system is based on the principle of beyond the power and the general competence.

Therefore, NLP (2011) developed a strategy to implement the core policy as follows:

- (a) The implementation and management of the GI in line with the global warming and climate change issues should develop a systematic and efficient planning.
- (b) The beautiful garden nation as a goal for national landscape development should support the management and sustainable landscape programs.

1.3 Problems Statement

To date the concept of GI is still being debated among researcher, planner and the decision maker, who are in the opinion that assessing the GI development requirement is the main issue to develop the concept of GI. The concept of GI continues to grow over time and all the landscaping needs are fulfilled.

Jabatan Perancangan Bandar dan Desa (JPBD) of Malaysia (2006) stated that the GI was first applied in some urban land developments, for example institutional, industrial, commercial and any mixed development spaces. Which any development should require the open spaces and recreational at least ten percent of the total land to be built. Nonetheless, the implementation of GI in Malaysia still have many problems. Currently, the implementation of GI has several problems as there are no comprehensive framework of GI. One of the important problems in implementation of GI is the coordination problem including those between related agencies. Usually, the coordination problem occurs in agencies that lack legal provision. Aside from coordination problem that influence the implementation of GI is the financial problems. However, the critical problems faced by local authorities who employ the implementation of GI in Malaysia is the performance evaluation since there is no success for implementation of GI at all levels without the evaluation of performance indicators.

Sandstrom (2002) established that the criteria of land use evaluation as the reflection from the work of the other recent author including the criteria of the Swedish National Board of Housing. These criteria give an idea to be used as a concept to create the GI strategy when constructing the implementation of GI. Unfortunately, developed countries do not address the awareness of this connection, including in Malaysia.

Importance of human GI in environment of urban is an issue to urban GI, especially on urban planning development. Mazlina (2011) divided those issues as stated below:

- (a) The lack of GI in urban development.
- (b) The existing green spaces have cut off interconnection or deficiency of connectivity.
- (c) Discharging GI in planning and management is weak

First issue, the provision and demand for green outdoor recreations are competing with the other physical development. The land that should be used for GI are often threatened by land acquisition, changes and modifications. Many existing

GI are sacrificed and imposed to make ways for new developments. The existing GIs are not valued as assets or heritage, therefore many physical developments substitute the existing GI. Subsequently, the lack of green environments interfere with the living prospect of more urban residents.

Second issue from Mazlina (2011), is that the issue of connectivity of GI planning corresponds to the accessibility between GI planning. The accessibility in GI planning is important, since it determines the proximity between places, physical and visual connectivity. By the accessibility, the resident can move physically to their chosen routes and continuously view their routes easily. (Carmona & de Magalhães, 2004). Nevertheless, in other cases, usually small green area, reserves drainage and river are lack in connection to each other green area (Sreetheran, Mohamad, & Yaman, 2004). In Malaysia, the lack and deficiency of interconnectivity between open green spaces of town or cities were often found (JPBD, 2006).

This is very serious and important when a case in Kuala Lumpur does not have interconnectivity between all existing open spaces, due to this metropolitan does not have a proper GI network to plan and implement the city network (Dewan Bandaraya Kuala Lumpur (DBKL), 1984, 2002; Sreetheran, Mohamad, & Yaman, 2004). So, it look like several components separate in a unified (Tibbalds, 2001; Carmona & de Magalhães, 2004). Hence, GI can have a role as a liaison between one space to another space. The fragmentation of open spaces without connectivity generate confusion for urban resident who move around (Tibbalds, 2001; Benedict, & McMahon, 2002). This may cause the community to be isolated when a neighborhood park is disconnected from other parks by highways or buildings. So, the resident is separated from recreational activities, other social communities and neighborhood by the lack of accessibility and interconnectivity.

