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Towards a sustainable landscape of urban parks in Kuala Lumpur, Malaysia: A study from a management perspective

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ABSTRACT

Kuala Lumpur's urban parks have evolved to fulfil the needs of its multi-cultural urban communities since the conception of its first public park in the late 19th century. Nevertheless, the management and maintenance of these tropical urban parks are currently under pressure as local authorities have no longer adequate funding to maintain the existing landscape as they have to focus on addressing the impact of environmental problems; particularly frequent flooding that has been a never-ending issue facing the city. There are growing pressures on resources, especially on water supply, in response to urbanization and population growth. Nevertheless, Kuala Lumpur's urban parks were highly dependent on potable water for landscape maintenance at a time of growing demand for this limited resource. There is a possibility that these urban parks can be managed in a more sustainable manner, which may consequently reduce their dependency on potable water resource for irrigation. They might also make a more positive contribution to managing stormwater control and increasing habitat diversity. The challenge, therefore, is to try and achieve a more sustainable, ecologically informed design and management practice without alienating park users, management, and maintenance staff.

This research aims to investigate the potential of changing the design and management of Kuala Lumpur's urban parks towards a more ecologically sustainable landscape practice. A case study approach was adopted through multiple sources of data collection, such as documents review, photo-based interviews and field observations. The historical development of the parks was also reviewed in order to understand how they evolved into the present day, and influenced the current state of landscape design and management practices associated with these tropical urban parks. Field observations conducted at each case study site help identified a potential aspect of design and management that can increase sustainability of the parks. Subsequently, interviews with the management's stakeholders further assessed their attitudes towards changing the current management and maintenance practice in adaptation to this sustainable landscape practice. The impact of applying this sustainable landscape practice was identified; alongside with its benefits and challenges. Finally, strategies for adaptation of Kuala Lumpur's urban parks towards delivering this ecologically sustainable landscape practice were recommended according to practicality and adaptability of such approach to fit in the local context.

Keywords: Sustainable urban park, Ecological sustainability, ecological design and management

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ABBREVIATIONS

ABC	Water Active, Beautiful, Clean Water Programme
Act 172	Town and Country Planning Act 1976
Act 267	The Federal Territory (Planning) Act
Act A933	Town and Country Planning Act
ALG	Ampang Hilir Lake Garden
ATSE	The Australian Academy of Technological Sciences and Engineering
BAP	Biodiversity Action Plan
BP	Bishan Park-Kallang River
DID	Department of Irrigation and Drainage
EDM	Ecological Design and Management
EPP	Entry Point Projects
ETP	Economic Transformation Programme
FRIM	Forest Research Institute of Malaysia
GHG	Green House Gas
GP005-	Planning Standard Guidelines for Open Spaces and Recreation
IWRM	Integrated Water Resource Management
JDC	River of Life Joint Development Committee
JPP	Sewerage Service Department
KeTTHA	Ministry of Energy, Green Technology and Water
KLCH	Kuala Lumpur City Hall
KLSP	Kuala Lumpur Structural Plan
KVP	Kiara Valley recreational Park
LA	Landscape Appearance
LA21	Local Agenda 21
LivCom	International Awards for Liveable Community
LLDC	London Legacy Development Corporation
LOP	London Olympic Park
MA	**The** Millennium Ecosystem Assessment
MCDT	Manor Castle development Trust
MFTUW	Ministry of Federal Territory and Urban Well-being
MP	Manor Fields Park
MP	Members of Parliament
MPAJ	Ampang Jaya Municipal Council
MPS	Selayang Municipal Council
MSMA	Urban Stormwater Management Manual for Malaysia
NDF	Neighbourhood Development Framework
NEP	New Economic Policy
NKEA	National Key Economic Areas
NLD	National Landscape Department

NLG	National Landscape Guideline
NLP	National Landscape Policy
NParks	National Parks Board, Singapore
NRE	Ministry of Natural Resources and Environment
ODA	Olympic Development Authority
PBG	Perdana Botanical Garden
PEMANDU	Performance Management and Delivery Unit
PJC	Putrajaya Corporation
PLG	Permaisuri Lake Garden
PRD	Park and Recreation Department
PUB/NWA	National Water Agency
SCC	Sheffield City Council
SILA	Singapore Institute of Landscape Architects
SMART	Stormwater Management and Road Tunnel
SuDS	Sustainable Urban Drainage System
SWT	Sheffield Wildlife Trust
TLG	Titiwangsa Lake Garden
TP	Tampines Eco-green Park
WCED	World Commission on Environment and Development
WHO	World Health Organisation
WP	Wetland Park
WSUD	Water Sensitive Urban Design

TABLE OF DEFINITIONS

NO.	TERMS	WORKING DEFINITIONS FOR THE STUDY
1.	Beautification project	A Landscape development scheme that is characterized by manicured landscape design emphasis on aesthetic, cleanliness and safety aspects, which requires constant and intensive maintenance to ensure it remains in the same condition over time.
2.	Ecological design and management/ Ecologically sustainable landscape practice	A process of creating an environmentally-friendly and multifunctional self-sustaining landscape that addresses site issues sustainably, whilst at the same time conserving urban park's natural resources and environment in order to be more resilient and adaptable to site modifications. A design that aspires to retain or improve ecological function such as integrated food networks for organisms.
3.	Ecological structure	Habitat diversity within green spaces consists of different plant and animal communities that interact and benefit from each other. This continuously evolves over time due to natural processes or human intervention.
4.	Ecological sustainability	The ability of the landscape of an urban park to maintain its natural state through self-regeneration and adaptation to site modification and environmental changes, for continuous ecosystem service provision to the city.
5.	Ecosystem service	Social and environmental benefits gained from landscape and natural environment. Ecosystem services are normally subdivided into: - Provisioning services i.e. products derived from ecosystems such as food, fuel, natural medicines, fresh water etc. - Supporting services e.g. primary production, nutrient cycling, soil formation, water cycling etc. - Regulating services: Benefits obtained from the regulation of ecosystem processes, including air quality regulation, climate regulation, water regulation and purification and minimising impacts of disease, pests, soil erosion etc. - Cultural services: Non-material benefits including spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences. (Millennium Ecosystem Assessment, 2005)
6.	Environmental management	A landscape management strategy that applies sustainable principles in managing the landscape and natural resources in compliance with sustainable development policies, goals and objectives.

7.	Environmentally sensitive design	A landscaping scheme that causes minimal impact on the environment by reducing the carbon footprint; and consumes less natural resources (i.e. water) in its operation.
8.	Management stakeholders	A workforce consisting of staff from different levels of management within the local authorities, who are directly involved in urban park management and attending to the needs of park users.
9.	Slow incremental approach	A Landscape management technique that applies a sustainable and economical solution to achieve long-term goals for park management.
10.	Sustainable design and management	A holistic and integrated landscape approach to urban park management that meets the needs of social, environmental and economic balance for providing eco-system services in the city.
11.	Sustainable urban park	A park with multifunctional and integrated landscape design that provide environmental needs, while considering the social requirement, in terms of a more economical approach.
12.	Urban park management	A landscape design and maintenance operation of public recreational spaces in the city including their natural resources to increase ecological sustainability.

CHAPTER 1

Introduction and background study

1.0 Introduction

This research focuses on how the management practices of Kuala Lumpur's urban parks can be adapted to help mitigate the environmental challenges that this city faces due to climate change and how they can become more ecologically sustainable. The chapter begins by briefly setting out the background and context to this study. A brief overview of the development and evolution of urban parks will be presented, and how their changing roles and functions influence the current management practice of these managed landscapes. The perspective on the landscape management of urban parks will be discussed in the context of Kuala Lumpur, Malaysia by identifying issues and challenges facing the city, and possibilities for adaptation by urban park management in delivering a more ecologically sustainable landscape practice. This will form the rationale for the study. The aim of the research will then be presented and the chapter ends with an outline of the thesis structure.

1.1 Research background and context

The role of urban parks is becoming significantly important for safeguarding the sustainability of the changing city environment. Previous studies show that urban parks in developed countries have always evolved following the changing public needs and demands (Conway, 2000; Cranz, 1982). The idea of environmental sustainability can be traced in John Claudius Loudon's initial proposal for the London city plan in 1829 (Turner, 2008). Nevertheless, his sustainable idea received little attention until Sir Ebenezer Howard introduced a similar concept in his Garden City movement in 1898. Some of the earliest urban park developments adopted this idea, such as the Birkenhead Park in the United Kingdom by Sir Joseph Paxton in 1847; and Central Park, New York by Frederick Law Olmstead in 1857. Yet, the concept of sustainability during this period was mainly focused on social needs. However, Cranz & Boland (2004) argue that this trend is no longer relevant in the 21st century, suggesting urban parks should fulfil the ecological needs of cities in adaptation to changing climate. Therefore, urban parks should extend their environmental role beyond that of primarily focusing on leisure and recreation.

Recently, there has been a move towards reviewing the potential role of public green space to address the environmental challenges of highly urbanized cities in the current changing climate (Seabrook, McAlpine, & Bowen, 2011), such as urban heat islands (Haq, 2011); flooding and

water pollution (ATSE., 2010) and decline of green spaces (Heidt & Neef, 2008; Wilby, 2007), alongside their continuous provision of leisure and recreational facilities for fulfilling demands of growing population (Chiesura, 2004). However, previous studies highlighted that changing these landscapes would affect the way those people perceived these new landscapes (Antrops, 2005; Nassauer, 1995). Therefore, it is important that any changes towards ecological landscapes should be made without compromising the social needs and expectations of park users (Gobster et al., 2007).

1.2 Problem statement: Urban development and environmental challenges facing the tropical city of Kuala Lumpur

Ever since the colonial administration (1850-1957), urban development in Kuala Lumpur has given rise to environmental degradation. During this period, mining activities and massive agricultural activities particularly the rubber plantations were the major economic sectors in Kuala Lumpur. These two major sectors have caused a decline in the city's greenery, in addition to creating derelict mining land and deterioration of rivers due to de-silting (LESTARI., 1997). The government's new economic policy introduced during the 70s and 80s has significantly influenced city planning by affording more weight to the commercial development concentrated near the river valleys towards the west coast of Kuala Lumpur as the eastern part of the city is mostly covered with high terrain.

Table 1.1: Kuala Lumpur land use changes 1966-1985 adapted from Katiman (1995), cited in (LESTARI., 1997) p. 50

Land use type	1966		1974		1985	
	(ha)	(%)	(ha)	(%)	(ha)	(%)
Urban development	7985	33.4	10374	43.4	14273	58.7
Agriculture	11878	49.7	10271	42.9	8265	34
Mining	2692	11.3	1865	7.8	1940	6.8
Forest and swamp	770	3.2	955	4	62	0.3
Others	589	2.4	449	1.9	60	0.2
Total	23914	100	23914	100	24300	100

Table 1.1 shows the land use changes between 1966 and 1985 in terms of urban development, an increase from 33.4% to 58.7% (LESTARI., 1997) that led to a significant decline in the natural green areas and other land use in the city. New land was opened for industrial and housing development as well as the city infrastructure. Similarly, the agricultural land (rubber plantation) and the ex-mining area were also converted into housing and commercial development areas to support the city's economic growth.

The Kuala Lumpur Structure Plan (KLSP) endorsed by the Kuala Lumpur City Hall in 1984 continued to increase commercial development by 116.5% percent; from 504 hectares to 1,092 hectares between 1984 and 2000, (LESTARI., 1997). In response to the high demand for

recreational spaces in the city, KLSP allocated 1630 ha for urban parks and open spaces development, including the Titiwangsa Lake Garden and Permaisuri Lake Garden (Kuala Lumpur City Hall, 2004). However, this provision covers only 6.7% of the total land use in Kuala Lumpur.

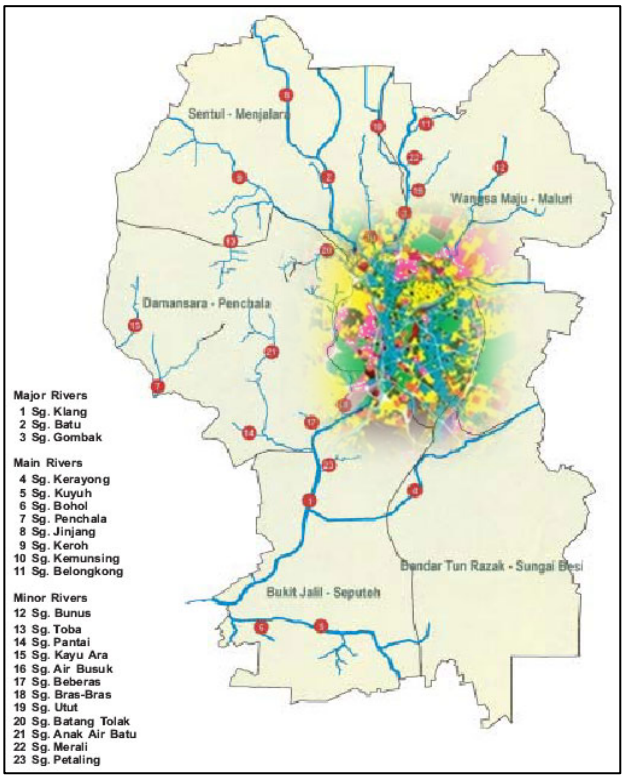


Figure 1.1: Commercial land use at the Kuala Lumpur city centre in the year 2000, mostly developed along the river system (Kuala Lumpur City Hall, 2004)

Figure 1.1 shows commercial land use in Kuala Lumpur in the year 2000, in which 25.2% of the commercial areas were concentrated in the city centre. The river system consists of the Klang River; this major river originates in the highlands 25 km to the northeast of Kuala Lumpur and flows through Kuala Lumpur towards the Straits of Malacca to the west of the city. This 120km river is connected by 11 major tributaries and covers approximately 1,288 km2 of the river basin. Rapid development near this river system has transformed the river into a large storm drain.

The continuous rapid growth of Kuala Lumpur for the past three decades has drastically changed the city's land use with greater emphasis on development of housing, commercial areas, institutions and other city infrastructures. These changes have compromised the city's environment and natural resources (A. A. Hezri & Nordin Hasan, 2006); as well as the river corridor (Abdullah, 2000). The city's ecological structure was affected by this trend; thus, it is no longer capable of sustaining the city's environment which has led to environmental problems, such as air and river pollution (LESTARI., 1997).

1.2.1 The impact of environmental problems and climate change on Kuala Lumpur

Among the many environmental impacts of the land use changes in Kuala Lumpur are the urban heat island effect, landslides, haze and flooding (LESTARI., 1997). However, this study will give more focus on flooding issues as it is critical for the city, yet to be fully addressed in spite of the preventive measures taken by the local authorities. Flooding in Kuala Lumpur is caused by the monsoon floods and flash floods. The monsoon flood mostly occurs during the two monsoon seasons, namely: the southwest monsoon season which occurs from May to August, and the North-east monsoon season from November to February. The southwest monsoon had the greatest impact on the western part of the Peninsula Malaysia including Kuala Lumpur. Meanwhile, the two inter-monsoon seasons in Peninsula Malaysia (March, April, September and October) also contributed to the heavy rainfall that usually occurs in the form of convective rains. This period is the wettest period for the west coast and potentially caused flash floods in the city. High sediment loads in the river systems from rapid development mainly along the Klang River and the Gombak River cause the river to become shallow and unable to support the huge amount of stormwater during heavy rainfall.

Table 1.2 Data of Flooding incidences in Kuala Lumpur between 1900 and 2003 (Keizrul, 2004)

Period	No. of times	Year
Before 1950	1	1926
1970s	1	1971
1980s	3	1982,1986, 1988
1990s	4	1993, 1995, 1996, 1997
2000	5	2000, 2001 (Apr & Oct), 2002, 2003)

Flooding has always been a critical issue facing Kuala Lumpur. Historically, since the city was developed in the 1850s flooding has been a common environmental challenge for Kuala Lumpur as it is located on a flood plain. Table 1.2 shows that flooding incidence has become more frequent in 2000 when compared to the early of the 1900s. The record shows that between the 1980s and the late 1990s, Kuala Lumpur was hit by at least six severe floods, followed by three more major flood events in the early 2000s (Saw, 2009). Climate change could further exacerbate this frequent environmental problem.

Climate change causes an extremely dry weather (El Nino) and severe wet weather (La Nina) conditions. This extreme weather over recent years has contributed to an increase in the city's annual rainfall especially during monsoon season (Mohan, Kwok, & Wan Azli, 2010). Further analysis of seasonal rainfall between 1980-2010 shows a decrease in the amount of rainfall in Peninsula Malaysia, but there was a trend of extreme rainfall intensity in the west coast region which resulted in frequent flash floods in Kuala Lumpur (Suhaila, Deni, Zin, & Jemain, 2010). These flooding events not only cause serious damage to government and private property but have also claimed people's lives.

The Malaysian government has given much attention to addressing flooding issues. In 2001, the Department of Irrigation and Drainage (DID) changed their conventional drainage management system to a more sustainable approach. The establishment of the Urban Stormwater Management Manual for Malaysia (MSMA) serves as a guideline for relevant practitioners in adopting sustainable urban stormwater management to overcome the pollution and flooding problems facing the city (Richard & Md Nasir, 2005). Furthermore, the Stormwater Management and Road Tunnel (SMART Tunnel) Project was initiated by the Malaysian Government in 2004, as part of the stormwater mitigation measures for the city. This RM1.9 billion project, jointly managed by the DID and Malaysia Highway Authority and Malaysia Highway Authority (ITA-AITES, 2011), adopted engineering solutions to tackle flood prevention and to address traffic congestion in Kuala Lumpur (SMART Control Centre, 2014). Despite these efforts, the city continues to face frequent flooding. Moreover, as the scope of the DID is limited to drainage, rivers and waterways, the role of urban parks in addressing this growing environmental challenge is yet to be fully explored.

1.2.2 Pressure placed on urban parks and green spaces by urbanization and population growth

The continuous process of urbanization and population growth in Kuala Lumpur (refer to table 1.3) has also caused a considerable loss of green spaces in the city. Kuala Lumpur was already facing an acute shortage of open spaces in 1997 due to land conversion (Kuala Lumpur City Hall, 2004).

Table 1.3: Total population and the annual growth rate in Kuala Lumpur 1970-2005
Source: Adapted from Ho (2008); *KLCH (2008); **DOS (2014).

Year	Total population	Annual growth rate (%)
1970	485,000	
1980	919,610	8.96
1991	1,226,700	3.04
2000	1,379,310	1.38
2005	1,556,200	1.78
2010*	1,674,800	1.30
2020**	2,198,400	

The ratio of open space in Kuala Lumpur was only 4 square metres per person compared to 10 square metres per person in many developed countries (Datuk Haji Nordin, 1997). According to the World Health Organisation (WHO) standard, the ratio for healthy provision of open space is 20 square metres per person (KLCH (2008). This suggests that KLCH needs to explore more options to provide quality outdoor spaces and environments within the limited green spaces in Kuala Lumpur.

The urban parks and other green spaces in the Kuala Lumpur are also poorly integrated into a comprehensive city green network system (Datuk Haji Nordin, 1997; Sreetheran & Adnan, 2007). This has reduced their potential for serving environmental functions within the city's ecosystem, such as managing floods, creating wildlife corridors and biodiversity enhancement.

1.3 Non-inclusion of landscape as part of the city's infrastructure in addressing the city's environmental problems

The uncertain and changing weather conditions due to climate change not only alter the city environment, but also reduce the city's ecological performance in coping with environmental problems, especially flooding. Despite the government's commitment to developing and upgrading the urban parks and open spaces in Malaysia, their potential in helping to address these environmental challenges is not being fully explored. It is therefore necessary to identify ways for the urban park management to adapt to the challenges of increasing urbanization and environmental changes in the city, with the growing pressure on limited government resources to sustain these open spaces. Furthermore, it is also important to explore the potential of the urban parks, as part of the city's green infrastructure, to overcome the social and environmental challenges facing Kuala Lumpur whilst at the same time contributing to the overall sustainability of the city environment. The role of these managed urban landscapes should not be confined to meeting leisure and recreational needs, but could potentially be expanded beyond the parks' physical boundaries.

1.4 Rationale for the study

Recent studies have provided new approaches to sustainable management of urban landscapes. At the park level, there is an urgent need to shift the conventional horticultural practice to adapt to the changing environment in our cities (Morgan, 1991). Urban park management will no longer be able to deliver conventional horticultural practices because they require intense maintenance (Cranz & Boland, 2004; Hitchmough & Dunnett, 2008). Such practice is not economically viable (Justice, 1986) or sustainable as it consumes a "huge amount of resources in energy for transport, irrigation, and fertilizers" (Smith, Dunnett, & Clayden, 2008, p. 5). According to Haq (2011):

> *"To get maximum level contribution from urban green spaces, local approach and integrative approaches should be focused to overcome the challenges faced by different cities in different countries…" (p. 601)*

This implies that although an ecological approach to urban park management could potentially contribute towards city sustainability, the level of adaptation for each park should vary according to the local setting and contextual background.

Therefore, the primary focus of this research is the urban park management of Kuala Lumpur, Malaysia and the extent to which they could change towards a more ecologically sustainable landscape practice by exploring new approaches that promote self-sustaining landscapes and minimise resources input. However, it is necessary to learn how the evolution of these urban parks has influenced the current landscape design and management practices before seeking means of adaptation towards a more ecologically sustainable landscape practice, as Antrops (2005) suggests.