The third issue of Mazlina (2011) is in the discharging of GI in planning and management which is weak, which means the green spaces of town and cities in Malaysia are not well organized, since inadequate provision of GI to manage the land used (JPBD, 2005). Certainly, there are several reasons of that case, firstly, poor

quality of plans development (JPBD, 2005; Nor Akmar, *et al.*, 2010), causes the GI planning in Malaysia to lack the appropriate planning, implementation and reinforcement (Cheang, 2010). For example, the people do not feel comfortable when they walk through not enough tree lined in sunny weather. Another case is when an urban place is cut off by the open space for whatever reasons, for example when that space becomes an impressive space. This issue is affected by the low standard of management and its implementation of GI to urban. Meanwhile, the management includes maintenance, work force, budget, skill, knowledge, interest, expertise, awareness and the mindset of the society (Adnan, 1998; Mohamamed and Kassim, 1999; Mustafa and Osman, 1999; JPBD, 2005).

Therefore, this study is addressed to evaluate the aspects that influenced the issues as mentioned above. Furthermore, development of the performance criteria of GI is required, in which some input are obtained from policy maker (NLP) and Local authorities as implementers. The performance criteria is set to build indicators as the evaluation of GI, which this indicators are important to identify the planning, developing and implementation of GI. Hence, there are variables required to analyse the performance criteria of GI. Firstly, recognize the implementation and performance of GI in local authorities in Malaysia, so as to determine how to measure its achievements. Secondly, to measure the performance GI in Malaysia, it is important to determine the proper measuring tools and/or what criteria can be used. Finally, with the proper criteria as the evaluation mechanism, a further performance of GI implementation can be measured.

1.4 Research Gap

Mazlina (2011) presented a number of authors of different disciplines' research that relates to GI as shown in Table 1.1. The table shows some authors concern to their research that solved any problems urban resident by applied some method, which related to GI implementation.

However, the implementation of the actual GI performance is measured by performance indicators. So that, by focusing on the environmental balance in

physical development of the urban area, those measurements can support and assist the local authority in Malaysia. Besides that, performance indicators can also monitor the development of implementation. Directly, Performance indicators can enforce the developer, consultant or stakeholder who are involved in development.

Meanwhile, the finding of this study has covered the lack of previous studies, especially for local authorities in Malaysia. Table 1.2 shows the previous research studies concern in their study that related to GI implementation. However, the previous studies lack the measuring instrument for performance of GI implementation. Some researcher focused on the implementation the GI for urban land development with its complex problems, however the instrument of GI for local authorities in Malaysia is very limited. Local authorities in Malaysia requires a guide to implement the GI in urban development.

1.5 Research Aim

The aim of this study is to develop the performance evaluation criteria of GI for local authorities of Malaysia guidelines. Therefore, concerning to that aim, the first step is to explore all relevant available literatures. Then, this study uses the investigative study and its analysis to produce the criteria and sub criteria that are apparently important for GI. Further, researcher develop the survey questionnaire to capture the criteria and sub criteria from the expert of local authorities in Malaysia. Lastly, all data collected would be analysed by using analytical hierarchial process (AHP) method. The outputs of this research will contribute to develop evaluation criteria and sub criteria of GI performance. This performance expected evaluation can assist local authorities in Malaysia when they develop the GI and take any decision that relates to criteria and sub criteria of GI.

Table 1.1: Previous studies concerning Green Infrastructure issues (Mazlina, 2011).

Disciplines	Authors	Concerns of Research
Environmental psychology and behaviour; Preventive medicine and community health; Urban design, environmental planning and landscape architecture	Examples include: Ulrich (1979, 1983); Kaplan (1992); Verderber (1986); Katcher and Beck (1987); Kaplan & Kaplan (1989); Brown & Grant (2005) ; Sherman, <i>et. al.</i> (2005); Pretty, <i>et. al.</i> (2005); Mazlina, Said & Labintah, (2009).	Urban residents' disengagement from nature impacts well-being
Urban design, environmental planning and landscape architecture, Urban ecosystem, conservation biology and landscape ecology	Examples include: Benedict and McMahon (2002); Sandstrom (2002); Streetheran, <i>et. al.</i> (2004, 2006); JPBD (2005, 2006); Weber, <i>et. al.</i> (2006); Maruani, Tseira, and Irit Amit-Cohen. (2007); Tzouls, <i>et. al.</i> (2007); Yap, <i>et. al.</i> (2007); Goličnik & Ward Thomson (2010); Nor Akma, <i>et. al.</i> (2010); Gairola & Noresah (2010)	Lack of connectivity caused by fragmentation reduces accessibility to GI
Urban design, environmental planning and landscape architecture	Examples include: Adnan (1998); Mohamamed & Kassim (1999); Mustafa & Osman (1999); Tzoulas & James (2004); Streetheran, <i>et. al.</i> (2004, 2006); Cheisura (2004); JPBD (2005, 2006); Tahir & Roe (2012); Ozguner & Kendle (2006); Groenewegen, <i>et. al.</i> (2006); Jim & Chen (2006); Thompson & Travlou (2007); Tyrvaiven, <i>et. al.</i> (2007); Wickham, <i>et. al.</i> (2010); Nor Akma <i>et al.</i> (2010); Gairola and Noresah (2010)	Lack of availability spatial, spatial organisation, poor management, implementation, maintenance & reinforcement affect vitality of uses of GI

Table 1.2 The gap of previous and current study

No	Author	Study	Method	Output	Application
1	Mc Donald, et, al. (2005)	Plan evaluation frameworks of GI	<ol style="list-style-type: none"> 1. Developed the structure definition for GI planning 2. Arranged “best practice” of guidelines for GI planning 3. Developed a framework for evaluating GI plans for different scales of planning. 	The plan evaluation of frameworks for regional and local scales applied by planners as a guideline or checklist practices development of GI plans, or a standard means for evaluating plans	United States of America
2	Mell (2010)	Concepts and perceptions of spatial planning of GI	<ol style="list-style-type: none"> 1. By exploring variations in the meanings of GI which, an examination of GI conceptual development to date. 2. Exploration of the role of perceptions in the value and use of GI resources to examine the role of ecological, psychological, and social constructions of GI and assess how these affect personal and communal landscape interpretations. 3. GI used by practitioners. GI are outlined and an assessment is given of how the principles of GI have been translated into appropriate landscape management. 	The Study was to Identify a number of conceptual and implementation principles for GI. Furthermore a GI approach to planning can be used to meet the complex challenges of current landscape planning	UK, Europe and North America

No	Author	Study	Method	Output	Application
3	Ji (2010)	Development of a design approach for sustainable landscape, based on GI and Urban Connectivity.	The qualitative study observed the combination of the elements & guidelines of GI and connectivity to enhance a sustainable urban development. three urban GI systems involved: transportation (mobility), urban open space (community & habitat), and storm-water management (water).	The site concept design of the Union Station District in Toronto, Ontario demonstrate the system guidelines of GI	Toronto, Canada
4	Ismail & Mazlina (2011)	The role of GI in cities-towns of South East Asian countries and its implications to well being of urban residents.	The major themes of the study findings were categorised into: (i) quantity of existing GI, (ii) studies on contribution of GI to well-being of urban residents (iii) significant parameters attribute that emerged from the studies.	The findings of environment sustainability implicates that accumulation of research promote public health of the cities in Southeast Asia.	South East Asian Countries
5	Mazlina (2012)	Exploration to residents experiential contacts with the properties and attributes of GI in Taiping Malaysia, and their effects to the residents well-being.	Theoretical framework was grounded by landscape perceptual theories which link diversity, naturalness, and coherence of a GI to well-being of the residents.	The findings suggest that the presence of diversity, naturalness and coherence in the green infrastructures facilitates the residents' experiential contacts affording them physical, cognitive and social well-being.	Taiping, Malaysia

No	Author	Study	Method	Output	Application
6	Current Study	Development of The performance Evaluation Criteria of GI for Local Authority in Malaysia	<ol style="list-style-type: none"> 1. Qualitatively identify the comprehensive performance evaluation criteria of GI especially for local authority Malaysia requirement. 2. Quantitatively develop the performance evaluation the GI for local authority of Malaysia. 	<ol style="list-style-type: none"> 1. The criteria of GI is applied as a basic to measure the GI performance or as a new approach in contemporary model development to evaluate performance level of GI for local authorities in Malaysia 2. Comprehensive GI performance criteria as guidance in determining the performance level of GI. 	Local Authority of Malaysia

1.6 Research Questions

This study formulated the research questions to control and to achieve the research objectives. The important research questions are outlined as follow:

- (a) What are the criterias of GI required by local Malaysian authorities, when they develop a platform for the GI implementation approach?
- (b) How is the appropriate performance evaluation for local Malaysian authorities to implement for a comprehensive GI?