Urban park management in developed countries has made several attempts to adopt new approaches to sustainable landscape design and management in response to the challenges of environmental change. Ian McHarg, Spirn and Hough's concept of ecological approach has inspired the work of other scholars. For example, Manning's (1982) study on the "techniques of vegetation management through the application of ecological awareness and knowledge to design and manage landscapes" (cited in Özgüner et al., 2007, p. 35). Previous studies have recognised the potential benefits of ecological approaches, such as resource efficiency and economic viability (Breuste, 2004; Hitchmough & Woudstra, 1999; Kingsbury, 2008; Lovell & Johnston, 2008); the potential of enhancing environmental functions for flood control and harvesting rainwater for outdoor use (Echols, 2008; Lovell & Johnston, 2008; Tan, 2006). At the same time, sustainable water management components create habitat diversity for wildlife conservation (Arifin & Nakagoshi, 2011; Hitchmough, 2008a; Koh & Sodhi, 2004; Lovell & Johnston, 2008; McGuckin & Brown, 1995).

The management of Kuala Lumpur's urban parks can learn much about changing towards a more ecological and sustainable approach from the experience of developed countries. Givoni (1992) suggests that implementing a self-sustaining landscape in tropical countries could be advantageous due to high levels of precipitation, where rainwater can be utilised for irrigation of the landscape. This system could potentially help reduce maintenance costs and at the same time make a positive environmental contribution to the city by increasing habitat diversity and managing the control of stormwater.

However, this research recognises a significant difference in climate and cultural background between Malaysia and developed countries. Ecological design and management practices in temperate climates might not be directly applicable to the local context as they would impose a different appearance. The different cultural background will have a significant influence on park management attitudes towards delivering ecologically sustainable landscape practice (Hitchmough & Woudstra, 1999). Therefore, it is significantly important to explore the potential of delivering this sustainable approach in the context of this developing tropical city, Kuala Lumpur, from the local park management perspective.

1.5 Research aim and questions

The research aims to investigate how the design and management of urban parks in Kuala Lumpur can be adapted in order to meet the challenges of environmental problems and climate change and the need to create more environmentally resilient and ecologically rich habitats. The research also explores how this might be delivered in a more effective way at a time of growing demands on limited resources in urban areas.

The main research question is: how can design and management of Kuala Lumpur's urban parks be adapted towards more ecologically sustainable practice? To help answer the main research question, the study has developed the following sub-questions:

1. How has the evolution of urban parks in Malaysia influenced the current design and management of these landscapes?
2. What aspects of design and management of Kuala Lumpur's urban park can be changed to increase ecological sustainability?
3. What is the appropriate appearance for ecologically sustainable landscape in Kuala Lumpur's urban parks?
4. What are the stakeholders' attitudes towards changing to an ecological approach to design and management at Kuala Lumpur's urban parks?

1.6 Structure of Thesis

The thesis is organised into eight chapters (refer to figure 1.1). ***Chapter 1*** provides the background and rationale of the study. The perspectives of the urban park management will be discussed in the context of Kuala Lumpur, Malaysia to highlight the potential for moving towards an ecologically sustainable landscape practice. The aim, research questions and the structure of the thesis are then presented.

Chapter 2 discusses the theoretical development for this research. This includes an in-depth discussion on ecological approaches to landscape design and management from the perspective of landscape ecology, urban forestry and urban water that potentially support urban park management, followed by consideration of stakeholders' attitudes towards changing approaches towards a more ecologically sustainable practice in the context of urban parks.

Chapter 3 discusses the approach and methodology of the research. The research design and development will be explained, including the procedure for the four phases of data collection and data analysis techniques in order to address the research questions.

PHASE 1	PHASE 2	PHASE 3	PHASE 4
Research Framework & background study	**Conceptual framework**	**Result & Analysis**	**Discussion, recommendations & conclusion**

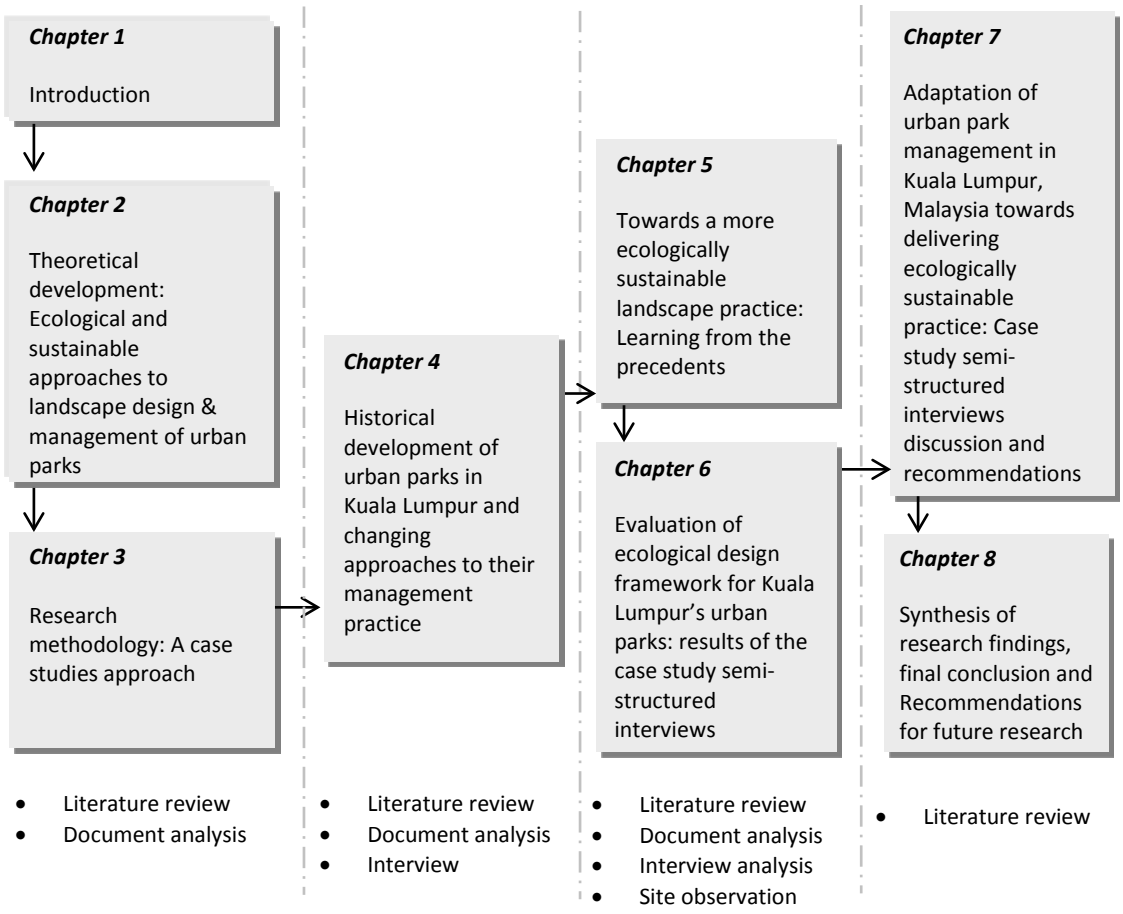


Figure 1.2: The Thesis Structure

Chapter 4 provides the historical timeline of the evolution of tropical urban parks in Kuala Lumpur, Malaysia and changes to their management approach, during the colonial period and the post-independence era. This includes an in-depth discussion on former and recent government policies relevant to urban park management and the influence of developed countries. Issues and problems facing the local authority in managing these parks will be discussed in the context of Kuala Lumpur, identifying the possibilities and challenges of changing the current management of urban parks towards a more ecologically sustainable practice.

Chapter 5 presents the key findings from the analysis of selected precedent studies from developed countries as a point of reference for delivering ecologically sustainable landscape practice in urban parks, followed by discussion of aspects of ecological design and management that could potentially be used to guide the development of an ecological design

framework for Kuala Lumpur's urban parks. Stakeholders' attitudes to delivering ecological approaches will be described in terms of benefits and challenges.

Chapter 6 will provide the key findings from the case study semi-structured interviews on the evaluation of the proposed ecological design framework for Kuala Lumpur's urban parks by stakeholders of different levels of management across the case studies, followed by a report on the stakeholders' attitudes towards changing the current design and management practice to a more ecologically sustainable approach.

Chapter 7 will provide a detailed discussion of the results and findings from the case study semi-structured interviews in answering the research questions and sub-research questions, besides making recommendations for adaptation of Kuala Lumpur's urban park management towards delivering ecologically sustainable landscape practice.

Chapter 8 will provide the synthesis of research findings, final conclusion and recommendations for future research.

CHAPTER 2

Theoretical development: Ecological and sustainable approaches to landscape design and management of urban parks

2.0 Introduction

This chapter provides a theoretical overview of the ecological approach in the design and management and maintenance of urban parks. Definitions of keywords and concepts related to this study will be provided for a better understanding of the terms related to this research. A historical perspective of the development of urban parks will be discussed to identify the changing role and function of this managed urban landscape. Understanding urban parks' evolution will provide justification for the need to change to a more ecologically sustainable approach to design, management and maintenance practice. Ecological landscape design, management and maintenance aspects and also stakeholders' attitudes towards this approach will be discussed as well as the potential for adapting ecologically sustainable landscape practice in tropical urban parks. Related issues and challenges will also be presented.

2.1 Definitions of keywords and concepts

Definitions of the key terms and concepts are provided below to explain their meaning in the context of this research, as well as to help clarify the scope of this study.

2.1.3 Stakeholders and their attitudes towards ecologically sustainable landscape

This research recognises that urban park management may consist of various stakeholders that include the local authority; related public and private agencies; and community groups or other interest parties. However, in the context of this study, stakeholders are defined as a workforce consisting of staff from different levels of management within the local authorities, who are directly involved in urban park management and attending to the needs of park users. They include the landscape architects, park managers, site supervisors and the maintenance staffs.

Assessing the management stakeholders' attitudes towards changing to a more ecologically sustainable practice of design and management of these managed green spaces is significantly important. This is because any such change will affect the overall landscape design, character and maintenance of the parks as it will create a new landscape style and also a new form of aesthetic (Cranz & Boland, 2004), which may differ from the conventional landscape of the past.

Eagly and Chaiken (1993) defined attitudes as “a psychological tendency that is expressed by evaluating a particular entity with some degree of favour and disfavour” (cited in Baur et al., 2013, p. 102). More recently, Crano & Prislin (2008) defined attitudes as:

> *“An evaluative integration of cognitions and affects experienced in relation to an object. Attitudes are the evaluative judgements that integrate and summarize these cognitive/affective reactions. …which in turn has implications for persistence, resistance, and attitude-behaviour consistency” (p.3).*

This definition suggests that imposing changes on the current landscape practice of urban parks may provoke both positive and negative reactions among the stakeholders since they are directly responsible for the management of these landscapes. Therefore, understanding their attitudes towards changing the approach to design and maintenance of urban parks is essential because their input will determine the success or failure of the implementation of an ecological approach in urban park management.

2.1.1 Urban park management

Urban parks represent publicly managed green open spaces within the city to serve the urban community. Dunnet et al. (2002) define urban parks partly as urban green space, which is:

> *“land that consists predominantly of unsealed permeable, ‘soft’ surfaces such as soil, grass, shrubs and trees…It includes all areas of parks, play areas and other green spaces specifically for recreational use” (p. 8).*

Konijnendijk et al. (2013) define urban parks as “delineated open space area, mostly dominated by vegetation and water, and generally reserved for public use” (p.2). These definitions clearly designate serving the public as the main purpose of their establishment. The term “urban parks” is used throughout this research to refer to urban public open spaces that are traditionally managed by the local authority. However, it also embraces new management approaches to managing these spaces through collaboration and partnership efforts, which also include financial support gained through community funds or public trust.

In the context of urban landscapes, the term “management” is a broad concept and needs to be clarified in relation to urban parks. Jansson and Lindgren (2012) review definitions of “management” used in landscape planning, park management and urban forestry, and find that it has different meanings in different fields. In landscape planning, “management” is mainly focused on regular operation and maintenance of the developed landscape, according to certain goals (Marshall et al., 1981). Similarly, in urban forestry, “management” is understood as managing technical and operational aspects of urban vegetation that requires an integrated approach (Jansson & Lindgren, 2012); mostly emphasis is on managing urban trees, with goals set for the benefit of urban communities (Gustavsson et al., 2005). “Management”, as defined in the park management field, is the management of physical resources including maintenance workforce and landscape materials, and the landscape operation of this landscape (Lindholst, 2008). It can be inferred from these definitions that “management” in the context of the urban

landscape and open spaces is more people and process oriented. Fundamentally it is about the park management identifying their goals and objectives, and then making decisions to achieve them, which Jansson and Lindgren (2012) describe as a continuous process.

However, in moving towards ecologically sustainable landscape of urban parks, landscape management should not only focus on constant upkeep of these urban landscapes, it must also adapt to any situation resulting from the ongoing development in the cities, for ensuring their sustainability. A more environmentally sensitive and holistic definition of landscape management is provided by the Council of Europe (2012):

> *"…action, from the perspective of sustainable development, to ensure the regular upkeep of a landscape, so as to guide and harmonize changes which are brought about by social, economic and environmental process" (cited in Jansson & Lindgren, 2012, p. 139).*

In response to these changes, Lankford et al.'s (2011) definition of management places greater emphasis on safeguarding natural resources of parks for ecosystem service provision, while fulfilling recreational needs of park users.

In the context of this study, the term "urban park management" is defined as a combination of landscape design and its maintenance operation of public recreational spaces in the city, including their natural resources, to increase ecological sustainability. This definition will be used in searching for possibilities for urban park management to adapt their current landscape practice towards a more sustainable approach that promotes multifunctional use of these spaces, such as storm water control (Kennedy et al., 2007), and habitat diversity and wildlife enhancement (Holsman & Peyton, 2003) as part of ecosystem services for the city, in order to achieve its environmental goals as well as public expectations.

2.1.2 Sustainable urban parks, ecosystem services and ecologically sustainable landscape practice

For the past two decades, the sustainable urban park has been an emerging concept, which expands the role of urban park as part of the city's green infrastructure to address the urban challenges caused by anthropogenic factors: urbanization and population growth, and natural factors: environmental problems and climate change. Cranz & Boland (2003) state that regardless of scale or location, the sustainable urban park plays an important role in providing eco-system services for enhancing public and environment health in the city.

The Millennium Ecosystem Assessment Board (2005) defines eco-system services as "the benefits people obtain from ecosystems" (p. vii): which can vary from natural lands to urban landscapes, such as urban parks. Boyd & Banzhaf (2007) provide a more specific definition of eco-system services, as "components of nature, directly enjoyed, consumed, or used to yield human well-being" (p. 619). The eco-system service helps urban communities maintain their physical and psychological health. Chiesura (2004) suggests that urban parks and their

vegetation are “sources of positive feelings and beneficial services, which fulfil important immaterial and non-consumptive human needs” (p. 129). Likewise, they also provide environmental benefits to the city by enhancing their ecological function through habitat diversity and allowing natural processes to occur. These definitions show that the sustainable urban park has been acknowledged as an innovative way for connecting urban communities with their natural surroundings and also overcoming urban environmental problems.

Sustainable urban parks have more potential to provide eco-system services for the city because they emphasise ecological sustainability in their management practice. Brown et al. (1987) defined ecological sustainability as “natural biological processes and the continued productivity and functioning of ecosystems” (cited in Platt, 1994, p. 11). In the context of urban park management, Gobster (1994) defined ecological sustainability as the “…aim to restore and maintain the ecological structure and function of ecosystems, and preserve and enhance the health and diversity of species and ecological communities” (cited in Parsons, 1995, p. 228). Protection of biodiversity and ecosystem functions within the city is vital, because a sustainable city, relying on rich biodiversity, will increase the efficiency of eco-system functions, and consequently will enhance the eco-system services provided for the city (Wu, 2013).

To conserve biodiversity and eco-system functions, urban parks could be managed through ecologically sustainable practice for safeguarding their natural resources and processes, such as water cycle, habitat diversity and wildlife. Lovell & Johnston (2008) suggest this can be done by adopting ecological design, and incorporating ecological knowledge into the management of urban parks. Ecological design is defined as “the reduction of pollution and resources use; and the protection or restoration of ecological processes with the intent of minimising the impact of the built intervention on the local and global environment” (Calkins, 2005, p. 30). Ecological design and management could support sustainable urban parks through three basic tenets, defined by Cranz and Boland (2004) as:

> *“(1) resource-self-sufficiency, in regards to material resources and maintenance, (2) solving larger urban problems outside of park boundaries, and (3) creating new standards for aesthetics and landscape management in parks and other urban landscape” (p.102).*

This definition suggests that sustainable urban parks encourage a more ecological design and management practice in providing a self-resilient landscape that consumes minimal inputs and is able to survive in a changing environment. As suggested by Wu (2012):

> *“landscape sustainability is not about maintaining the landscape at a steady state by reducing the variability in landscape dynamics or optimising its performance, but rather focusing on the landscape adaptive capabilities to cope with uncertainties” (p. 66).*

It is, therefore, important for urban parks to be ecologically resilient in order to adapt to environmental challenges in the city.

The implementation of ecological design in urban parks will consequently change their landscapes’ appearance and impact on the existing maintenance regime. Therefore, in moving

towards a more ecologically sustainable landscape practice, it is vital to get feedback from the relevant stakeholders involved in urban park management (Cranz & Boland, 2004), in searching for the best strategies of implementation considering the adaptability and practicality of such an approach to different urban park contexts and settings.

2.2 The evolution of urban parks and changes to their design and management

Since their conception in the early 19th century, urban parks have evolved to fulfil the needs and demands of urban communities, and local authorities are often responsible for the creation and upkeep of these parks (Reeves, 2000). The earliest public urban parks in the western world were created in England and their development was influenced by the picturesque design style of the Victorian landscape. During the industrial revolution in the early 19th century, huge environmental problems faced by many cities in England were the key driver to the public park movement (Jordan, 1994). As a result, more public parks were developed in urban areas. Built in 1847, Birkenhead Park was the first publicly-funded municipal park in the United Kingdom, (Conway, 2000). A similar approach was adopted in the development of Central Park, New York in 1857, designed by Frederick Law Olmstead (Lawrence, 2008). These parks have inspired development of other parks in developed countries, as well as in developing nations including Malaysia.

2.2.1 The key drivers influencing the changing role of urban parks

Urban parks have evolved from providing leisure and recreational needs to serving a more environmental role in order to adapt to social, economic and environmental challenges in the city (Reeves, 2000). Cranz (1982) categorised this evolution into four types of parks that emerged in four different eras, namely, the Pleasure Ground (1850-1900), the Reform Park (1900-1930), the Recreation Facility (1930-1965), and the Open Space System (1965-1990). The main role of urban parks was initially to provide social places for the public (Cranz & Boland, 2004; Young, 1995) given that “appalling living conditions, unhealthy lifestyles, hard and monotonous work led, for many, to unhealthy pursuits characterised by physical, mental and moral degradation” (Reeves, 2000, p. 157). However, this role began to change towards a sustainability function as a result of rapid industrialization and urbanization (Jordan, 1994; Yuen, 1996).

Rapid industrialization and urbanization have caused social problems such as “poor health, poverty, crime and political corruptness” (Young, 1995, p.537), which are major contributors to environmental problems (Robinson, 1904). It is suggested that public access to urban parks and their recreational facilities helps improve individual moral behaviour and social well-being (Crompton, 2007; Jordan, 1994), thereby leading to a better society (Young, 1995). Considering

their significant role in enhancing the social sustainability of a city, more urban parks were developed at the end of the 19th century.

Between 1850 and 1900, modernization further influenced the urban parks' evolution (Young, 1995). This movement influenced social reformers in developed countries to explore new potentials of urban parks to improve the quality of urban living. In the UK, Sir Ebenezer Howard initiated the Garden City Movement in 1898, suggesting urban parks as the key component of overall city planning, in a design for beauty and functional purpose, which later inspired the City Beautiful Movement that sparked in the United States (Hinds, 1979). Burlap & Watrous (1916) highlight a similar view suggesting urban parks of a modern city should emphasise "beauty and utility…so a park design must attain pictorial agreeableness without disregard of practical service which it must render" (p. 58). The park systems model was introduced by integrating urban parks and other open spaces with the city structure. Apart from this environmental function, horticultural interest remains as a public attraction to these spaces, with beautiful garden displays (Jordan, 1994).

Between 1930 and 1965, the role of urban parks changed to serve public recreational needs. Development of more sports and recreational facilities, formal gardens, a pinetum and an amphitheatre compromised the natural woodland; besides, introducing intensive landscape maintenance (Zipperer & Zipperer, 1992) produced a more "manicured landscape" using a variety of native and exotic species that were visually attractive (Young, 1995).

As environmental issues became more critical in the 1960s, a more sustainable approach to managing urban parks began to emerge. Cranz & Boland's (2004) study identified an emerging new trend between 1982 and 2002 that promoted more ecologically sustainable practices in parks. Their study indicated a new appetite among landscape practitioners to expand the role of urban parks towards delivering a more ecological and sustainable landscape practice.

2.2.2 The impact of environmental problems and climate change on urban parks' design and management

The impact of climate change on urban environments is one of the most significant subjects of debate in landscape literature and research. In the urban context, urban heat islands and extreme weather are among the impacts of climate change, affecting the urban environment by limiting its ecological function (Hunter, 2011), causing urban flooding and pressure on urban water supplies (Wilby, 2007). There is a potential for urban parks to perform an environmental role in addressing these problems, through measures that include stormwater management (ATSE., 2010), at the same time creating habitat diversity for biodiversity enhancement (Wilby, 2007). Therefore, it is important for these managed urban landscapes to be sustainably managed in order to ensure they are more resilient to environmental change. This can possibly be done by introducing plant communities that are adaptable to different site conditions, whilst also promoting species richness and variety (Hunter, 2011). There is disagreement among

scholars on the selection of species for such ecological designs. Some scholars believe native plants are more appropriate for this scheme (Calkins, 2005; Simmons, Venhaus, & Windhager, 2007). However, Hunter (2011) argues that non-native species could potentially support ecological design. Similarly, Hitchmough (2011) strongly recommends a more naturalistic style using exotic species as part of the vegetation strategy for creating a resilient and sustainable landscape. Exotic species, especially those that are non-invasive, could potentially thrive and may perform better in a highly modified urban environment. Some of these species are aesthetically pleasing and are also appropriate to the local environment and wildlife. This management approach allows plant communities to survive naturally; thus, less maintenance resources and minimal human intervention are required.

2.2.3 Financial implications for urban park design, management and maintenance

Local authorities have been facing difficulties in securing constant financial support for managing urban parks, especially those parks practising intensive and costly horticultural practice (Jansson and Lindgren, 2012). Limited government resources may pose challenges to the local authorities in managing these landscapes, as suggested by Jordan (1994):

> *"With the current financial pressures on local authorities, their absence of statutory duties to maintain public open space, with the problems of vandalism which follow when the on-site presence of the park keeper goes and neglect sets in, and with the potential concerns of compulsory competitive tendering for maintenance contracts, the priceless national resource of public parks is under threat" (p. 111).*

In developed countries, lack of secure funding has become one of the key drivers for local authorities to change their current landscape practice to a more sustainable approach. For example, Zipperer & Zipperer's (1992) study of changes in landscape management practice at Thornden Park, Syracuse, New York found that limited funding had led the park management to change the manicured landscape of the park to a more naturalistic style, in order to save maintenance costs. Subsequently, the amount of woodland in the park increased by 10.4% between 1955 and 1981. This study claims a similar trend was followed in other urban parks in the country, as well as some other European countries. Considering this trend, urban park management could potentially apply a similar economic solution that would be adaptable for immediate and long-term goals, at the same time increasing natural vegetation in urban parks.

2.3 Ecologically sustainable practice in relation to urban park management

As urban parks evolve in the 21st century, they need to serve a more multifunctional role towards delivering more environmental services to the city (Cranz & Boland, 2004), without compromising the needs and requirements of park users (Gobster et al., 2007). Ecologically sustainable practice could promote sustainable urban parks, which would enhance the city environment and thereby eventually benefit urban communities. The following section sets out the basic principles and ideas that underpin an ecological approach to managing urban parks.

2.3.1 Ecological approaches for managing urban landscapes: How inputs and perspectives from various fields of studies inform research in landscape architecture.

The past 50 years have seen the emergence of a growing body of research on ecological approaches to urban landscape management, with inputs from many fields of study directly concerned with urban landscapes, such as landscape ecology; urban forestry; environmental studies; and urban stormwater management. The following sections discuss the potential of these ecological approaches to increase sustainability, in relation to urban landscapes.

- ***Ecological sustainability from a perspective of landscape ecology***

From a landscape ecology perspective, ecological sustainability mainly emphasises the conservation of natural vegetation and the related ecological processes. Wu (2012) highlights that integrating ecological processes into the planning and design of urban landscapes will help secure and sustain ecosystem services: an important component of sustainable cities for promoting public health in the future. Parsons (1995) states that:

> *"At its most basic level, landscape ecology involves the use of scientific ecological principles in the management and design of landscapes, and these principles have direct implications for the management of wildlife habitats" (p.228).*

As habitats and wildlife are important resources of urban landscapes, application of ecological knowledge can support their management towards ecological sustainability for providing ecosystem services to the city.

There are, however, different scales of application of ecological knowledge in managing urban landscapes for adapting to environmental and social change in the city context. To strengthen ecological stability under environmental uncertainty at the city scale, Gunderson (2000) suggests 'adaptive capacity' management could increase the resilience of the managed landscape in accordance with its natural state by creating habitat diversity for biodiversity enhancement, which eventually would increase the landscape's stability and ability to perform its ecosystem functions.

Besides providing design solutions in accordance with the scale of the site; ecological knowledge also promotes strategies to expedite their implementation. McAlpine et al.'s (2013) study on the potential of incorporating ecological design in landscape management practice to support ecologically sustainable landscape outlines four strategies for implementation, which are: (1) identifying the problems and their level of consequences; (2) developing a comprehensive ecological solution; (3) delivering a proper knowledge transfer from theory to the implementation; and (4) promoting eco-system restoration to support ecological resilience. However, Lovell & Johnston (2009) suggest that ensuring successful implementation of ecological designs requires continuous supervision and assessment of the landscape

performance using various tools. Seabrook et al. (2011) go further and recommend a continuous review of landscape design and management strategies, followed by appropriate adjustment to ensure that they are sustainable and able to perform ecosystem functions in correspondence to environmental change.

It can be summarised that integrating ecological knowledge into urban park management requires a proper framework to identify the best strategy for delivering this sustainable approach through multifunctional designs and innovations that could enhance ecological processes while at the same time corresponding to public expectation in terms of the park's appearance.

- ***Ecological sustainability in the perspective of urban forestry***

Ecological sustainability is also a growing concern in the field of urban forestry, which considers urban landscapes as part of managed forest areas. Historically, the forest concept was introduced to restore the natural urban woodlands cleared for industrialization. Konijnendijk et al. (2006) reviewed the development of urban forestry in developed countries and traced how this concept emerged and was practised by local authorities in North America and Europe at the end of the 19th century to address social and environmental problems in urban areas. Since then, urban forest has complemented and been incorporated into design of urban parks to enhance their connection with nature. In the 1970s, the urban forest concept was revived as a result of a growing interest in urban landscape management as one of the ecological solutions to address urban social and environmental problems through a more holistic manner by joining all of the urban green spaces in the cities, including urban parks, under one comprehensive system (Werquin, Duhem, & Lindholm, 2005). This was referred to as the 'Open Park System' by Cranz & Boland (2004). With urban forest being part of the urban landscape, knowledge of its management is vital to inform and support other disciplines in urban management, such as urban landscape management. Randrup et al. (2005) suggest that forest management should be integrated within urban landscape management at the policy and operational level.

The urban forest concept can assist urban landscape management through its incorporation into the idea of sustainable forest practice. This practice increases the capacity of trees and woodland to provide ecosystem services by "sustaining the environmental quality, resource conservation, economic development, psychological health, wildlife habitat, and social well-being" (Clark et al., 1997, p.18). In the context of urban landscapes, the urban forest concept places specific emphasis on the conservation and management of urban trees and woodlands through an arboricultural approach that focuses on individual tree care in order to achieve cumulative effects on the health and performance of urban forest in terms of ecosystem services (Konijnendijk et al., 2006). Thompson et al. (1994, p.5) studied the role of urban forestry in achieving the ecologically sustainable city and suggest that this approach comprises the following four areas of emphasis:

a. *Species selection and diversity* by creating a heterogeneous mixture of plant communities that are adaptable to changing site conditions;
b. *Inventory and landscape planning* by providing a proper database and information system to assist current and future management of urban forest;
c. *Tree care and wood utilisation* by recycling wood wastes for maintenance;
d. *Public relations and support* by encouraging public, private and community engagement in tree planting and management programmes.

Clark et al.'s (1997) study highlighted a similar view, which they translated into a model for urban forest sustainability, suggesting three basic principles of urban forest management, which include: "(1) vegetation resources; (2) a strong community framework; and (3) appropriate management of the resources" (p. 21). This principle allows regeneration of urban woodlands through natural processes on various spatial and temporal scales. Thus, strong collaboration between different levels of landscape management within the public and private sectors and involvement of the community in this process are necessary for gaining mutual understanding and acceptability of this ecological approach (Clark et al., 1997).

In can be summarised that knowledge from urban forestry can support management of the natural vegetation and woodland in urban landscapes. However, at the management level, it can be argued that this ecologically sustainable practice requires comprehensive and iterative planning and management based on proper knowledge and a skilled workforce, with short-term and long-term strategies, which may involve huge initial investment for long term benefits (Thompson et al., 1994). Without the prior knowledge and approval of the people directly managing and using the urban landscapes, disagreements might emerge in the event of the implementation of this approach.

- ***Ecological design in the perspective of water management***

Research in water management is becoming a necessity in searching for appropriate solutions to disruption of the hydrological cycle in the city that has been caused by urban development. Previous studies in water management have discussed alternatives for sustainably managing urban stormwater, using landscapes as their main components. This includes sustainable urban drainage system (SuDS) (Kennedy, Lewis, Sharp, & Wong, 2007) and artful rain gardens (Nigel Dunnett & Clayden, 2007; Echols, 2008). The integration of these sustainable systems into urban parks enhances their multifunctional roles.

SuDS apply an ecological approach to managing stormwater on-site by integrating two or more stormwater collection and filtration components before it enters the waterways. Glerum (2011, p. 2) outlines the following seven components of SuDS using ecological treatments:

a. Source control: includes green roof, rainwater harvesting and permeable pavements
b. Filtration: includes filter strips, filter drains or trenches
c. Infiltration: includes soakaways and trenches
d. Detention: detention basins are often designed as a dry landscaped area that can be used to detain large volumes of stormwater when required
e. Retention: includes retention ponds that are designed with water treatment
f. Wetlands: includes wetlands that are often designed to treat water and provide increased biodiversity
g. Open channels: includes swales, which convey water as well as provide some infiltration capacity, and other harder engineered open channels such as canals and rills.

These landscaped components act as surface water flow control and cleansing tools, which enable the collected rainwater restored in the pond and wetlands to be used for irrigation and other landscape maintenance.

Rain gardens are another example of how ecological knowledge can be integrated with stormwater management that uses landscapes as part of the ecological treatment. The idea of the rain garden is based on an understanding of interrelated function between water and landscapes in a continuous process, which is delivered in an innovative design. Similar to SuDS, rain gardens are designed to collect, treat and restore stormwater, whilst also using this resource to irrigate plants.

Besides these main functions, rain gardens have the potential to increase the site's multifunctional value. Echols (2008, p.6) reviews case studies of rain garden projects in the USA to demonstrate the various environmental and social benefits of this ecological approach, which include the following:

a. Ecological legibility- communicates ecological and hydrological function.
b. Maintenance strategies- introduce new methods and guidance for upkeep of this landscape
c. Information systems- provide alternative media to raise stormwater awareness
d. Physical accessibility- encourages people to see, touch and play with rainwater
e. Multiple use- integrates multiple uses beyond stormwater treatment
f. Visual integration- creates visual coherence between the form and function of a space
g. Public awareness- demonstrates a community's existing knowledge about stormwater
h. Perceived value- creates recognised added economic value
i. Municipal commitment- creates positive agency action and inter-agency cooperation

Echols's (2008) study suggests that "rainwater designs that integrate multiple uses will have greater public acceptance and add more value than designs that only provide stormwater treatment" (p.11).

The integration of SuDS and rain gardens is a successful exemplar of ecologically sustainable landscape practice in urban landscapes. Besides functioning as water filtration and control systems, SUDs can potentially enhance the environmental function of the landscapes (Nigel Dunnett & Clayden, 2007; Lovell & Johnston, 2008; McGuckin & Brown, 1995), whilst delivering public leisure and recreational needs (Kennedy et al., 2007). In addition, Makhzoumi (2000) suggests that it is vital for this landscape to be aesthetically acceptable to the public.

- ***Changing towards ecologically sustainable practice for urban park management***

Research inputs from other fields of study have acknowledged and highlighted the contribution of ecological knowledge in urban landscape management. These studies have outlined diverse potentials, various strategies for implementation, and also some specific improvements to ecological design and management practices in the context of urban landscapes for increasing sustainability in the city. It is also noticeable that most of these previous studies focused on the different scales: regional, city or park, within a context. Wu (2013), referring to Forman and his own studies on the significance of spatial configuration to enhance sustainability performance, infers that "a landscape or region, consisting of multiple ecosystems…represents a pivotal scale domain for the research and application of sustainability" (p. 1000). Forman (1995) further suggests this is because at these scales the interaction between man and nature occurs simultaneously (cited in Makhzoumi 2000, p. 177) and humans' interaction with their environment is obvious (Dramstad, Olson, & Forman, 1996) and thus observable. However, Wu (2013, p. 1000) argues that:

> *"While all spatial scales, from individuals and local ecosystems to the global and the biosphere, are relevant to understanding and practice of sustainability, some scales are more operational than others".*

Therefore, in the context of this study, the urban park is the appropriate scale for studying ecologically sustainable research and practice because it best represents the "scale at which people and nature mesh and interact most acutely, and thus the composition and configuration of a landscape both profoundly affect, and are affected by, human activities" (Wu, 2013, p. 1000). Being a larger part of urban landscapes, urban parks are important areas in bringing a more ecologically sustainable landscape into practice with creative innovations of green technology, as they have all of the possible resources and processes to perform this function (Lovell & Johnston, 2009). In the context of Kuala Lumpur, urban parks can be an appropriate model for research and application of ecological design and management practices, which could benefit KLCH in terms of addressing environmental challenges in the city, especially the constant flooding issues.

2.3.2 The role of urban parks in adopting more ecologically sustainable landscape design and management practices

As an integral part of cities, the role of urban parks in contributing to a more ecologically sustainable landscape has been widely recognised. As part of the green infrastructure of cities, the typical role of urban parks in providing leisure and recreational space should be expanded to include environmental responsibility. As Solecki & Welch (1995) stressed, "urban parks and open spaces are essential for the ecological health of urban environments" (cited in Ryan, 2006 p. 61). Gairola and Noresah (2010) suggest that urban parks are "key ecological service providers to urban dwellers with multiple functions and are also important pillars of sustainable development" (p. 44). They help conserve and manage urban resources to provide ecosystem services for the city. The Millennium Ecosystem Assessment 2003 divided ecosystem services into four types:

> *"(1) Provisioning services, providing goods like food; (2) regulating services, including climate and flood control; (3) supporting services, including ecological properties; and (4) cultural services, providing humans with recreational, spiritual and aesthetic values" (cited in Kremen & Ostfeld, 2005 p. 540).*

Kremen & Ostfeld identify that ecosystem services and biodiversity are dependent on each other; thus it is important to increase biodiversity in urban landscapes. Being a major component of urban landscapes; urban parks have the potential to support conservation, management and education about biodiversity (Sandström et al., 2006) through creation of habitat diversity, wildlife protection and stormwater management (Andersson, 2006; Lovell & Johnston, 2009). Chiesura (2004) also suggests that the landscape vegetation in urban parks provides:

> "*…important environmental services such as air and water purification wind and noise filtering, or micro-climate stabilization. These natural areas also provide social and psychological services, which are of crucial significance for the liveability of modern cities and the well-being of urban dwellers". (p.130)*

This suggests that besides introducing new ecological design to urban parks, it is also important to conserve the existing natural vegetation of these landscapes in fulfilling both recreational and environmental needs. Cranz & Boland (2003) suggest that creating more linkages between these green spaces could bring a closer interaction between people and the natural environment. This not only contributes to public health and wellbeing but also enables the community to develop an understanding and appreciation of nature and natural processes. Further interactions between socio-ecological networks will produce multifunctional landscapes that put added value into the urban landscapes (Waldheim, 2006).

It can be summarised that urban parks have great potential to increase the ecological sustainability of cities in the future. In developed countries, ecological sustainability has been an important goal for urban parks, through sustainable design and management. However, achieving this goal requires a shift in the current practice towards a proper understanding of the

attributes of ecological design and management, including design aspects, benefits, and the challenges of implementation.

2.4 The attributes of ecological design and management

Sustainable urban parks are characterised by certain ecological attributes that differ from traditional or conventional landscapes in terms of their practice. According to Manning (1982):

> *"…ecological approaches to landscape design involve the replacement of more traditional horticultural maintenance by techniques of vegetation management through the application of ecological awareness and knowledge to design, management of landscape and has been defined as an alternative to the restricted, artificial and expensive creations of conventional design" (cited in Özgüner et. al., 2007, p. 35).*

It suggests that applying such an approach enables park management to change to a maintenance strategy that is more flexible, consumes less resource and is more cost-effective.

Previous studies have discussed various ecological approaches to the design and management of urban landscapes including urban parks, which promote landscape restoration (Seabrook et al., 2011); creating multifunctional landscape design (Lovell & Johnston, 2008); and introducing stormwater management using SUDs (Nigel Dunnett & Clayden, 2007). The attributes of this approach include creating different types of visual appearance (Cranz & Boland, 2004), such as a naturalistic design style, in urban landscapes (Hitchmough & Dunnett, 2008) that encourage self-sufficient landscapes (Cranz & Boland, 2004).

However, in order for ecological design to be acceptable to the public, Nassauer (1995) suggested using 'cues to care' techniques in managing the landscape, by considering the aesthetic aspects of the approach (Gobster et al., 2007; Nassauer et. al. 2009). All of these attributes and aspects of ecological design, management and maintenance, including their benefits and challenges, are discussed below.

2.4.1 Aspects of ecological design and management of urban parks

Landscape restoration is one of the important aspects of ecological design and management of urban parks. According to Seabrook et al. (2011, p.409), "restoration is critical for the conservation of biodiversity, the maintenance of ecosystem services and the mitigation of climate change, and needs to become a core business of landscape ecology and landscape and urban planning in the 21st Century". They suggest three directions for successful implementation of ecological design through restoration that could encourage natural regeneration of semi-woodland areas in the parks, which include:

a. Allowing natural succession to occur in the ecosystems,
b. Repairing disturbed landscapes through retrofitting the existing landscape,
c. Creating new ecological landscapes to improve the local conditions.

In terms of vegetation strategies, there is disagreement over species selection for ecological landscape design. Echols (2008) argues that ecological design should emphasise the use of native species because they are more resilient to surviving under extreme climate conditions. Despite such advocacy of the use of native species for this purpose, climate change may pose challenges to conservation of these species. Due to realisation of their aesthetic aspects, the use of non-invasive exotic species is becoming acceptable in ecological design (Hunter, 2008). Vegetation in this naturalistic landscape style does not necessarily need to be of native types; it is also possible to blend these with exotic species to create heterogeneity (Hitchmough, 2008b; Seabrook et al., 2011). Most importantly, the interaction among these species in their plant communities should allow succession processes to occur and should be able to tolerate the extent of extreme climate alteration (Hunter, 2011). Taylor & Johnston (2009) suggest that a proper combination of these species through a variety of plant communities could potentially increase the ecological performance of these managed urban landscapes.

Ecological landscape design is more flexible in terms of its maintenance regime. For example, ecological design replaces high maintenance conventional lawns with open meadows, using mixed native grasses and allowing natural succession to occur (Cranz & Boland, 2004). Thereby, mowing activities are limited to priority areas such as pathways and at the edge of natural plant communities in order that visitors can appreciate that the landscape is intentionally maintained in that way and is not the result of neglect (Nassauer, 1995). In addition, "creating soft edges to concrete lined ponds and changing the mowing regime to allow the grass to grow longer can bring about a considerable increase in species diversity by providing habitat for insects, birds and small mammals" (Özgüner et. al., 2007). Once the natural processes are allowed to take place, the landscape will become more resilient and increase its self-sufficiency in terms of resources use, which will eventually lead to it becoming less dependent on labour input. However, Cranz & Boland (2004) argue that to apply ecological landscape design in urban parks still requires a certain level of care to avoid negative perceptions by the public in terms of the visual appearance.

2.4.2 Appropriate appearance for ecologically sustainable landscape

Visual appearance is another important aspect of ecological design that should concern urban park management. This is because the public usually judge landscape quality based on its visual appearance (Kaplan, 1985). According to Cranz & Boland (2004), ecological design creates a different meaning of visual appearance. Some people may perceive the visual appearance of ecological design as unpleasant or neglected (Nassauer, 1995a). Makhzoumi (2000) points out that people will not recognise the ecological value unless it provides a good visual appearance. To gain people's acknowledgement and acceptance, Nassauer (1995) suggests improving the visual appearance of ecological design by imposing ecological treatments that are familiar to them.

To address this issue, Nassauer (1995a) introduced the “Cues to care” concept, which incorporates conventional landscape elements in the ecological landscape in a way that people can understand and appreciate. This concept introduced new aspects of ecological design - introducing plants of various sizes and colours to promote visual interest designed in familiar forms. Hitchmough & Woudstra (1999) also suggest a combination of native and exotic herbaceous perennials species to improve the landscape’s visual appearance (Hitchmough & Woudstra, 1999). The “cues to care” concept also incorporates simple structures for attracting wildlife, such as bird feeders that are recognisable by people. In addition, some areas remain as manicured gardens with garden furniture, which represent intensive or a more familiar treatment and aesthetic. Nassauer (1995) suggests that proper presentation of the ecological landscape to the public will help promote this landscape treatment and raise societal awareness of the importance of a more environmentally sensitive approach.