1.7 Research Objectives

To answer the research questions and resolve the problems as mentioned above the following are the objectives of this study:

- (a) To identify the criteria of performance evaluation of GI to be adopted by Malaysian local authorities; and
- (b) To develop the framework performance evaluation criteria of GI for Malaysian local authorities.

1.8 Research Scope

This study focuses on local authorities in Malaysia who have the landscape master plan. Generally, this research is in line with the local authorities portfolio. This includes operational processes such as the implementation of the policies involved, and operations management, financial resources and management of customers need on the development of green infrastructure. Therefore, this study

compared a number of case studies of the implementation of performance evaluation of green infrastructure from a global and local context. All 59 local authorities in Malaysia with landscape masterplans are involved in this research to fulfill the requirement of development of GI criteria for Malaysian context. In addition, a panel of experts from related industries such as architects, landscape architects, urban planners, engineers and academicians are invited ~~needed~~ to give their feedback on this research. The result is used to introduce the GI criteria performance evaluation for local authorities in the country.

1.9 Research Methodology

This study proposes the methodology that is based on six phases. The methodology in this research study used the Delphi method, which is integrated with the analytic hierarchy process (AHP). The Delphi method systematically assists the decision maker(s) to identify the organizational objectives. Furthermore, this method set up the priorities of objectives (Okoli & Pawlowski, 2004). The research flowchart of the study is illustrated in Figure 1.1.

1.10 Research Significant

The expected outcome of this research is to provide the guidelines and the standard operation procedures of performance evaluation criteria of GI. Local authorities of Malaysia who control the development will effectively develop the GI development by adopting this performance. The findings of this research will give benefits to several relevant parties namely, local authorities, National Landscape Department, developers, professional firms and academicians. Therefore, those parties who were involved in planning, development, construction and management of infrastructure will consider the GI in tackling the environmental issues in Malaysia.

1.10.1 Local Authorities

The local authorities of Malaysia is the required platform of GI, as they are especially associated with the development of the performance evaluation criteria of GI. The findings of this study can be proposed as a guideline for local authorities in Malaysia to support their interest.

1.10.2 Malaysia National Landscape Department

The Malaysia National Landscape Department also require some guidelines to plan and develop some ideas then implement it as a landscape development. Therefore, the result finding of this study will assist their concern to make any decision in criteria and evaluation performance of GI.

1.10.3 Developers

The performance evaluation criteria of GI as the finding of this study can help the developers to make decisions that relate to the GI development in Malaysia.

1.10.4 Professional associations and firms

The implementation of the performance evaluation criteria of GI will be applied by any local authorities in Malaysia such as, Engineer, Architect, Landscaper, Planners and any related associations that have been making decisions for design and planning development.