2.4.3 Benefits of ecologically sustainable landscape practice for urban parks management.

Most of the previous studies discussed the benefits of sustainable urban parks and open spaces in terms of ecosystem services provision (Burgess, Harrison, & Limb, 1988; Chiesura, 2004). Figure 2.1 presents a comparison in terms of long-term costs and benefits between providing potential ecosystem services through traditional manicured landscape management and through ecological design and management practice. Such a comparison is necessary to explain the best management practice for optimising the role of urban parks, as part of the city’s green infrastructure, in responding to environmental challenges.

This comparison between traditional landscape management and ecological landscape management is conducted according to the four categories of ecosystem services outlined by the Millennium Ecosystem Assessment Report (2005), namely, supporting services, provisioning services, regulating services, and cultural services. Ecological design would contribute to supporting services by encouraging the landscape to self-regenerate through natural processes that include the nutrient cycle, soil formation and the hydrological cycle, thereby forming a cost-free support system for the people and environment. Whereas, maintaining the traditional manicured landscape is more resource intensive and might have higher cost implications.

Table 2.1: Comparison of potential costs and benefits of ecosystem services provision between traditional manicured landscape management and ecological park design and management

Potential ecosystem services (Millennium Ecosystem, 2005)	Traditional landscape management		Ecological landscape management	
	cost	benefits	cost	benefits
Supporting services (Natural cycle)	*Human intervention*		*Self-regenerated*	
- Nutrient cycling	***	-	-	***
- Soil formation	***	-	-	***
- Hydrological cycle	***	-	-	***
Provisioning services (Natural resources)	*Consumption*		*Conservation*	
- Food (people/wildlife)	***	***	*	**
- Water (water supply)	***	-	*	***
- Woods (habitat diversity)	-	-	**	***
Regulating services (environmental benefits)	*Conventional design*		*Integrated design*	
- Climate regulation (thermal comfort)	***	***	***	***
- Flood mitigation (stormwater management)	***	**		***
- Water purification (SuDS)	-	-		***
- Air quality regulation (reduce energy consumption/ carbon footprint)	-	-		***
Cultural services (social benefits)	*Social oriented*		*Socio-ecological oriented*	
- Aesthetic (manicured/naturalistic landscape)	***	***	**	*
- Recreational (health and well-being)	***	***	*	**
- Educational (environmental awareness)	***	***	**	***

Legend: level of cost and benefits - Low Moderate** High****

Regarding provisioning services, ecological landscape management potentially shifts urban park management from rigid traditional practices to practices that are more dynamic, sensitive and adaptable to environmental changes, as suggested by Hunter (2008). Unlike the traditional management practice, ecological landscape management promotes conservation and restoration of the park's vegetation with minimal landscape intervention. This scheme safeguards the park's natural resources, and secures the food and water supply for long-term sustainability. However, Cranz & Boland (2004) argue that some landscape designers interpret ecological design as meaning mimicking nature without integrating natural processes, due to a lack of ecological input. Some interpret ecologically sustainable environment as "relatively open grassy areas, punctuated by occasional groupings of trees and shrubs" (Parsons, 1995. p. 232). This has resulted in the creation of landscapes that are unable to perform their optimum environmental role but instead consume a lot of energy and resources.

The regulating services could yield environmental benefits such as climate regulation, flood mitigation, water purification and air quality regulation. The traditional manicured landscapes require instant effects and constant maintenance, and are therefore more costly. However, ecological design enhances landscape heterogeneity through the creation of habitat diversity and biodiversity that helps to increase performance of various ecological functions, such as flood control; mitigating urban heat islands; addressing urban problems; and adapting to the

changing climate (Cranz & Boland, 2004; Hunter, 2008; Lovell & Johnston, 2009; Wilby, 2007). These multifunctional roles can be achieved through integrated design, but this requires strong collaboration between landscape architects and other experts, sharing knowledge inputs responsibilities. Such collaboration can also provide opportunities to integrate urban park management with other fields of management, such as storm water management for on-site water collection, treatment and reuse; assisting ecologists and foresters in managing urban resources and biodiversity (James et al., 2009). The cost of implementation and operation could be shared with other respective agencies. Some of these possibilities may not be available with traditional landscape management because it usually involves conventional design and costly engineering solutions for achievement of each separate purpose.

In terms of cultural services, the main role of urban parks has always been socially oriented, towards such as increasing people's physical and psychological health (Chiesura, 2004; Parsons, 1995) and instilling social and cultural values (Burgess et al., 1988) through leisure and recreational facilities. Therefore, the requirements of aesthetics, recreation and education imposed on traditional landscape management differ from those in ecological landscape management. There is the problem that in aiming to fulfil socio-ecological functions, ecological designs for more naturalistic landscape might be disapproved of by the public because of the messy appearance. However, recently, there has been a shift away from the social role of urban parks towards instilling knowledge, experience and awareness among the public of their environmental role (Swanwick et al., 2003). Therefore, ecological knowledge aids landscape designers and managers to creatively develop multifunctional designs that fulfil the ecological needs of urban parks while providing aesthetically pleasing landscape suitable for recreational activities (Lovell & Johnston, 2008). This approach could enable park management to manage operational costs more efficiently while gaining optimum environmental benefits.

The comparison of cost and benefits between traditional and ecological landscape management shows that each type of management has its own strengths and weaknesses. It could be inferred that traditional landscape management applies conventional design solutions that require more human intervention and resource consumption, which can be costly, yet produces limited ecosystem services, and mostly focuses on social aspects. Whereas, promoting integrated design, ecological design and management could potentially provide optimum ecosystem services on a more modest budget. However, in aiming for socio-ecological balance, there may need to be compromises between ecological design and social expectation, especially regarding aesthetic aspects. To address this issue, Makhzoumi (2000) suggested that designers shift their perspective towards creating landscapes that reflect their meaning and purpose rather than solely the aesthetic aspect, which would simultaneously enhance the local character and identity. It would also be beneficial, in applying ecological knowledge into practice through public green spaces such as urban parks, to allow people to experience and be part of these ecological landscapes. Despite the various benefits, Lovell & Johnston (2008)

acknowledge that ecological design and management is a multi-faceted approach, and its implementation may pose challenges for managers.

2.4.4 Challenges in implementing ecological design, management and maintenance

Practising ecological sustainability requires a change of perspective on urban landscape management and the traditional work culture on the part of urban park management, which can be challenging. Previous studies have highlighted that despite receiving growing interest in ecologically sustainable landscapes, ecological design, management and maintenance are still not widely practised (Calkins, 2005; James et al., 2009; Sandström, Angelstam, & Khakee, 2006). These studies have highlighted the key challenges and provide some learning experience for implementing this approach.

Sandström et al.'s (2006) case study of ecological approaches to habitat management in urban landscapes of Sweden explains that the limited application of such approaches is due to lack of knowledge and skilled personnel within the local authorities to implement these practices on the ground. Similarly, Calkins' (2005) survey on ecological design practice in the USA among landscape professionals and practitioners indicates that despite their interest in this approach, they are facing challenges in implementing ecological design. Amongst the challenges is a lack of ecological knowledge and skill among the practitioners that has caused their inability to convince the client to apply an ecological design scheme. This survey highlighted resistance by the client and contractor in terms of budget and construction methods, which focused on the time-consuming process of sourcing plant materials from a limited selection, especially native species, and the low aesthetic value. Furthermore, unfamiliarity with green technology and its potential, such as SUDs, permeable paving and green roofs, creates a conflict of interest between the initial cost of implementation and the long-term benefits.

Many studies have recognised the importance of research input to overcome the difficulties in realising the ecological approach (Calkins, 2005; Nassauer & Opdam, 2008) such as adaptation to weather uncertainty due to climate change (Hunter, 2008); creating multifunctional landscapes in sustaining public and environmental needs (Echols, 2008; Lovell & Johnston, 2008); changing approaches to landscape design and management to adapt to the changing environment (Hunter, 2011); and developing a comprehensive management plan to sustain this landscape (Lovell & Johnston, 2009).

Supporting research development as well as the application of ecological design and management requires collaborative efforts among researchers and practitioners in urban park management and other related professions. However, James et al. (2009) found that the lack of a proper structure to update research input in the complex urban management structure has led

to ineffective solutions to the design, management and maintenance of urban landscapes, to adapt to changing social and environmental needs. Acknowledging the complexity of urban ecosystems, James et al. (2009) have developed a research framework to support knowledge transfer in urban landscape management, which involves the following innovative approach:

> *"…multi-disciplinary: individuals or groups working in different disciplines address the same issues; inter-disciplinary: individuals or a group work at the boundaries of traditional disciplines; and trans-disciplinary: an individual or group uses knowledge from a number of disciplines, to see new connections and gain new insights" (p. 66)*

Nassauer & Opdam (2008) suggest that creating a strong link between research and design through these collaborations will determine the successful implementation of ecologically sustainable practice, provide the public with a better understanding and increase their acceptance of this landscape.

Besides the design and management aspects, ecological design also poses challenges in terms of its visual appearance. According to Nassauer (2011), the aesthetic is the most prominent character of the landscape, and is determined by the level of maintenance:

> *"The look of the landscape reflects on those who are responsible for it. A place that looks neglected suggests that those who care for it are irresponsible or overwhelmed" (p.321)*

Based on this perception, urban park management might face a challenge in convincing the public to accept the "messy" appearance of naturalistic landscape as a common attribute of ecological design. Thus, a two-pronged strategy was proposed for adopting an ecological approach in landscape practice: first, the development of an inclusive and flexible framework of a new landscape style (Makhzoumi, 2000), and second, the establishment of technical information (specification) to guide design implementation at local and regional levels (Makhzoumi, 2000; Cranz & Boland, 2004).

It can be summarised that even though researchers and practitioners have acknowledged the benefits of an ecological sustainable landscape, there are challenges in putting this approach into practice. Previous studies suggest strong collaborative effort and integration of multiple disciplines are required to transfer research inputs into real practice. While most research has focused on a larger context of urban landscape management to address urban problems, in order to develop proper ecological solutions to adapt to these changes, it is also important to investigate how the environmental challenges affect the single organisational structure of an urban park's management. In addition, assessment is needed of attitudes among various stakeholders involved in urban park management regarding ecologically sustainable landscape practices.

2.5 Stakeholders' attitudes towards ecologically sustainable landscape

Stakeholders' attitudes towards ecologically sustainable landscapes require in-depth review and assessment because they have significant influence on the implementation of such practice. Historically, studies on peoples' attitudes towards certain objects or features suggested that they are influenced by aesthetic preferences. Kaplan's (1985) studies of people's attitudes towards landscape and the environment imply that attitudes are usually formed by their visual preference. Ecological sustainability may have implications for people's attitudes and preferences towards managed urban landscapes, especially in relation to their aesthetic appearance. Some of the earliest theories about the relationship between people's attitudes and aesthetics were developed in the 18th century in the work of philosophers of arts, such as Hume's theory of taste (Carroll, 1984), Kant's theory of aesthetic judgement (Kant, 2000), and the modern aesthetic attitude theory of Stolnitz (1978).

A British philosopher, Hume (1757), in his theory of taste claims that people's attitudes are very much influenced by their understanding of the positive or negative implications attached to them individually and socially, which results in acceptance or rejection (cited in Gracyk, 1994, p. 177). Hume refers to this attitude as "aesthetic taste", which is often reflected as a sense of beauty; however, he accepts that "beauty is no quality in things themselves: it exists merely in the mind that contemplates them; and each mind perceives a different beauty" (cited in Carroll, 1984, p. 182). Since tastes vary between individuals, Hume suggests that an aesthetic judgement towards a certain object or subject should be guided by a set of rules that promotes general acceptance rather than personal opinion (Carroll, 1984).

Furthermore, Kant (2000) argues that the acceptance of something that is good requires understanding the meaning of it; thus aesthetic judgement does not necessarily focus solely on beauty. Therefore, Nassauer (1995) suggests the importance of promoting the meaning of an ecological landscape to the public in order for them to understand, recognise and accept this concept for implementation in the urban landscape, particularly urban parks. Stolnitz (1960) posits that "when one's attitudes toward a thing is positive, he will try to sustain the object(s) existence and continue to perceive it" (cited in Hospers, 1969, p.18). However, to promote a positive attitude towards this landscape, first, the urban park management need to have a proper understanding and knowledge of this ecological approach in order for them to disseminate this information to the public.

In the context of urban park management, attitudes towards ecologically sustainable landscapes are one of the significant discussions in landscape studies. Eventually, people's attitudes will determine the success or failure of the ecological design and management of urban parks. Nassauer (1995) argues that misconception of this ecological design as unattended landscape may cause the public to reject this approach. This will create a perception amongst the people that the urban park management is not properly maintaining the

landscape, because as Nassauer's (2011) theory of care and stewardship states, "landscape evidence of care has a halo effect in which an overall impression of the appearance of the landscape affects assumptions about the people who are responsible for providing, as well as assumptions about resources characteristics" (p.321). However, to achieve sustainability, it is important to change people's attitudes towards such an approach (Fischer et al., 2012). As people's attitudes towards ecologically sustainable landscapes may vary based on their cultural background, it is important to understand how culture influences people's attitudes.

2.5.1 Cultural influences on people's attitudes to ecological design

People's attitudes and cultures have a mutually significant influence on each other. "Different cultures have different value systems and relationships with nature" (James et al., 2009). Steiner (2011) states that these different meanings and interpretations amongst different cultures further influence landscape change. Thus, "understanding how different cultural and subcultural groups in cities use urban green spaces is central in developing appropriate management systems" (Johnston & Shimada, 2004).

Nassauer (1995) argues that culture is part of landscapes and landscape is inculcated by culture. Acknowledging the importance of incorporating cultural principles into ecological landscape design, Nassauer (1995) outlines four principles in the relationship between landscape structure and culture, namely:

a. "*Human landscape perception, cognition and values* directly affect the landscape and are affected by the landscape.
b. *Cultural conventions* powerfully influence landscape patterns in both inhabited and apparently natural landscapes.
c. *Cultural concepts of nature are different from scientific concepts of ecological function*.
d. *The appearance of landscapes* communicates cultural values" (p. 229).

Therefore, in the search for a potential ecological design, Nassauer (1995) suggests a need to investigate various alternative landscape designs, which incorporate cultural preference as well as ecological function.

Nassauer (1995a) argues that historically people have been culturally instilled with the concept of picturesque nature, which defines nature or the natural landscape as a maintained landscape that is clean and tidy rather than by its ecological purpose. This knowledge has been embedded into the belief system that socially influences the way people perceive the quality and functionality of landscapes according to their beauty. Therefore, to change the cultural perception of ecological landscapes, the first step is to alter the landscape into a form that is familiar to a specific culture in terms of its design and maintenance aspects. Nassauer's (1995a) theory of cues to care best describes this strategy.

To accelerate cultural acceptance of ecological landscapes, it is necessary to provide a closer link between people and their environment; this could be done in urban parks that form a larger green open space, promoting social interaction in the city. Forman and Godron (1986) argue that developing a strong social and ecological network between people and their environment will help to improve the urban ecosystem function. His 'landscape ecological urbanism' theory suggests that integrating both social and ecological knowledge into landscape design will enhance these values to improve urban ecology in the future, such as through "an evolution of aesthetic understanding, a deeper understanding of human agency in ecology, and reflective learning through practice" (Steiner, 2011, p. 337). The people's close interaction with their environment will then promote a better understanding and appreciation of the important role and function of nature that will eventually be instilled into their social and cultural system. Makhzoumi and Pungetti (1999) suggest that ultimately ecological design will not only increase sustainability, but also enhance the natural and cultural character of the local landscape (cited in Makhzoumi, 2000). The natural character can be in the form of ecosystem services, while the cultural character is presented through the aesthetic character of the landscape.

The aesthetic aspect is one of the cultural influences on ecosystems. The aesthetic attitude is commonly based on personal interest in beauty. During the 19thth century, people perceived landscape aesthetic by its beautiful appearance. The perception of beauty itself has evolved from the more ordered form of 'Capability Brown' into more natural 'Picturesque' landscape styles. However, King (2012) suggests a new way of looking at the value of aesthetic, which is based upon its meaning. Thus, to create an ecological design that is culturally accepted, there will need to be some aesthetic input into the design of the overall landscape. Gobster et al. (2007) developed a conceptual model of the aesthetic-ecological relationship in order to search for a balance between the two goals at the landscape scale because any changes made at this scale have a significant impact on the environment. Gobster et al. (2007) suggest applying ecological design in an appropriate context and setting would stimulate its visual attraction among the public, thereby eventually achieving both environmental function and acceptable naturalistic appearance. However, it must also be understood that ecological sustainability may impose conflict in terms of the aesthetic appearance. In the context of Kuala Lumpur, the emergence of a post-colonial society where the public have been instilled with the idea of "beauty" in a developing sense of nationhood and a desire to assert its own identity could cause a unique cultural challenge to delivering this sustainable approach.

2.5.2 Conflict in terms of ecological sustainability and aesthetic appearance

Urban landscapes derive similar value and strength from their ecological and social features (James et al., 2009). However, despite recognition of the environmental value of ecologically sustainable practice, the debate continues about the best strategies for its implementation, due to conflict between ecological values and aesthetic appearance. According to Parsons (1995),

although the environmental aesthetic is as important as ecological sustainability, there is a tendency for conflict to arise from people's different preferences in relation to these two goals, especially among those responsible for landscape maintenance. The findings from his study demonstrate that direct human interaction with wildlife increases physical and psychological health, yet the public still prefer an open lawn with a cluster of trees and shrubs (Parsons, 1995).

Despite increasing interest in creating landscape that is ecologically sustainable and also visually pleasing, Makhzoumi (2000) argues that there are obvious discrepancies over how to implement these two goals. Parsons (1995) reports that 14% of previous studies show disagreement concerning landscape ecological values and aesthetics, which reveals that although environmental aesthetics and ecological sustainability are both equally important, it is a challenge to achieve an 'ecological aesthetic' as a goal of landscape design and management. Therefore, there is a need to identify potential aspects of ecological design where the appearance is acceptable to both the management and the public.

Anderson (2006) highlights that the ecosystems of the city consist of a relationship between people and their environment; thus ecological sustainability will eventually have an impact on urban communities. To overcome this issue in the context of urban park management, it is necessary to investigate the implications of this type of landscape from the urban park management perspective. This study, therefore, sets out to assess the attitudes of various stakeholders in urban park management towards changing approaches to design, management and maintenance to more ecologically sustainable practice.

2.6 The need to assess stakeholders' attitudes towards ecologically sustainable landscape practice

Attitudes towards landscape management are influenced by a common working culture that is acceptable within the management structure. Assessing stakeholders' attitudes towards ecologically sustainable design and management of the landscape of urban parks is a vital input in terms of addressing any limitations and constraints on its implementation. As part of the urban park management team in a local authority, they are responsible for determining the success or failure of the sustainability effort. Hume's theory of aesthetics suggests that what causes preferences to vary between people is "insensitivity, inattention, prejudice or inexperience…people can be trained to be more sensitive, more attentive and without prejudice. It is possible to educate experts in aesthetics" (cited in Thompson, 2000, p. 18).

Exploring new ways to introduce more ecologically sustainable design and management is necessary in order to assist the relevant stakeholders in urban park management to design and manage the urban environment and its resources in the face of current and future issues and challenges, and to enable them to communicate the concept and purpose of this sustainable

approach to the public. Fischer (2012) argues that changing the urban landscape management needs to start at the policy making level, because this top down approach can be very coercive in terms of influencing and directing sustainable actions toward the local level. He also suggests that collaborative effort is required at intra- and inter-institutional level, as well as the engagement of society in this effort. However, this research will focus on investigating stakeholders' attitudes towards such practice from the urban park management perspective.

Özgüner et. al.'s (2007) surveys on the attitudes of various landscape professionals towards naturalistic versus formal urban landscapes in the UK highlight different attitudes towards ecologically sustainable landscapes in terms of benefits and challenges, including those discussed in the previous sections. Despite their positive attitude towards ecologically sustainable landscapes, respondents expressed concerns about the public's misconceptions about the visual appearance of this landscape; sustainability issues in terms of the vegetation strategy; the effect of the ecological form and structure of this landscape on public safety; disagreement over development and maintenance costs; the park's potential role as a learning centre for environmental awareness and for habitat diversity for wildlife enhancement; and the opportunity for developing public engagement with the park management. Their study implies that landscape professionals are willing to adopt a more naturalistic landscape style for the environmental benefits; however, private consultants and the local authority also tend to favour ornamental landscapes in urban parks because of "public demand" and "appropriateness of the style to the urban environment" (Özgüner et al., p.43).