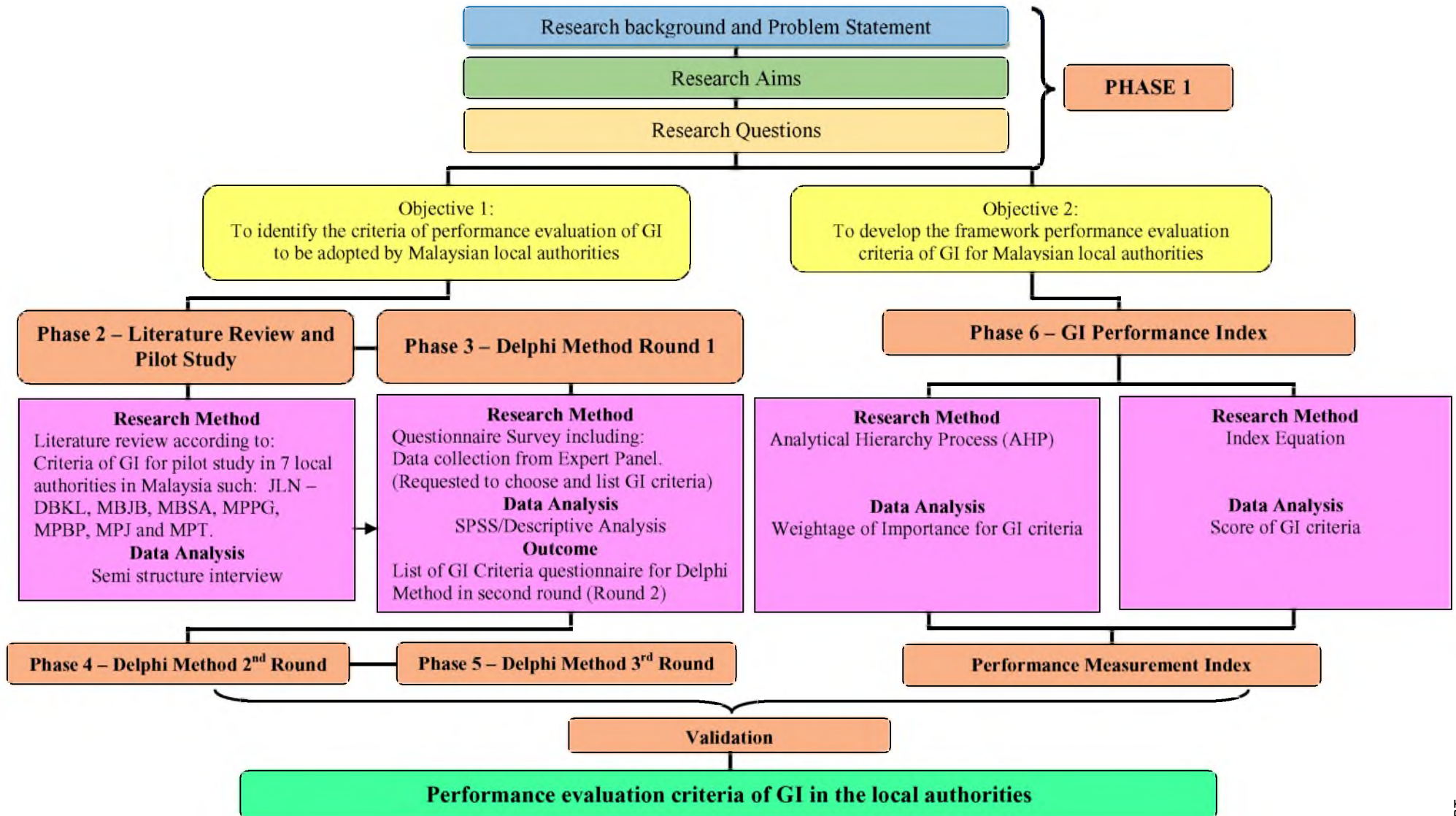


Figure 1.1: Research Flowchart.

1.10.5 Academician Environment

The discovery of the study is organized as a guide to academics and as a reference related to this issue and area of study. Other researchers can further use the results in the field of GI development from this research.

1.11 Organisation of Thesis Chapters

This thesis is divided into two sections as Figure 1.2. First section is Chapter 1 which, the general introduction will be presented as the brief introduction of the study, background, the current issues and problems related with the study, some questions that support the idea of the study, objectives, aim, scope and limitation, and the last of which is important of the study is the significant and finding. Also the frame work of methodology is presented to draw up the work of this study.

Second section is divided into three parts of thesis content namely, Part A, Part B, and Part C. Part A presents the literature reviews and methodology, i.e. Chapter 2 and Chapter 3. Some literatures and theoreticals related and associated with the current study will be presented as Chapter 2. The methods of this study will be expressed in Chapter 3 as Research Methodology. Chapter 4 will present the analysis and the finding of the current study. Both quantitative and qualitative data analysis using Delphi and Analytic Hierarchical Process (AHP) method will be described in this chapter. Also the discussion of findings from both literature review and data collection including developing the performance evaluation criteria of GI in the local authorities will be presented in this study including the validation of expert panel for this study. Finally, part C gives the conclusion of the findings, recommendations, and suggestion for future research.