2.7 Summary

It can be summarised that there is potential for urban park management to deliver ecologically sustainable practice by creating ecologically resilient and functional landscapes which are at the same time aesthetically pleasing. However, despite its environmental benefits, the challenges to delivering ecological design and management must be properly identified; and such designs must be adapted to local climate and cultural context if they are to be accepted by the public. So far, in considering benefits and challenges, previous studies have only drawn on insights gained from professionals in urban landscape management. However, as the structure of urban park management comprises several different levels, it can be argued that input from professionals alone is not sufficient to represent the whole urban park management team. Thus, management perspectives on changing towards a more ecologically sustainable landscape practice need to be investigated from top to bottom, including both professionals and operational staff, in order to address this gap in previous research.

CHAPTER 3

Research methodology: A case studies approach

3.0 Introduction

This chapter describes the methodology used for gathering data via a case studies approach. A research development strategy will be presented as systematic guidance towards achieving the research aim that will justify the use of case study method for conducting the research inquiry and will outline the research design and techniques, including an explanation of the study phases and the sequence of data collection procedures. The criteria for the selection of the precedent and current case studies will also be presented, followed by detailed descriptions of each of the selected sites and the data gathering techniques and tools developed for answering the main research question and sub research questions. The chapter ends with discussion of the strategy and process of data analysis for producing the results and findings.

3.1 Choosing case studies as the approach to conduct the research

The main purpose of selecting a case studies approach for conducting this research is to answer 'how' the current design and management of urban parks in Kuala Lumpur, Malaysia can be changed towards a more ecologically sustainable practice. Therefore, an in-depth understanding of the historical development of these parks and how their evolution has influenced their current design and management is necessary, in order to assess the potential for their adaptation towards delivering a more sustainable practice. Moreover, the experience of developed countries in addressing similar issues is explored in the current study through a review of relevant literature to form a theoretical framework for guiding the research focus and direction.

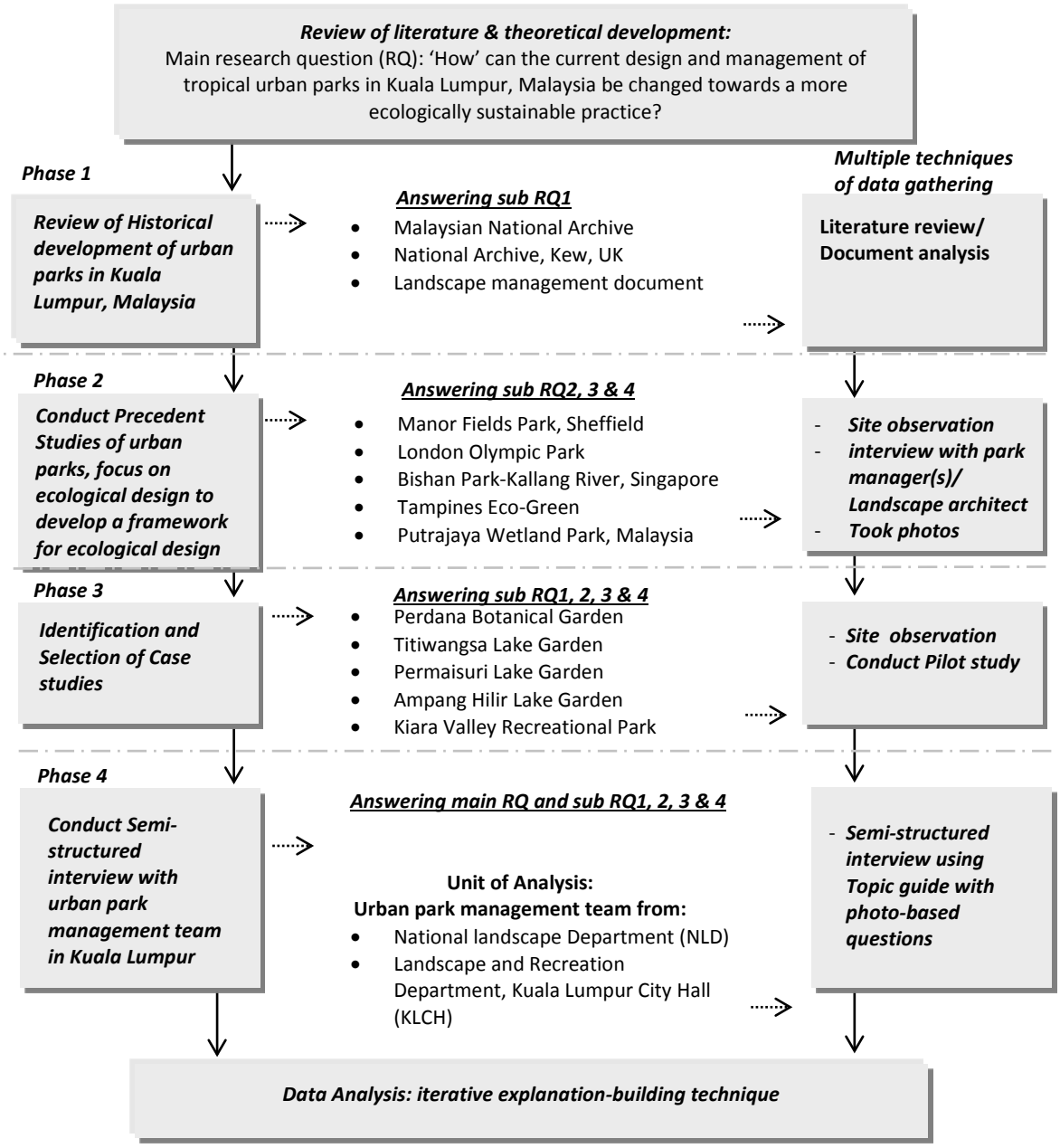
In addition to the literature review, this study explores multiple sources of relevant in-depth evidence, including archival records, documents, observations and interviews, as information sources most frequently used in case studies. According to Yin (2009, p.115), "the use of multiple sources of evidence in case studies allows an investigator to address a broader range of historical and behavioural issues". In the context of this research, the best medium for gaining such evidence was the personnel who manage these urban parks and who therefore have access to all the relevant information. However, as the amount of archival information held by the current urban park management is limited, some of these historical documents were acquired from the National Archives.

As in-depth understanding of the current management practice also requires first-hand experience, case study was considered the appropriate approach for this inquiry as it includes “direct observation of the event being studied and interviews of the persons involved in the event” (Yin, 2009, p.11). Acknowledging urban park management as part of a dynamic organisation that involves numerous people and processes (Jansson & Lindgren, 2012), case study not only provides the opportunity to explore multiple cases and evidence but also the potential to integrate these multiple sources of evidence for validating the research findings through triangulation (Creswell, 1998). Thus, site visits to the respective urban parks were conducted to gain real experience of the sites and their management team with regard to ecologically sustainable practice.

Despite their undoubted potential for producing large amounts of valuable data, the study recognised that multiple case studies “require extensive resources and time beyond the means of a single student or independent research investigator” (Yin, 2009, p. 53). To address this limitation, the research has chosen precedent sites, which demonstrate changes by urban park management towards a more ecologically sustainable landscape practice and include examples with a similar climate and contextual background.

3.2 Research design and data collection techniques

Figure 3.1 presents the research design and techniques for the case studies approach. The research is designed in four phases to guide the data collection for answering the main research question and the sub-research questions, which will be described in detail in the next sections. Multiple data gathering techniques were adopted to deal with a range of evidence, with findings from one source supporting those from other sources of evidence.



Figures 3.1: Research design and techniques guided by Yin's components of case study design

3.2.1 Phase One: Historical Development of Urban Parks in Kuala Lumpur, Malaysia

The historical development of urban parks in Kuala Lumpur was studied to develop an understanding of how they have evolved and the extent to which this now informs current management and maintenance of the landscape, which contributes to answering sub RQ1 (as described in chapter 1 section 1.5). According to Marcucci (2000):

> *"Landscapes are constantly changing, both ecologically and culturally, and the vectors of change occur over many time scales. In order to plan landscapes, they must be understood within their spatial and temporal context" (p. 67).*

This viewpoint suggests that studying the historical development of urban parks will offer vital knowledge for explaining the influence of the ecological and cultural changes that have led to the current landscape management trend of sustainable practice. Therefore, in order to explore the historical timeline of the development of urban parks, a literature review and documentary analyses were conducted, which included studying archival records and documentation relating to urban park development and management practice in Kuala Lumpur. Reviewing this relevant literature not only provided explanation for the changes that have occurred, but also offered valuable information as guidelines in the search for potential means of changing approaches to urban park management to a more ecologically sustainable practice appropriate for Kuala Lumpur.

3.2.2 Phase two: Precedent studies of urban parks with a focus on ecological design

Precedent studies can help to identify the best exemplars of ecologically sustainable practices by demonstrating both the history of alternative approaches to managing the particular landscapes and innovations in their design and maintenance, representing experience of different climates and cultural backgrounds, with a specific focus on:

a. Innovations in the use of vegetation to reduce maintenance costs and increase habitat diversity,

b. How the landscape has been designed to contribute to the management of urban stormwater control and more specifically the opportunities that this creates to increase habitat diversity,

c. The contribution that urban parks can make towards the delivery of an integrated, city wide green infrastructure.

3.2.2.1 Rationale for precedent study selection

The rationale for selection of the precedent studies is that they provide useful guidance for developing the content and structure of the research questions and the interviews with case study participants in Kuala Lumpur. At a practical level, it will also help shape the photo-based ecological design framework, e.g. edited images showing different ecological treatments for case study sites that will be used when gathering data from research participants about the impact that these changes might have on the current landscapes of Kuala Lumpur's urban parks and those who manage and maintain them.

Information about ecological design and management practices of the precedent studies was gained from interviews with the respective landscape architects and park managers for each of the precedent study sites, supported by photographic records of each site. In addition to this information, relevant literature was also gathered for each of the sites which included: documentations about the project development such as planning and development guidelines, case study reports and other related documents.

These sources of information provided the researcher with an in-depth understanding of the key drivers for delivering ecologically sustainable landscape. Furthermore, it helped to identify aspects of ecological design and management that could increase sustainability and their implications for the existing landscape practice. They also provide a valuable insight into the benefits and challenges experienced during the implementation of such an approach at each site. These findings will contribute to answering sub RQ 2, 3 and 4.

3.2.2.2 Criteria for precedent study selection

Through a desktop study, numerous models and examples of ecological design and management were explored, as emerging and current trends in many developed countries. Whilst it might have been desirable to also include potential sites in most of these countries (e.g. North America), this was not possible given the time and cost constraints of this research. Therefore, a few exemplars that are most appropriate and relevant to the study were shortlisted, in the United Kingdom, Singapore and Putrajaya, Malaysia. The sites were identified and chosen based on the following criteria:

a. Two exemplars in the United Kingdom (UK)

Two precedent studies were selected in the UK because it has a long history of ecological design, adaptation of existing parks and SUDS management. The two sites demonstrate different urban contexts, which also relates to the research focus, whilst from a practical perspective they are accessible to the researcher. The Manor Fields Park (*MP*) demonstrates a slow incremental approach to retrofitting an ecological design into urban parks, whereas the London Olympic Park (*LOP*) represents a more contemporary and a high profile project, which incorporates more recent developments in this approach. It also represents a multiagency lead project.

b. Two exemplars in Singapore

Besides the selected precedent studies in the UK, a further two sites were chosen from Singapore, namely the Bishan Park Kallang River (*BP*) and Tampines eco-green Park (*TP*), both of which are parks that have been developed within a climate and cultural

context that are similar to Malaysia. The two sites may also be familiar to the research participants in KL. In addition, these sites could potentially be visited by the researcher to learn from the knowledge and experience of those directly responsible for managing these parks through ecological approaches. Likewise, the research could also identify practices that may transpire as being different from those in Kuala Lumpur, in terms of the available resources to maintain each of the sites.

c. One exemplar in Malaysia

Selecting a precedent study from Malaysia is important as this site demonstrates the Malaysian government's emerging awareness of ecological approaches and the potential benefits of managed urban landscapes. The Wetland Park (*WP*), Putrajaya is the most relevant and closest example of changing approaches to ecological design and management of urban parks in Malaysia and how they could potentially influence park management beyond this site. It would also be interesting to discover the extent to which research participants in KL are familiar with this development and how and if it has impacted upon their current practice.

3.2.2.3 Contextual description of the selected precedent studies

Table 3.1 provides a contextual description and background information of the five selected precedent studies:

a. The Manor Fields Park, Sheffield, UK

The Manor Fields Park is located to the south-east of Sheffield city centre, surrounded by a new housing estate, within the Manor and Castle area. As part of the inner-city regeneration programme in Sheffield, the 25ha District Park was a model for a multifunctional urban park with the aim of addressing aspects of social decline, such as poverty and crime (Manor and Castle Development Trust, 2012) and environmental degradation caused by climate change.

Table 3.1: Key information about The Manor Fields Park, Sheffield, UK

Key Information	
Type of Park	District Park
Transformation periods	Hunting ground: 1400-1600s Farmland: 1600s Deep Pits Park: 1700s - early 1800s Allotment site: 1930 -1990s The Manor Fields Park: 1st phase 1998 - 2003 2nd phase 2007- 2011
Re-opening date	2011
Size (ha)	25
Location	South-east of Sheffield City
Park owner	Sheffield City Council
Park Management	The Green Estate
Project cost	£1.5 million
Date of Visits	April 2013
Participant interviewees	Landscape architect (PS1); Park manager (PS2)

The Manor Fields Park has a long historical background and has gone through many changes since it was first established as a royal hunting ground in the 13th century. In the 17th century (1400-1600s), the site was developed as farmland; and later, during the industrial revolution between the 18th and 19th centuries (1700s-1800s), it was transformed by coal mining and was locally referred to as Deep Pits and a portion of the area was turned into a park to serve as local public space.

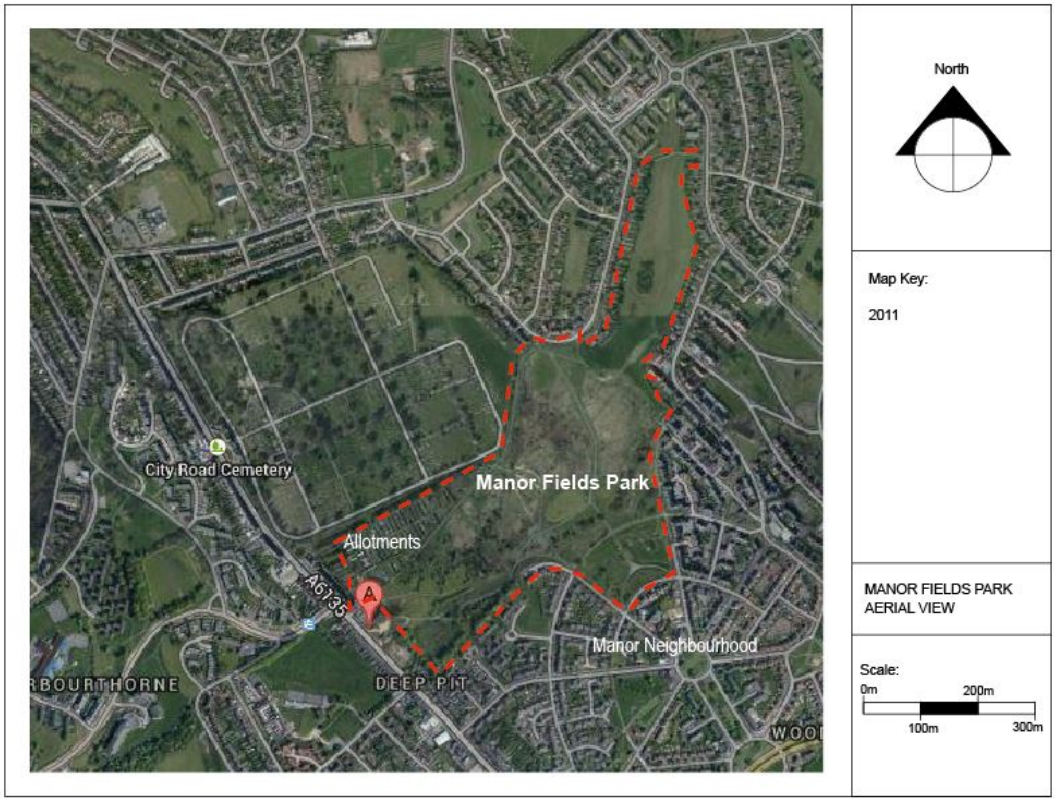


Figure 3.2: 2011 aerial photo of the Manor Fields Park showing the site boundaries and surrounding neighbourhood area linked through pedestrian and transportation networks.
Resource: Google Map (2014), Digital Globe, Getmapping plc, Infoterra Ltd & Bluesky, the Geoinformation Group (2011)

In the early 20th century, a large area of the park was reclaimed by Sheffield City Council for development of local housing, and included an area set aside for allotments in the southern area of the park. Much of the remaining open space was semi-derelict and subject to fly tipping and vandalism. In 1998, Sheffield City Council (SCC) proposed the redevelopment of the site in a new Masterplan for the Manor and Castle area (refer to figures 3.2) as part of the Sheffield inner city regeneration programmes (Kennedy et. al., 2007), which is guided by the Neighbourhood Development Framework (NDF), a long term planning strategy with the aim of improving quality of life in the neighbourhood, which is located in the poorest district in Sheffield (Sheffield City Council, 2007). The park management's decision to adopt ecological solutions for flood mitigation that would avoid the high cost of conventional drainage systems has simultaneously contributed to habitat creation for wildlife enhancement (Kennedy et al., 2007), besides offering recreational space for the public (N. Dunnett, 2011).

Figures 3.3: The photos show how the abandoned site (left) has been transformed into a district park (right), re-opened to the public in 2011
Source: Roger Nowell and Ian Stanyon (2012)

The transformation of this long abandoned site into a district park (refer to figures 3.3) through an ecological approach has cost approximately £1.5 Million (Landscape Institute, 2014). The development was led by Sheffield City Council's Parks and Countryside Department in collaboration with the Manor and Castle Development Trust (MCDT), the Sheffield Wildlife Trust (SWT) and many other related organisations in terms of consultation and financial support. The Green Estate, a public enterprise, was formed to manage the construction and maintenance of the park (Sheffield City Council, 2007).

b. London Olympic Park, United Kingdom

The London Olympic Park is located in Stratford, East London. It claims to be the largest 21st century urban park in the United Kingdom. It was initially created for the Olympic Games 2012 by the Olympic Delivery Authority (ODA), transforming an ex-industrial site into a 102 ha regional park with provision of 45ha for the restoration and creation of new ecological habitat (Olympic Delivery Authority, 2008). The park is currently owned and managed by the London Legacy Development Corporation (LLDC), which took over the

development from the ODA. The establishment of the park promotes a sustainable principle of “one planet living” through a multifunctional landscape but also addresses environmental issues, besides having the ability to generate future income for the park that could improve the social inclusion of the surrounding communities in the long term (Olympic Delivery Authority, 2011).

Table 3.2: Key information about London Olympic Park, the United Kingdom

Key Information	
Type of Park	Regional Park
Transformation periods	1st phase 2007-2011 2nd phase 2012-2014 3rd phase 2014-2030
Re-opening date	April 2014
Size (ha)	102
Location	East London
Park owner	London Legacy Development Corporation
Project cost	1st phase: £77 million (Olympic Games) 2nd phase: £150 million (Transformation)
Awards or sources of recognition	1. Landscape Institute President’s Awards (2012) 2. Mayor’s Award for Best Built category in the London Planning Award (2014)
Date of visits	April 2013
Participant interviewees	Landscape Architect (PS2)

Although the contextual issues were quite similar to those affecting the Manor Fields Park in Sheffield, the ecological design for this park was delivered in a more holistic and comprehensive way, using short and long-term strategies, the benefits of which extend beyond the context and scale of the park (refer to Figure 3.4). Ecological aspects have been given a central place in the long term planning of the development of the London Olympic Park, guided by the Biodiversity Action Plan. Stormwater management is one of the ecological strategies that have improved and revitalized the existing polluted waterways through a sustainable urban drainage (SuDS) scheme whereby treated water is reused in landscape irrigation. This scheme is integrated with the conservation and creation of habitat diversity in the park. These aspects are delivered through a sustainable design and management strategy that integrates seamlessly with the social and economic functions of the park.

The delivery of these multi-functional features was divided into three phases: the first phase was to accommodate the Olympic Games and Paralympic Games (2007-2012); the second phase was the transition to the Olympic Parklands (2012-2014), which were then renamed the Queen Elizabeth Olympic Park in 2012; and finally, the Legacy phase is the future development of the park into mature parklands (2014-2030).

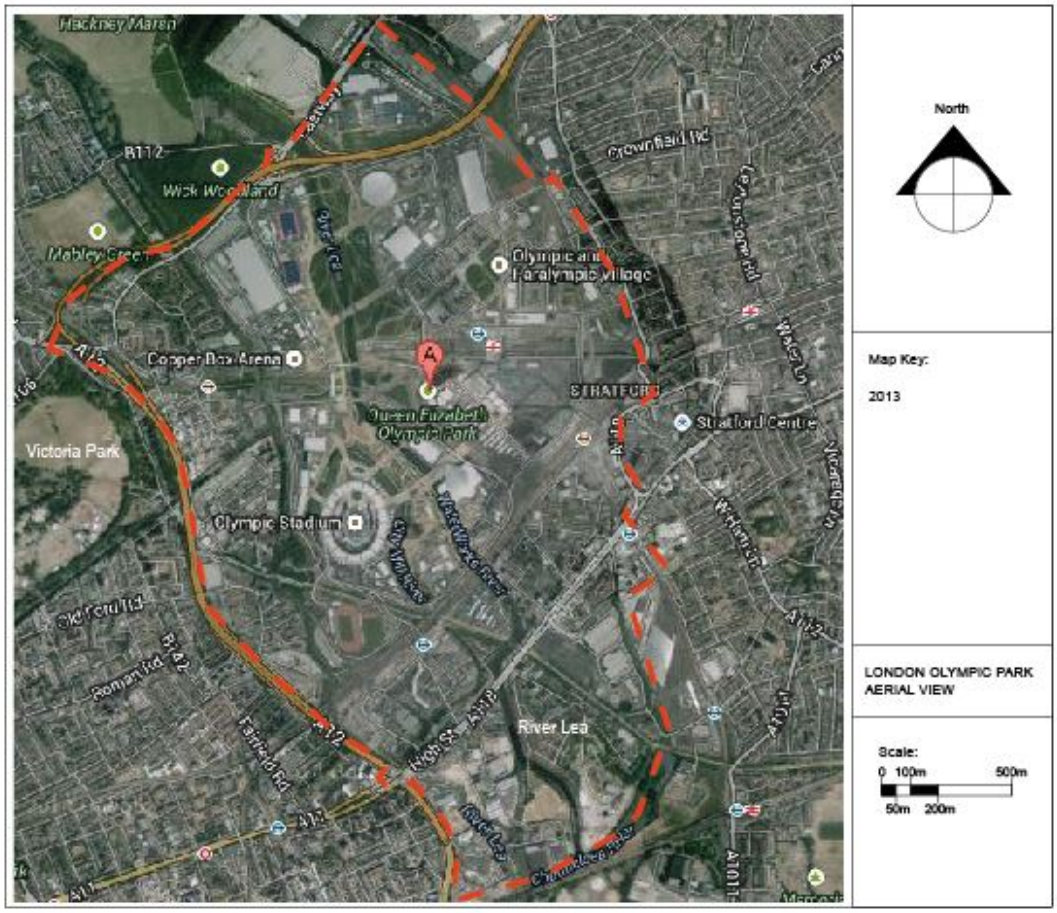


Figure 3.4: 2013 aerial photo of the London Olympic Park showing the site boundaries linked to the surrounding neighbourhood and other green spaces through ecological and river corridors.
Resources: Google Map (2014), Digital Globe, Getmapping plc, Infoterra Ltd & Bluesky, Landsat, the Geoinformation Group (2013)

As this project was initiated for the 2012 Olympic Games venue, it provided an opportunity for significant resource investment in the development of this park and for future expansion. A total sum of £227 million was spent on the completion of the first and second phases, which allowed the park design and management team to implement various strategies to develop the park towards sustainability.

The park has received several awards for outstanding design and contribution towards sustainability. It also received the Landscape Institute President's Award (2012) and the Peter Youngman Award (2012), both of which recognised the design and management team for their skill, contribution and commitment in delivering the project.

c. Bishan Park – Kallang River, Singapore

Bishan Park - Kallang River is located near the nature reserves in the Central Region of Singapore. It covers an area of 62 hectares, surrounded by the Bishan neighbourhood to the south and Ang Mo Kio neighbourhood to the north. The former riverine park was

initially built in 1988, its link with a public transportation network making it one of the most popular recreational areas in Singapore. Previously, there was a Kallang River concrete canal passing through the park, which provided stormwater drainage. This canal not only split the recreational space into two and limited pedestrian access to the park, but also created an unattractive view of the site.

Table 3.3: Key information about Bishan Park - Kallang River, Singapore

Key Information	
Type of Park	District Park
Transformation period	The existing park 1988-2009 Redevelopment of the park 2009-2011
Re-opening date	2011
Size (ha)	62
Location	Central Region, Singapore
Park owner	National Parks Board, Singapore; Public Utility Board, Singapore
Project cost	76 Million SGD (£37.15 million)
Awards or sources of recognition	Landscape of the Year Award by the World Architecture Festival 2012 Excellence on the Waterfront Honour Award 2012 President's Award Singapore 2012
Date of Visits	June 2013
Participant interviewees	Landscape architect, park manager

In 2006, the Singapore government had a vision of transforming the country's waterways into an integrated system with urban parks and open spaces, with the aim of beautifying the river and bodies of water, improving the quality of urban water, and enhancing the wellbeing of the urban communities by bringing them closer to these waterways. This vision has led to the initiation of a project known as the Active, Beautiful, and Clean Waters (ABC Waters) Programme, steered by the Singapore National Water Agency (NWA) in collaboration with the National Parks Board (NParks), and the Bishan Park-Kallang River was chosen as a pilot project for this programme (PUB Singapore's National Water Agency, 2010) (refer to figure 3.5).

The project construction started in 2009, with the restoration of the 2.7 km Kallang river canal to a 3.2 km naturalized river, integrated with the upgrading of the 62ha Bishan - Ang Mo Kio Park (Atelier Dreiseitl, 2012), thereby enhancing the multifunctional role of this park for sustainable urban stormwater management with an emphasis on ecological enhancement and improved recreational facilities for the public. Green innovation and materials were incorporated in the design and construction, including soil bio-engineering techniques for stabilizing the naturalized river slope and cleansing biotopes using phyto remediation (Leonard & Suebpanich, 2011).

Figure 3.5: 2010 aerial photo of Bishan Park during construction, showing the site boundaries linked to the surrounding neighbourhood and other green spaces, with the restoration of Kallang River channel to the west of park.
Resources: Google Map (2014), Cnes Spot Image, Digital Globe, Map data (2014)

Since its completion in 2011, the park has become a precedent for multifunctional design through a smart combination of water resource; flood management; biodiversity and recreation (refer to figure 3.6). “On the surface, this is a park re-design and river rejuvenation project; but underlying this is a multi-layered holistic design that seeks a balance between functional, ecological and communal needs for a sustainable co-existence, twinned with the aim of protecting Singapore’s limited and precious freshwater asset” (World Building Directory, 2008).

Figure 3.6: Photo showing the concrete canal passing through Bishan Park in 2008 (top) and the naturalized river after the transformation of the Bishan Park-Kallang River in 2011 (bottom). Source: Leonard Ng, Atelier Dreiseitl (2011)

The project has successfully improved stormwater management, and created the habitat diversity of the park required for biodiversity enhancement, which has shown an increment of 30% (Atelier Dreiseitl, 2012). It has become a reference point for urban park management, not only in Singapore, but also elsewhere, including Malaysia. The park won the Landscape of the Year Award at the World Architecture Festival 2012; an Excellence on the Waterfront Honour Award 2012; and the President's Design Award Singapore 2012, for its contribution towards environmental sustainability through the delivery of ecological design and management practice.

d. Tampines Eco-Green

Tampines Eco-Green Park is located in the East Region of Singapore. It was developed through a bottom up initiative by the local community. They brought an idea for making a park on vacant land that had been designated for housing development to the Member of Parliament (MP) for Tampines, who supported this idea. The MP used his power to convince the National Parks Board (NParks) of changing the site's designation from housing development to interim parkland. This temporary designation is the key factor in shaping the development of a park based on ecological concepts, through building on the existing quality of the natural regeneration site considering its natural assets including marshland, grassland and secondary forest.

Table 3.4: Key information about Tampines Eco-Green Park, Singapore

Key Information	
Type of Park	Regional Park
Transformation period	2009-2011
Opening date	2011
Size (ha)	36.5
Location	East of Singapore
Park owner	National Parks Board, Singapore, Singapore
Project cost	3 million SGD (£1.47 GBP)
Awards or sources of recognition	Gold award for General Design Category, SILA Professional Design Award 2010
Date of Visits	June 2013
Participant interviewees	Former and current park manager

The Tampines Eco-Green Park is located next to the Tampines River; within walking distance of Tampines neighbourhood and town centre (refer to figure 3.7). Located adjacent to Tampines Bike Park and Sun Plaza Park, it is integrated with the Tampines Park Connector that forms part of a wider Park Connector Network, a series of green corridors linking to other major parks and nature reserves in Singapore developed and managed by the NParks.

Figure 3.7: 2012 aerial photo of Tampines Eco-Green Park, showing the site boundaries linked to the surrounding neighbourhood, Tampines River Canal and other green spaces linked by the park connector.
Resource: Google Map (2014), CNES/ Astrium, Cnes/Spot Image, Landsat, Map data (2014)

The construction of this 36.5ha regional park started in 2009 and the total build cost was 3 million SGD (£1.47 million GBP) (Singapore Institute of Landscape Architects, 2010). Since the park is designated as interim parkland, a modest budget was forecast for its development, which is one of the drivers for adopting an ecological approach to park design and management. Through this approach, only 2.5ha of the park was developed to include park amenities, while the existing natural landscape was conserved. These natural habitats were enhanced with additional planting of fruit bearing trees and plants rich in nectar, as well as tall grasses to serve as wildlife habitat. The existing water bodies are included in the sustainable urban drainage system (SuDS) to manage the stormwater.

According to the National Parks Boards (2011), ecological features were proposed to complement the natural landscape of the park, such as the eco-toilet, green roof shelter, bird hides, etc. These eco-friendly designs are guided by the Green Mark for Parks, sustainable assessment criteria developed by The Building and Construction Authority, Singapore (BCA); in addition, the Australian model for Water Sensitive Urban Design (WSUD) was integrated into the park design, as part of the government's initiative to encourage more environmentally sustainable design in Singapore.

Since its opening in April 2011, Tampines Eco Green Park has been a popular spot for nature recreation and education. Its significant contribution towards environmental sustainability has been rewarded with a Gold award in the General Design Category, by the Singapore Institute of Landscape Architects (SILA), in the Professional Design Awards 2010.

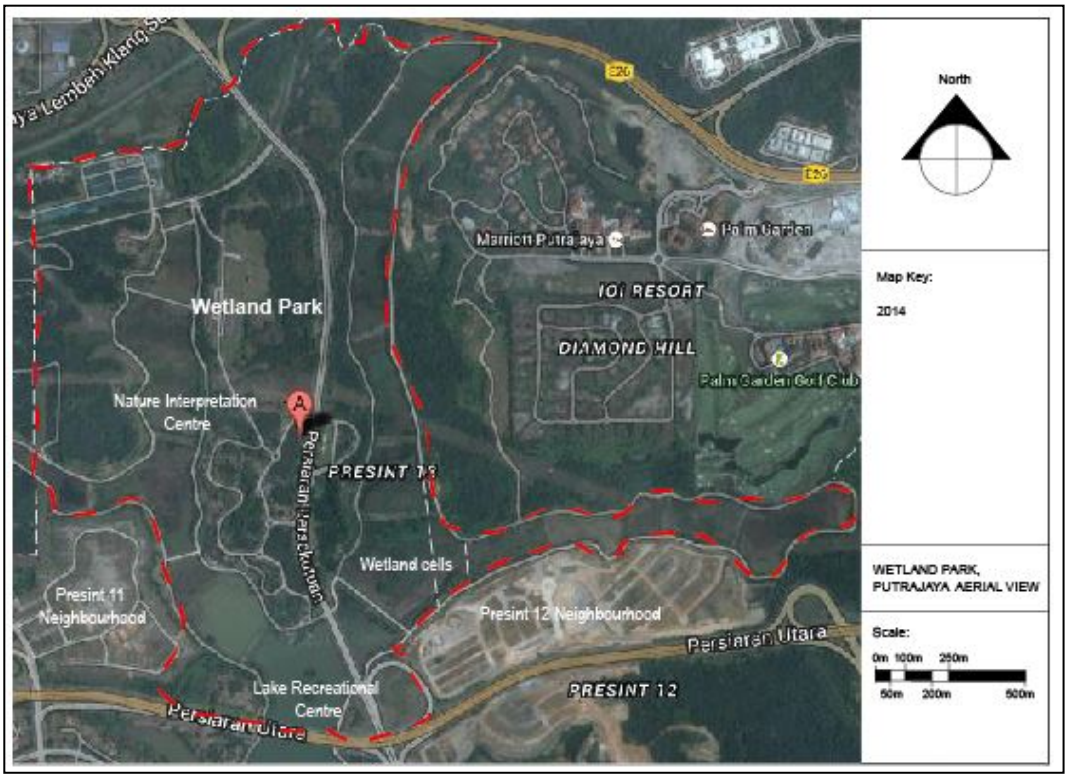
e. Putrajaya Wetland Park, Malaysia

Putrajaya Wetland Park is a metropolitan park located in the North of the city of Putrajaya and covers an area of 197ha. The key driver for the park's development was the Malaysian Government's decision to incorporate water as an integral component of Putrajaya in the form of lake and wetlands. As the planning of Putrajaya was inspired by the "Garden City" concept for sustainable development, Putrajaya Lake has been an important component of plans for integrated green infrastructure for the city.

Table 3.5: Key information about Putrajaya Wetland Park

Key Information	
Type of Park	Metropolitan Park
Transformation period	1st phase 1997-1998 2nd phase 2000-2003
Opening date	1998
Size (ha)	197
Location	North of Putrajaya, Malaysia
Park owner	Putrajaya Corporation (PJC)
Project cost	Phase 2 : RM66 millions (£12.58 millions)
Awards or sources of recognition	- Malaysia Landscape Architecture 2011 Excellence Award for design and planning, implementation and management by the Institute of Landscape Architects Malaysia (ILAM) - Lake and Eco hydrology Management of Watershed 2012 by The International Awards for Liveable Communities (LivCom)
Date of Visits	June 2013
Participant interviewees	Former president of PJC; Deputy Director of park development; park manager

As the Putrajaya Lake is a central water catchment for the city, it is important to maintain the water quality at an acceptable standard for outdoor use. Therefore, a wetland system consisting of 24 wetland cells was developed as a natural filtration system for water coming from two rivers in the north of Putrajaya, while the urban parks and open spaces would help improve the runoff of surface water before entering Putrajaya Lake (Putrajaya Corporation, 2011). Apart from the main function of managing the stormwater of Putrajaya, the park development team saw the opportunity of creating a nature park surrounding the wetland system, which potentially would serve multifunctional purposes in terms of meeting the social and ecological needs of the city (refer to figure 3.8). Besides offering nature recreation, the park contributes to the enhancement of habitat diversity and biodiversity in this area. A biodiversity survey conducted by the Putrajaya Corporation (PJC) in 1999, a year after the park was established, discovered that species richness constitutes a complete ecosystem in the park (Mohamad, 2012).



Figures 3.8: 2014 aerial photos showing the location of the wetland cells, Lake Recreation Centre and Nature Interpretation Centre that serve hydrological, ecological and recreational functions in the Wetland Park
Resource: Google Map (2014), CNES/ Astrium, Cnes/Spot Image, Digital Globe, Map data (2014)

Putrajaya Wetland Park is an exemplar of the expansion of the role of the urban park as part of a city-wide green infrastructure in provision of ecosystem services for the city. The park has received numerous awards for the delivery of ecological design and management, both locally and internationally. These include an Excellence Award for design and planning, implementation and management at the Malaysia Landscape Architecture Awards 2011, from the Institute of Landscape Architects Malaysia (ILAM). In addition, the International Awards for Liveable Communities (LivCom) 2012 presented the park with a Gold Award for Lake and Eco hydrology Management of Watershed.

3.2.3 Phase Three: Identification and selection of case studies

Case studies give insights into the current landscape practice by the urban park management of Kuala Lumpur, followed by direct reporting of the attitudes of the management stakeholders' on the potential for their adaptation towards delivering a more sustainable practice. Their direct experience in the design and management of the selected sites is extremely important in determining the practicality of such an approach for the local urban parks, taking into account the challenges of the evolving city environment and increasing public demand on these spaces. These findings are significantly important for answering sub RQ 1, 2, 3 and 4 (as described in chapter 1 section 1.5).

3.2.3.1 Rationale for case study selection

As there are various types and hierarchies of urban parks in Kuala Lumpur, and each is bounded within its contextual background and has its own unique characteristics, a variety of case study sites were identified and chosen to gain different perspectives in regards to the subject being studied. The selection of multiple case studies is believed to be more appropriate than studying a single case in building a strong body of research evidence through comparison of the similarities and differences within-case and cross-case (Creswell, 1998). Multiple case studies were identified through a desktop study, followed by further shortlisting according to the selection criteria presented in the following section.

3.2.3.2 Criteria for case study selection

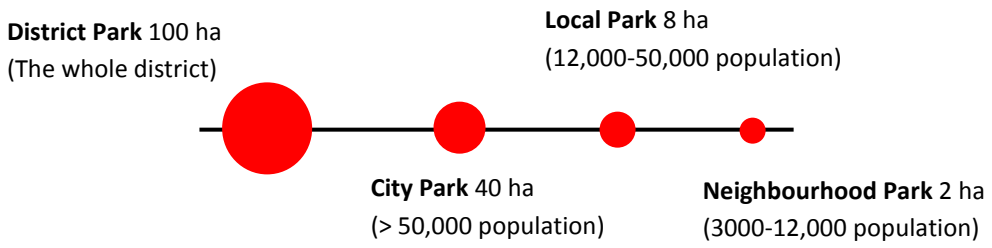
Through a desktop study, multiple case studies were identified from a range of urban parks in Kuala Lumpur, Malaysia that are currently managed by the local authorities. The selected sites for this study represent a gradient of the managed public open spaces within the city; each may represent one or more of the following criteria:

a. Age of the parks

The selected case study sites represent various ages of urban parks in Kuala Lumpur, an important criterion in investigating similarities and differences in landscape management practice between old and new parks. Parks of different ages exhibit distinctive temporal and spatial variations, which could reveal the extent of the need for different strategies in implementing ecologically sustainable practice in each park, as suggested by Zipperer & Zipperer (1992).

b. Size of the parks

The green spaces in Kuala Lumpur represent a hierarchy of urban parks and open spaces according to population capacity, in accordance to the requirements of the Planning Standard Guidelines for Open Spaces and Recreation (GP005-A) (Federal Town and Country Planning Department, 2013) as presented in figure 3.9.



Figures 3.9: Hierarchy of open spaces in Kuala Lumpur, adapted from Planning Standard Guidelines for Open Spaces and Recreation (GP005-A)

Reference is also made to the hierarchy of urban parks for the city as specified in the Kuala Lumpur Structural Plan 2020 (Kuala Lumpur City Hall, 2004). Most of the selected urban parks were managed by the KLCH. However, one of the local parks selected for this study is currently managed by the National Landscape Department because it was combined with another park to form a Federal Park despite its local classification.

These various park types perform different roles in providing social and ecological functions for the city, which are vital for its sustainability (Karuppannan et al., 2013). Therefore, the local authorities may have taken these differences into account in their management priorities in terms of operations, maintenance intensity, and financial allocation.

c. Location of the Parks

The location of urban parks was also an important criterion for the selection of the case studies. Selection of locations was based on three landscape management zones assigned by the Kuala Lumpur City Hall (KLCH), each of which has its own management team led by a landscape architect and/or horticultural officer responsible for managing the green spaces, including urban parks (Webb, 1998). The management zones comprise the north zone (Ampang Hilir Lake Garden and Titiwangsa Lake Garden), the central zone (Perdana Botanical Garden) and the south zone (Permaisuri Lake Garden).

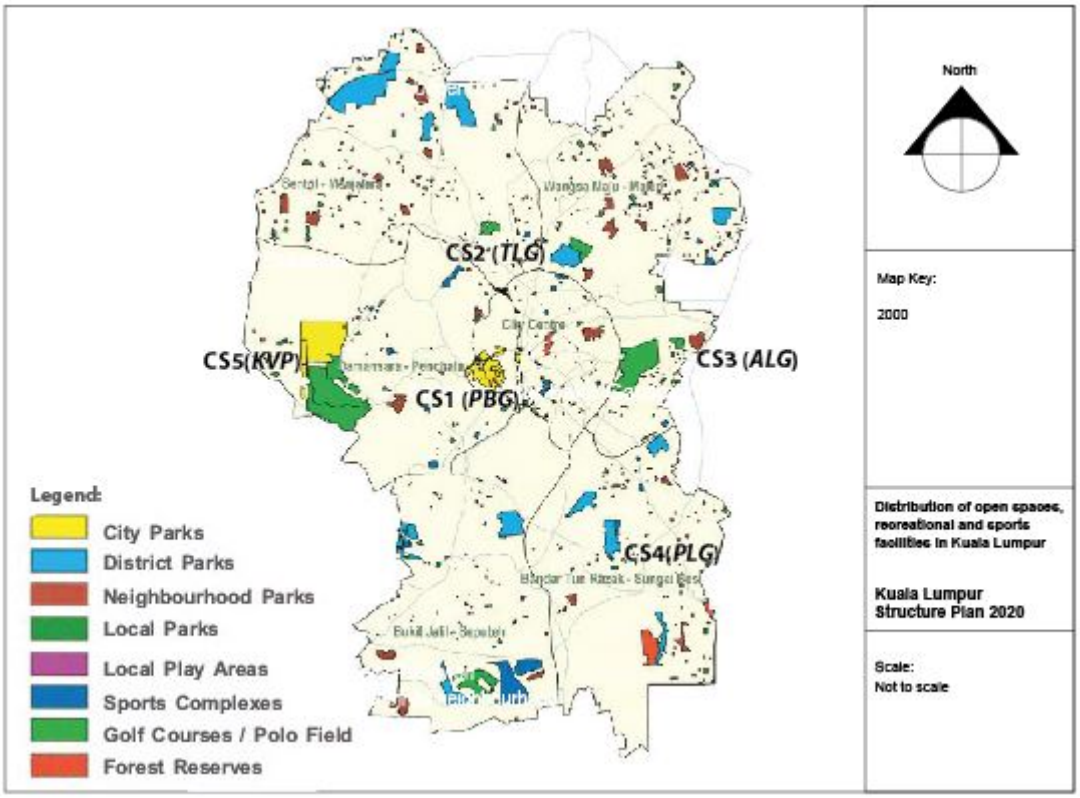
The case study sites were also selected from different demographic areas categorised as upper-middle class (Kiara Valley Recreational Park), middle class (Titiwangsa Lake Garden), lower-middle class (Permaisuri Lake Garden), and mixed-level areas (Perdana Botanical Garden and Ampang Hilir Lake Garden). These demographic differences may have a significant influence on the way these parks are managed in response to the expectations of the different social classes and also the different educational backgrounds of park users, as perceived by the park management. This would provide a resource for future investigation where the views of public stakeholders could be gathered using this research material.

d. Current level of ecologically informed design and management practice

The current level of ecologically sustainable management practice reflects the current state of ecological design and management, which could potentially be further enhanced for future improvement towards sustainability. According to Cranz & Boland (2004), these characteristics help “increase the ecological performance of parks” (p.104), and hence are important elements of sustainable urban parks.