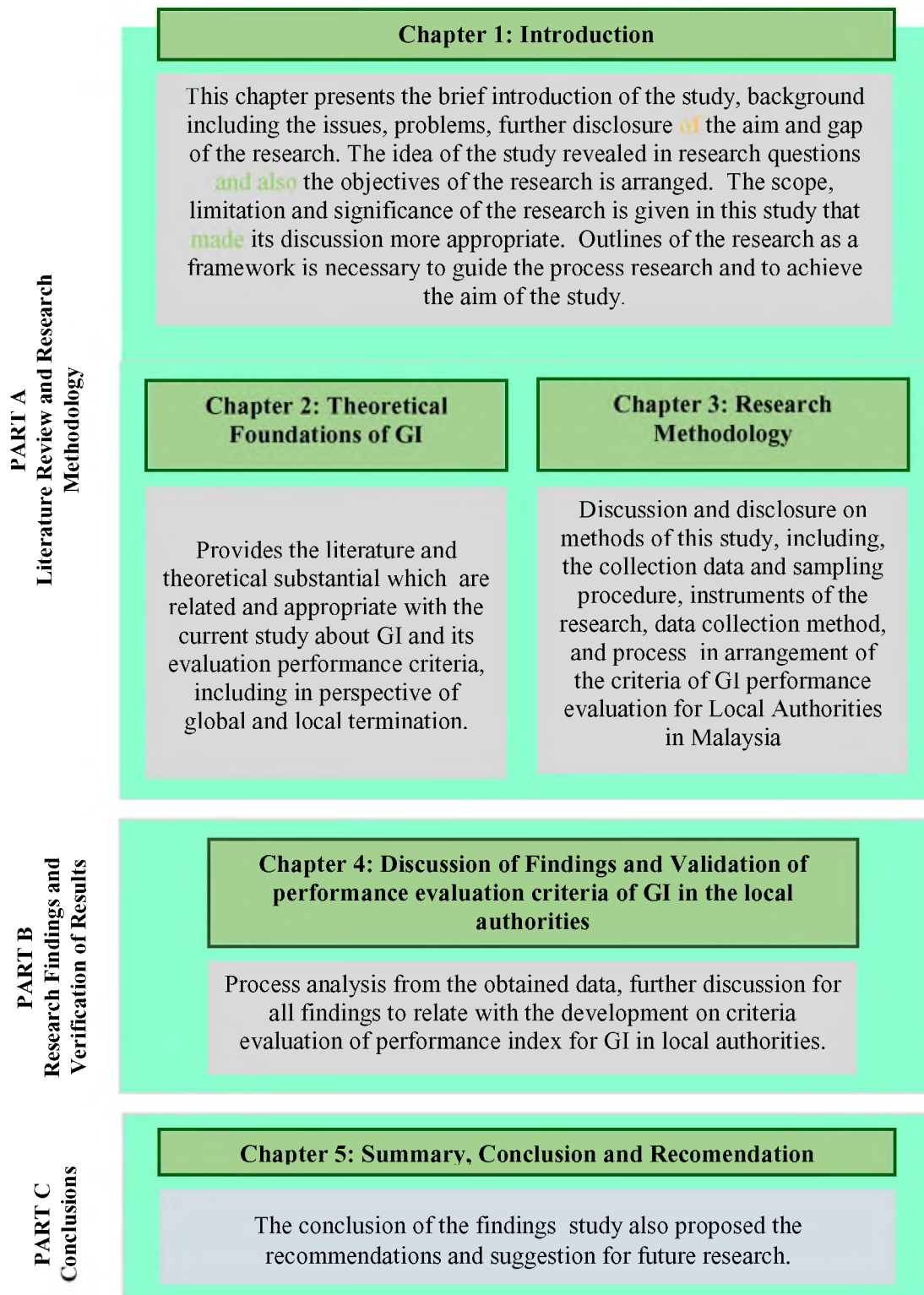


Figure 1.2: Research Structure.

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