All the above criteria may have an influence on landscape management practice and could provide potential solutions to adapting to environmental challenges, such as addressing flooding issues in the city. In this regard, most of these parks have their own water bodies, such as lakes and retention ponds, as the majority were developed from former mining land. Therefore, these sites may also provide specific opportunities in terms of promoting more sustainable design, management and maintenance practice. These characteristics may also pose great challenges to the local authorities in managing the parks.

3.2.3.3 Contextual description of the selected case study sites



Figures 3.10: Selection of case study sites according to the hierarchy of open spaces, recreational and sports facilities in Kuala Lumpur, adapted from the Kuala Lumpur Structural Plan 2020

Although many parks in Kuala Lumpur comply with the above criteria, five urban parks were shortlisted as best suiting the set criteria for this research, namely, Perdana Botanical Garden (*PBG*); Titiwangsa Lake Garden (*TLG*); Ampang Hilir Lake Garden (*ALG*); Permaisuri Lake Garden (PLG), which is currently managed by the Landscape and Recreation Department, Kuala Lumpur City Hall (KLCH); and finally, Kiara Valley Recreational Park (*KVP*), management of which was taken over by the National Landscape Department in 2010, prior to the establishment of Bukit Kiara Federal Park, initiated by the Malaysian Government. These case studies were considered appropriate for the research inquiry as they complied with at least one of the selection criteria (refer to figure 3.10). A brief outline of their establishment and contextual description is presented as follows:

a. Perdana Botanical Garden (*PBG*)

The 126 year old Perdana Botanical Garden is located in Kuala Lumpur city centre. The 91.6 ha park is characterised by undulating hills and valleys, with a man-made lake as a central feature of the garden, surrounded by semi-natural woodland and designed landscapes with botanical collections and displays. Being the first and oldest park in Kuala Lumpur, the 91.6 ha park has evolved through several stages: from botanical garden (1888) to a leisure and recreational park (1896) initiated by the British Colonial Government. Their greening policy very much influenced the landscape transformation in this park that was carried out under a joint effort by the Forestry Department, the Agriculture Department, and the Public Works Department during the colonial period.

Table 3.6: Key information about Perdana Botanical Garden, Kuala Lumpur

Key Information	
Type of Park	City Park
Transformation period	Botanical Garden: 1888-1896 Leisure and recreational Park: 1896-1975 Introduction of themed gardens: 1975 -2011 renamed as Perdana Lake Garden Botanical Garden: 2011 (3 years) renamed as Perdana Botanical Garden
Re-opening date	2011
Size (ha)	91.6
Location	Centre of Kuala Lumpur
Park Management	Landscape and Recreation Department, Kuala Lumpur City Hall
Date of Visits	July 2013
Participant interviewees	*Senior management:* Director of the Landscape Department , Deputy Director (landscape development), Deputy Director (Horticulture), *Park operation level:* Landscape architects, Assistant Horticulture officer, Horticulture assistants, and maintenance labourers.

After the country's independence in 1957, major transformation work, initiated by the Malaysia Government from 1975-1995, was carried out by the Beautification Unit formed under the Urban Services Department of Kuala Lumpur. More leisure and recreational facilities were developed for the public, including the Anniversary Theatre (1967); Tun Abdul Razak Memorial (1982); and the National Planetarium (1993).

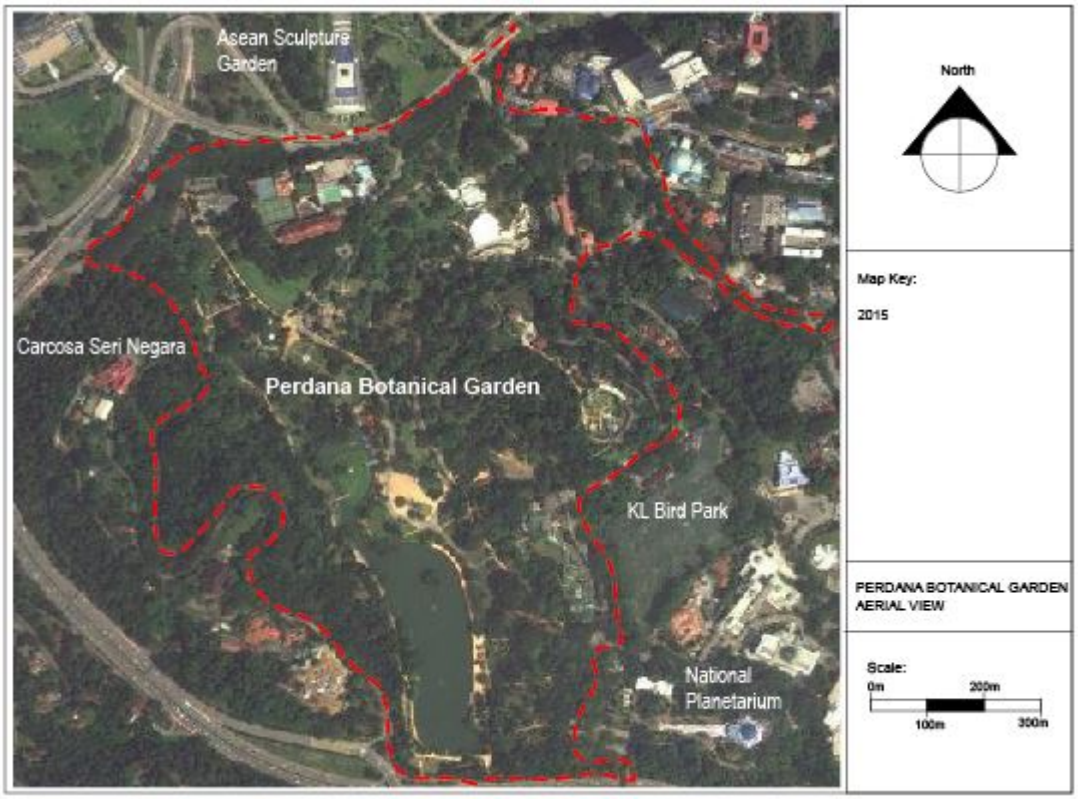


Figure 3.11: 2015 aerial photo of the Perdana Botanical Garden showing the site boundaries and surrounding tourist attraction spots (i.e. KL Bird Park and National Planetarium).
Resource: Google Map (2015), Imagery © DigitalGlobe Map data © 2015 Google.

In addition to these cultural venues, several themed gardens were created based on a "gardens in a garden" concept, namely, the Orchid Garden (1986); Deer Park (1987); Hibiscus Garden (1989); Bird Park (1991); Butterfly Park (1994); and Herbs and Conservatory Garden (1995), which gradually transformed this large scale park into a variety of display gardens (refer to figure 3.10). Meanwhile, the urban forest concept introduced in the late '80s resulted in the addition of more semi-natural woodland surrounding these gardens, bringing more greenery into the park. During the 2000s, no major upgrading work took place in the park, because the Asian financial crisis of the late '90s and the global financial crisis of 2008 resulted in cuts in the government's budget allocation to urban park management (Athukorala, 2010). However, inclusion of this city park in the government's Greening Greater Kuala Lumpur investment programme of 2010 led in 2011 to its rebirth as Perdana Botanical Garden.

b. Titiwangsa Lake Garden (*TLG*)

Located to the north of Kuala Lumpur city centre, Titiwangsa Lake Garden was developed in 1980. The 46.13 ha district park was also the first urban park to be developed on ex-mining land and was built to provide sports facilities and as a recreational park under the provisions of the revised Town and Country Planning Act 1976 (Act 172).

Table 3.7: Key information about Titiwangsa lake Garden, Kuala Lumpur

Key Information	
Type of Park	District Park
Opening date	1980
Size (ha)	46.13
Location	North of Kuala Lumpur
Park Management	Landscape and Recreation Department, Kuala Lumpur City Hall
Date of Visits	July 2013
Participant interviewees	*Park operation level:* Horticulture officer, Assistant Horticulture officer, Horticulture assistants, foreman, maintenance labourers

Unlike most of the parks in Kuala Lumpur, Titiwangsa Lake Garden is characterised by a flat landscape surrounding two lakes, one an ex-mining pond while the other is man-made (refer to figure 3.12). There was also some additional landform remodelling to create mounded areas to break up the monotonous landform. The landscapes of the park reflect an ornamental Gardenesque style, with shrub borders and cluster plantings in most areas of the park. This park is an example of KLCH's success in transforming abandoned land as one of its strategies for urban regeneration through addressing the lack of green spaces in the city (Jamil, 2002).

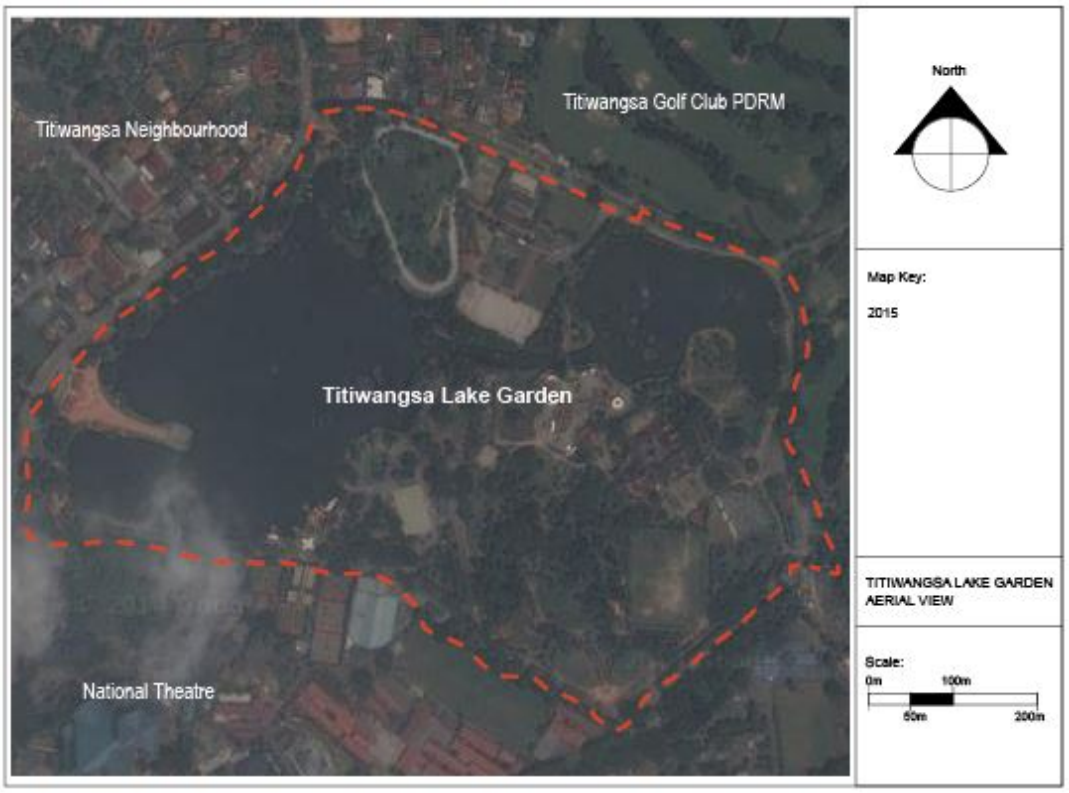


Figure 3.12: 2015 aerial photo of the Titiwangsa Lake Garden surrounded by upper class neighbourhood, golf course and other tourist attraction (i.e. National Theatre).
Resource: Google Map (2015), CNES/ Astrium, Map data © 2015 Google.

The park's location within close proximity of the city centre has made it one of the most accessible scenic public spaces in Kuala Lumpur; it has subsequently become a popular destination for leisure and recreation among the upper class residents, and other local communities. The fact that the park is also surrounded by tourist venues, such as the National Art Gallery and the National Cultural Centre, has made it one of Kuala Lumpur's most popular tourist attractions.

c. Ampang Hilir Lake Garden (*ALG*)

Table 3.8: Key information about Ampang Hilir Lake Garden, Kuala Lumpur

Key Information	
Type of Park	Neighbourhood Park
Opening date	2009
Size (ha)	16
Location	North-east of Kuala Lumpur
Park Management	Landscape and Recreation Department, Kuala Lumpur City Hall
Date of Visits	July 2013
Participant interviewees	*Park operation level:* Horticulture officer, Assistant Horticulture officer, Horticulture assistants, foreman, maintenance labourers

Ampang Hilir Lake Garden is located to the east of Kuala Lumpur city centre. The 16 ha park represents the transformation of an ex-mining pond into a new neighbourhood park

to serve the surrounding socially mixed neighbourhood that comprises an upper-middle class residential area and embassies to the north and west of the park and unplanned settlements to the south (refer to figure 3.13).

Figure 3.13: 2015 aerial photo of the Ampang Hilir Lake Garden surrounded by mixed neighbourhood.
Resource: Google Map (2015), Imagery © DigitalGlobe Map data © 2015 Google.

Besides offering leisure and recreational facilities, the park also serves as a flood retention pond to divert the Ampang river discharges during heavy rainfall, one of the components of a stormwater management programme initiated under the Kuala Lumpur Flood Mitigation Plan (Keizrul, 2004). The park is made up of small green spaces with a jogging track surrounding a steep edged retention pond, intended for leisure and passive recreational activities.

d. Permaisuri Lake Garden (*PLG*)

Table 3.9: Key information about Permaisuri Lake Garden, Kuala Lumpur

Key Information	
Type of Park	District Park
Opening date	1989
Size (ha)	49.4
Location	South of Kuala Lumpur
Park Management	Landscape and Recreation Department, Kuala Lumpur City Hall
Date of Visits	July 2013
Participant interviewees	*Park operation level:* Horticulture officer, Horticulture assistant, site supervisor (landscape contractor)

Following the success of the Titiwangsa Lake Garden, the KLCH developed a third urban park for Kuala Lumpur in 1989. The park is built on ex-mining land located in Cheras, 15km to the south-east of the city and surrounded by a new township for middle and lower income residents (refer to figure 3.14). Permaisuri Lake Garden has very similar characteristics to Titiwangsa Lake Garden in terms of age, size and functions, but in terms of physical characteristics, it is very similar to Perdana Botanical Garden, with significant secondary woodlands and water bodies. Development of this park focused on mixed environmental and cultural design with provision of various sports and recreational facilities to cater for the high density population in this middle and lower income area (Jamil, 2002).

Figure 3.14: 2015 aerial photo of Permaisuri Lake Garden surrounded by lower-middle class neighbourhood and sports and youth centre
Resource: Google Map (2015), Imagery © DigitalGlobe Map data © 2015 Google.

As the park was developed during the country's first recession period in the late '80s, the park management faced the challenge of tight financial constraints, which resulted in the park being built with minimal expenditure, as reflected in the conservation of the existing woodlands and natural water sources of the park, alongside the conventional design based on the cultural concept of a traditional Malay garden. While the natural area of the park has successfully maintained its ecological value, the conventional design did not survive the introduction of this economic approach, resulting in deterioration of some design elements, such as the terrace garden at *Laman Puteri* (Princess Garden).

e. Kiara Valley Recreational Park (*KVP*)

Kiara Valley Recreational Park was developed in 1975 as the main recreational area for the local upper-middle class neighbourhood of Taman Tun Dr. Ismail, a suburban township located to the west of Kuala Lumpur. Located in a valley surrounded by the Kiara Hills, the 16.17 ha park is an urban park with high ecological value (refer to figure 3.15). Its ecological features include the natural spring of Penchala River and a secondary forest regenerated from the former rubber plantation which is rich in biodiversity.

Table 3.10: Key information about Kiara Valley Recreational Park, Kuala Lumpur

Key Information	
Type of Park	Local Park (form part of the Bukit Kiara Federal Park)
Opening date	1975
Size (ha)	16.17
Location	West of Kuala Lumpur
Park owner	National Landscape Department
Date of Visits	August 2013
Participant interviewees	*Senior management:* Director of Technical service and Special Project Division, *Park operation level:* Director and Deputy Director of the Landscape Management Division, Assistant Landscape Architect, site supervisor (landscape contractor), and maintenance labourers.

In 2007, the Malaysian government approved the redevelopment of the park to combine it with the adjacent Kiara Hills Park, with emphasis on conservation of the plantation and semi-woodland areas to form a large arboretum as part of a new Federal park for the city for nature recreation, research and environmental education. Because of its increased scale and status, the National Landscape Department took over management of the park from the KLCH in 2011. The large extent of secondary forest provides an opportunity for a range of leisure and nature based recreations, making the park a popular local and tourist destination.

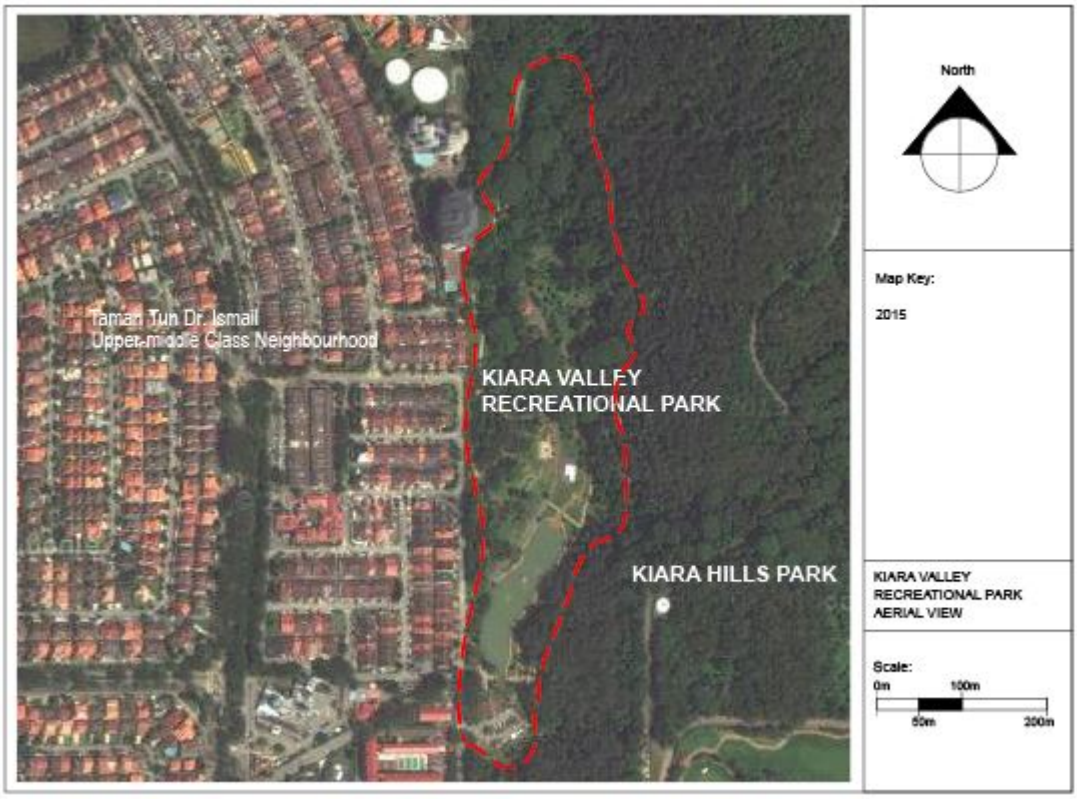


Figure 3.15: 2015 aerial photo of Kiara Valley Recreational Park located between the upper-middle class neighbourhood of Taman Tun Dr. Ismail and Kiara Hills; both parks were designated as a Federal park
Resource: Google Map (2015), Imagery © DigitalGlobe Map data © 2015 Google.

Having learned about the historical background of urban park development in Kuala Lumpur (as presented in chapter 3), these case studies represent the current state of local urban parks, originally created from rubber plantations *(KVP, PBG)*; ex-mining land *(TLG; ALG)*; and a mix of both types of site *(PLG)*. These sites were transformed into public parks, introducing designed landscapes with emphasis on a stronger design aesthetic based on beautification with some enhancement of the semi-natural vegetation, which resulted from a combination of the Picturesque and Gardenesque styles inherited from the colonial era and the urban forest concept inspired by American ideas of sustainability from the '80s. This combined approach has a strong influence on the current design and management practice of the local authority.

3.2.4 Phase Four: Semi-structured interviews with the landscape management teams of the selected urban parks in Kuala Lumpur

The semi-structured interviews were conducted in phase four of the data collection, which helps to address the main RQ and sub RQ1, 2, 3 and 4. The aim was to gather detailed information about the current design and management of Kuala Lumpur's urban parks, followed by direct reports of the management stakeholders' attitudes towards changing to a sustainable approach. Their direct experience in the design and management of the selected sites is extremely

important in determining the practicality of such an approach for the local urban parks, besides the potential benefits and challenges of implementation. These findings would be beneficial for the local urban park management in adapting their landscape practice towards a more sustainable practice.

In broad terms the interviews explored: education and employment history, duties and responsibilities in relation to the selected case studies, knowledge of the existing management and maintenance practice, knowledge and understanding about ecological design and management. Finally, the respondents were asked about what they saw as the implications of changing their current landscape design and management to adapt the existing landscape towards a more ecologically sustainable practice. According to Burgess et al. (1988), "qualitative methods are more suitable for exploring attitudes and values about open space because such approaches are grounded in the contexts of people's daily lives" (p.456); the context of this research involved the daily landscape operational and maintenance practice by the urban park's management team.

3.2.4.1 Recruitment of participants for semi-structured interviews

The respondents were purposely selected from the park management team of the respective case studies because they had the greatest access to information relevant to the research. The selected respondents represented a hierarchy of urban park management that would bring different perspectives to addressing the research questions. Miles & Huberman (1994) suggest that a small number of respondents can be sufficient in case study research provided that they have the relevant inputs on the subject being studied. The initial target for the interviews for each park was between 10 and 12 persons. However, as some of the parks had smaller management teams, between 5 and 10 persons were available and willing to be interviewed during data collection.

3.2.4.2 Procedure of the semi-structured interviews

The research recognises that different levels of education and academic background reflect the different experience and knowledge that these different groups will bring to an understanding of the research questions. Therefore, the interview procedure was developed to accommodate these differences, as translated in the design of the questions for the semi-structured interviews, described in section 4.5.3.

It was initially planned to conduct the semi-structured interviews on a one-to-one basis. However, in cases where staff schedules were particularly tight, the researcher had to comply with the request by some of the park managers to conduct group interviews. The interviews for

the case studies were conducted in Malay language, because this is the official language of the government administration and, furthermore, English proficiency was low among the majority of the respondents. The interviews were recorded using an audio recorder and notes were also taken during the interviews. The recorded data produced during this research were transcribed and translated into English in preparation for the analysis.

3.2.4.3 Background of the participants for semi-structured interviews

The backgrounds of the selected respondents from the four levels of urban park management, from the top downwards, are presented as follows:

a. Senior management personnel (SMP)

Senior management personnel in the urban park management structure at KLCH and NLD are among the decision makers in urban landscape management in Kuala Lumpur. Their role includes overseeing that the landscape development and management divisions of Kuala Lumpur's urban parks implement landscape design strategies in accordance with the structural plans and National Landscape Policy. The respondents included the Director for the Technical Service and Special Project Division, NLD, who is responsible for landscape design and development at *KVP,* the Director of the Landscape and Recreation Department at KLCH, who is supported by the Deputy Director of the Landscape Planning and Development Divisions, the Deputy Director of the Horticulture Division, and senior landscape architects with responsibility for landscape design and management at *PBG*, *TLG*, *PLG* and *ALG*.

The senior management personnel are responsible for consulting with the city Mayor and Ministers on landscape planning and development for Kuala Lumpur's urban parks and open spaces, besides liaising on necessary action concerning urban park design and management with park managers and assistant park managers with responsibility for the landscape management of the city.

All the respondents have a landscape architecture background except for the Director and Deputy Director of the Horticulture Division, KLCH. This is because it is normal practice in Malaysia's public services to fill vacant posts in top management temporarily with officers based on their seniority over merit and qualifications, who then perform an acting role until a qualified candidate is available. Being the most established local authority, KLCH has implemented several changes in the management structure of the Landscape and Recreation Department to improve their landscape practice. During the landscape development boom in the '90s, more landscape architects were appointed to landscape planning and development roles, while former staff with agriculture and forestry backgrounds were redeployed to lead the park management, mainly focusing on

landscape maintenance operations. Since then, there have been separate divisions for landscape design and landscape management of urban parks in Kuala Lumpur. However, being newly established in the mid '90s, the NLD has opened up opportunity for landscape architects to head all the landscape divisions, including the park management of *KVP*.

b. Managerial staff (MS): Park Manager and Assistant Park Manager

Park managers are responsible for overseeing the delivery of landscape design and management at urban parks. The scope of work for park managers at urban parks managed by KLCH includes contract administration; maintenance supervision; managing the park's activities; and attending to public complaints. Although landscape design proposals for urban parks in Kuala Lumpur are mostly devised by landscape architects under the Landscape Development Unit, the park managers have the authority to make design decisions for small scale projects in their respective parks.

Referring to the historical background of urban park management in Kuala Lumpur, the strong agricultural (particularly horticulture) and forestry background have had a significant influence in determining the education and training of park managers. Unlike other parks managed by KLCH, *PBG* is an example of an urban park with multiple goals and specific targets. For example, *PBG* is currently being transformed into a botanical garden. Thus, the park manager has to perform the role of a curator (managing the botanical collections), besides overseeing the landscape design and management of the park. Due to its changing role as a botanic garden, *PBG* has its own management structure, which is larger and more complex than that of other parks in Kuala Lumpur. Similarly, the National Landscape Department has added new roles to the *KVP* park manager's job of managing the vast amount of natural resources within the park, considering the park's new status as part of the 188.93 ha Federal Park. Landscape architects are considered more appropriate for managing these tasks besides performing normal duties of a park manager similar to those of KLCH park managers.

Besides having multiple roles within management of the particular park, some KLCH park managers have been assigned to manage more than one park, as urban park management in Kuala Lumpur is divided into 3 zones that are managed by separate teams. *TLG* and *ALG* are among the urban parks within the northern zone which are led by the same park manager; whereas the park managers of *PLG* are also responsible for managing other urban parks located in the southern zones. Due to the demands of managing such a large area, the park manager is assisted by the Assistant Horticulture Officer at KLCH or the Assistant Landscape Architect at NLD.

c. Support staff (SS): Horticulture assistants /assistant landscape architect/ site supervisors

In the urban park management structure at Kuala Lumpur's urban parks, the horticulture assistants (KLCH) or assistant landscape architect (NLD) are the support staff who supervise daily maintenance operations carried out by labourers. On the basis of their experience and particular horticulture skills, they provide hands on training to the labourers on delivering their tasks and need to provide monthly reports to the park manager or assistant park manager on maintenance progress and outstanding issues. In addition to their maintenance responsibilities, they are also responsible for public safety and responding to issues raised by park users. They therefore have a significant role in ensuring the aims and objectives of the park management are successfully delivered.

In urban parks managed by KLCH, most of the horticulture assistants have more than 20 years' experience. They initially joined KLCH as ground staff with a minimum qualification of Malaysia Certificate of Education or Vocational Malaysian Certificate of Examination from the Agricultural Vocational School, at the age of 17. Through the staff development programme offered by KLCH between the late '80s and early '90s, these staff were sent for in-service agriculture based training courses at the Bogor Agriculture Institute, Indonesia and obtained a Certificate in Agriculture, which enabled them to be promoted to the horticulture assistant position. One of the horticulture assistants completed a diploma in landscape and park management from the same institute, and currently specializes in tree management for *PBG*. After this programme was discontinued, in the 2000s, the KLCH started to appoint horticulture assistants with a Malaysian Skills Certificate from the local Agricultural Institute as a minimum qualification for the same post.

The National Landscape Department (NLD) requires its employees to have a Diploma in Landscape Architecture. As the *KVP* is a pioneer urban park managed by NLD, the landscape maintenance package is fully sub-contracted due to the limited workforce, particularly among ground staff. For all contracted maintenance operations, KLCH and NLD require a site supervisor to be appointed as the landscape contractor's representative to assist the horticulture assistants and assistant landscape architect in maintenance supervision.

d. Ground staff (GS): Foreman and maintenance labour

Ground staff include the foreman and maintenance labourers who are responsible for the daily maintenance operation of the parks that includes daily cleaning work (e.g. clearing dry leaves and trimming debris, rubbish collection, washing pathways) and grass mowing;

besides regular maintenance of the soft-scape (e.g. watering, weeding, fertilizing, tree pruning, shrub trimming).

As regards KLCH, the ground staff were employed as permanent staff of the Landscape and Recreation Department. The minimum academic qualification for this ground level post is a primary school assessment certificate (aged 12). However, the majority of the ground level staffs have at least a Malaysian Certificate of Education (aged 17) or Malaysia Lower Certificate of Education (aged 15). The CHKL also provides training opportunities for the ground level staff to improve their work skills. Besides permanent employment, some labourers are appointed on contract basis, usually by private contractors engaged by NLD and KLCH to carry out basic maintenance task in Kuala Lumpur's urban parks. As they are mostly foreign labourers (i.e. Indonesian and Bangladeshi), who are more affordable but typically have no qualifications or skills compared to the local labour, this would have an effect on delivery of ecological design and management.

3.3 Data gathering techniques and instruments for the case studies

As the case studies were exploring multiple sources of evidence, the researcher adopted various techniques and instruments to assist in data gathering from the different resources, as discussed in the following sections.

3.3.1 Documentation and archival records

Documentation and archival records were important means of investigating historical development and also the current state of the urban parks being studied. They included historical manuscripts relating to landscape design and management and other supporting documents (site photos, annual reports and local grey literature). The historical documents were obtained from the National Archives of Malaysia, the Library of Kuala Lumpur City Hall, as well as from the library of Arts and Archives from the Royal Botanic Garden, Kew, in London, United Kingdom.

The management documents were accessed through the respective landscape architects and/or park manager. For the precedent study sites, these documents were obtained from the respective landscape consultants and the local authorities in the UK, Singapore and Malaysia. Meanwhile, for the case study sites, the current documents were acquired from the Landscape and Recreation Department, Kuala Lumpur City Hall and the Landscape Management Division, and the National Landscape Department (JLN), with consent from the Director and Director General. These documents included site records, landscape plans, maintenance specifications/manual and related publications. Some documents were also retrieved from published literature available online and from project websites. These documents were

reviewed during phase one of data collection, in the analyses of changes in the urban parks' design, management and maintenance approach.

3.3.2 Site observations

The site observations assisted the researcher in confirming that the selected precedent and case study sites were appropriate for answering the research inquiry. Yin (1984) suggests that evidence from observations is often useful in providing additional information on the real practice of the discipline. In particular, site observations can provide prior knowledge of the context, specific incidents and behaviours (Merriam, 1997), which in the context of this study provided the researcher with first-hand experience of ecologically sustainable practice at each of the precedent study sites, including design and management aspects, visual appearance, and also respondents' attitudes towards such a sustainable approach. The observations were recorded using digital photography with accompanying field notes during the visit to the individual park. These observational data assisted in validating the findings from the review of documents as well as from the interviews.

The observation of the precedent study sites performed in phase two of data collection offered valuable information about ecological design and management aspects and the appropriate appearance, which informed the development of a framework for ecological design alternatives that formed part of the photo-based questions to be answered by the urban park management team of the selected case study sites during the semi-structured interviews in phase four.

Meanwhile, for the case study sites, the field observation conducted in phase three of data collection provided an understanding of the current state of landscape design and management practices in Kuala Lumpur's urban parks (e.g. irrigation, cleaning, pruning, mowing, etc.); in addition, it assisted in identification of different types of landscape areas at the case study site. This understanding would be useful in signifying areas within each park where there was potential for implementing more sustainable design and management practices. Recorded images of these areas were used to develop the ecological design framework that was used in the semi-structured interviews

3.3.3 Ecological design framework for case studies interview

To evaluate the potential of applying ecological design and management through the integration of SuDS, a framework for ecological design alternatives informed by the findings from the precedent studies was used to guide the case study interviews with the urban park management of the local authority in Kuala Lumpur. These ecological design alternatives are presented in a form of digital manipulation of real site photos superimposed with ecological design alternatives, in order to investigate stakeholders' attitudes to changing to this ecologically sustainable landscape practice (refer to Apendix 5).

3.3.4 The interview topic guide using photo-based questions

The interview topic guide was developed based on the case study protocol by Yin (2009), to give some flexibility to the researcher in seeking information from various respondents that would reflect their different roles and engagement within the urban park management. Due to differences in the respondents' educational backgrounds, their levels of understanding about the research topic could have varied from low to high, and it could even have been totally unfamiliar to some of the respondents. To address this issue, photo-based questions were developed to support the semi-structured interviews, using photo elicitation technique. According to Bignante (2010), photo elicitation has been widely adopted in interviews, using images to assess respondents' opinions and attitudes towards the topic being studied.

The use of photos as image representation in interviews has proven to be an effective tool in learning about stakeholders' attitudes and preferences in landscape studies, with both expert and non-expert respondents (Kaplan, 1985; Barroso et al., 2012; Jorgensen et al., 2002; Kaplowitz & Lupi, 2012; Kendal et al., 2012; Özgüner et al., 2007). Besides using actual site photographs to assess the adaptation of ecological landscape design in the urban park, digital manipulation technique is another possible option. Nassauer et al.'s (2009) study is an example of the use of this technique, whereby six ecological design alternatives were developed for exurban residential front yards, varying from conventional to ecological design style, which were then used to assess the influence of cultural norms on residents' preferences. A similar technique was also used for a comparative study of the impact of woodland spaces and edges on perceptions of safety and preference conducted by Jorgensen et al. (2002). The use of digital manipulation helped to represent various types of ecological treatment in images which were then used to support interviews with respondents regarding this sustainable approach.

These techniques help to "facilitate respondents' understanding of complex or new concepts such as landscape changes" in their local context (Sullivan et al., 2004, cited in Kaplowitz & Lupi, 2012, p. 365). In this research, they provided visual insights about ecologically sustainable practice for the respondents and represented images of alternative ecological landscape designs for Kuala Lumpur's urban parks for eliciting respondents' attitudes regarding changing their landscape design and management practices towards this approach. Rose (2007, p. 238) argues that provision of this prior knowledge is necessary to elicit respondents' personal and general attitudes towards the meaning and implications of the topic, as photo elicitation simultaneously provides "information, affect and reflection", thereby offering significant information for this research.

Photo elicitation as used in the interviews involved using an ecological design framework that consisted of exemplars of ecologically sustainable practice informed by the precedent studies' outcomes, to form visual representations of the practices proposed for Kuala Lumpur's urban

parks. The former were actual site photos of urban parks presented in a booklet format, while the latter comprised two types of photos. Type 1 consisted of existing site photos, showing the existing landscapes of each of the case study sites in Kuala Lumpur, with different landscape types ranging from lawn area, shrublands and semi-woodland to ponds and water-edge areas, which were identified from the site observations. The existing photos of each landscape area would form the basis for the ecological design alternatives.

Using the same framework, type 2 photos were developed by digital manipulation of the real site photos to imitate the proposed ecological landscape vegetation, using Adobe Photoshop software. According to Barroso (2012), this should be done with proper control of the new elements on the existing landscape. Two alternative designs were proposed to represent ecological landscape design: (1) moderate treatment and (2) intense treatment, using the examples of ecological landscape design observed from the precedent study sites. These colour photographs were superimposed on the existing site photos of the case study sites to develop the following framework (refer to appendix):

a. Landscape that represents ecological style

Each type of landscape is arranged according to spatial proximity (low to high density) and vegetation layers (single to multi-layered structure) representing vegetation arrangement from parkland to woodland.

b. Landscape treatment for stormwater control

This consists of appropriate landscape treatment for water treatment representing taxonomy of ecological design.

c. Landscape that represents habitat diversity

Vegetation is classified according to habitat diversity (lawn - herbaceous and shrubs - woodland) and naturalistic planting style representing taxonomy of ecological design.

Such digital manipulation provided visual stimuli of ecological landscape design in a park setting that was familiar to the respondents, in order to elicit their opinions and judgments on changing the current landscape to a more ecologically sustainable practice.

3.4 Pilot study to test the case study method

A pilot study was conducted prior to the actual data collection from the case studies in Kuala Lumpur. The purpose of the pilot study was to test the research instruments and protocols to be used in the data collection. According to Voss et al. (2002, p. 205), conducting interviews in

multiple case studies requires an appropriate protocol to be followed; thus there needs to be "piloting either in a pilot case or in initial interviews within an organisation".

In the context of this research, initial interviews were conducted with the landscape architect and park manager of the Botanical Lake Gardens, Kuala Lumpur during the preliminary study in 2012, to seek prior knowledge about the park, based on its status as the first public park built in Kuala Lumpur. This included the background context and changes made to the park design and management; related issues and problems for the current management; and the existing vegetation and resources available in the park. The interviews also assessed the stakeholders' familiarity with and understanding of ecological approaches to design and management of urban parks towards sustainability, such as the rain garden concept and sustainable urban drainage systems (SUDs). Site observations of the daily landscape operations and maintenance and landscape management plans and documentation became supporting evidence for the topics discussed in the interviews. The findings from the initial interviews helped inform the aim and focus of the research and set an outline for the interview topic guides.

Prior to the interviews with the urban park management teams of the selected case study sites, the interview topic guide was tested with landscape architects and park managers who had relevant experience in the design and management of urban parks in Kuala Lumpur. They were approached by email and telephone to make appointments, and upon their agreement the interviews were conducted in their offices.

The pilot study helped to refine the research instruments and protocol as outlined below:

a. In conducting the semi-structured interview for the case studies, two references were used to support the interview topic guides: the exemplars of ecologically sustainable practice from the precedent studies and the photo elicitation of this practice as proposed for the Kuala Lumpur's urban parks. The pilot test helped improve the representation of the research tools; the precedent studies were made into an A4 size booklet format, making it easier for the researcher to handle and to brief the respondents about the project during the interviews. Meanwhile, the photo elicitation of the ecological design framework was developed into different sets for each park that included photos of the existing site and showing alternative 1 for moderate ecological treatment and alternative 2 to represent extreme treatment for each landscape type, ranging from lawn area, shrublands, semi-woodland, to pond and water-edge area.

b. In light of the responses given by respondents during the interviews, some questions in the interview topic guide that might have been ambiguous were edited and refined to make them more specific and clearer, whilst questions considered too repetitive were omitted.

c. The photo elicitations were also refined to take account of the comments made by the respondents.

d. The pilot test not only helped the researcher to modify the research instruments but also to practise and improve the procedure for conducting the interview in terms of following a proper order and timing; in addition to get the interviewee actively involved within the one hour interview but not to speak beyond the scope of the topic, which was quite a challenging task.

3.5 Approaching the urban park management's personnel for permission to conduct the research

As the research involves multiple case studies, building a good relationship with the selected urban park management's personnel was an important yet challenging task for the researcher. They were initially identified from the staff directory on the official website of the respective landscape consultant firms and local authorities; from suggestions by the research supervisors through their professional networks; and the researcher's own professional contacts.

In the case of the precedent studies, the relevant landscape architects and park managers were approached by email to ask them to participate in a semi-structured interview. Prior to their agreement, an official letter with key information about the research was emailed to them, together with a participant information sheet that explained in detail the aim of the study and the respondent's input to support the research; a consent form for endorsement of their participation and confidentiality of the data collected from the interview was also enclosed (refer to appendix 1). The researcher's name and contact number were provided in case the respondents had any queries about the research and their involvement

For the case study sites, an initial approach to the local authorities was made during the preliminary study by sending an official letter to the Director of the Landscape and Recreational Department of Kuala Lumpur City Hall (CHKL) seeking permission to conduct the case studies, hold an initial interview with the landscape architect, and to request access to relevant design and management documents of the selected urban parks. As management of one of the selected parks had been taken over by the National Landscape Department (JLN) from the CHKL, a similar official request was also made to the Director General of the National Landscape Department (JLN). Upon gaining their approval, the researcher contacted the park manager of each of the selected urban parks for an interview appointment and for their suggestions on a list of staff representing different management levels for the interviews. Appointments with these respondents were arranged by the park manager.

The majority of the contacted respondents agreed to participate and provided very positive feedback. There were also some potential respondents who were not willing to participate, yet

some of them provided contact details of other related personnel who might assist in the research.

3.6 Data analysis procedure

The results and findings from these studies were reviewed and analysed using an analytical process based on the explanation-building technique suggested by Yin (1984) to identify the potential adaptation of urban park management in Kuala Lumpur, Malaysia towards delivering a more ecologically sustainable practice. According to Yin (2009), it is important to show the sequence of analysis processes linking the research inquiry to the findings, in order to address the validity and reliability issues inherent in conducting qualitative research.

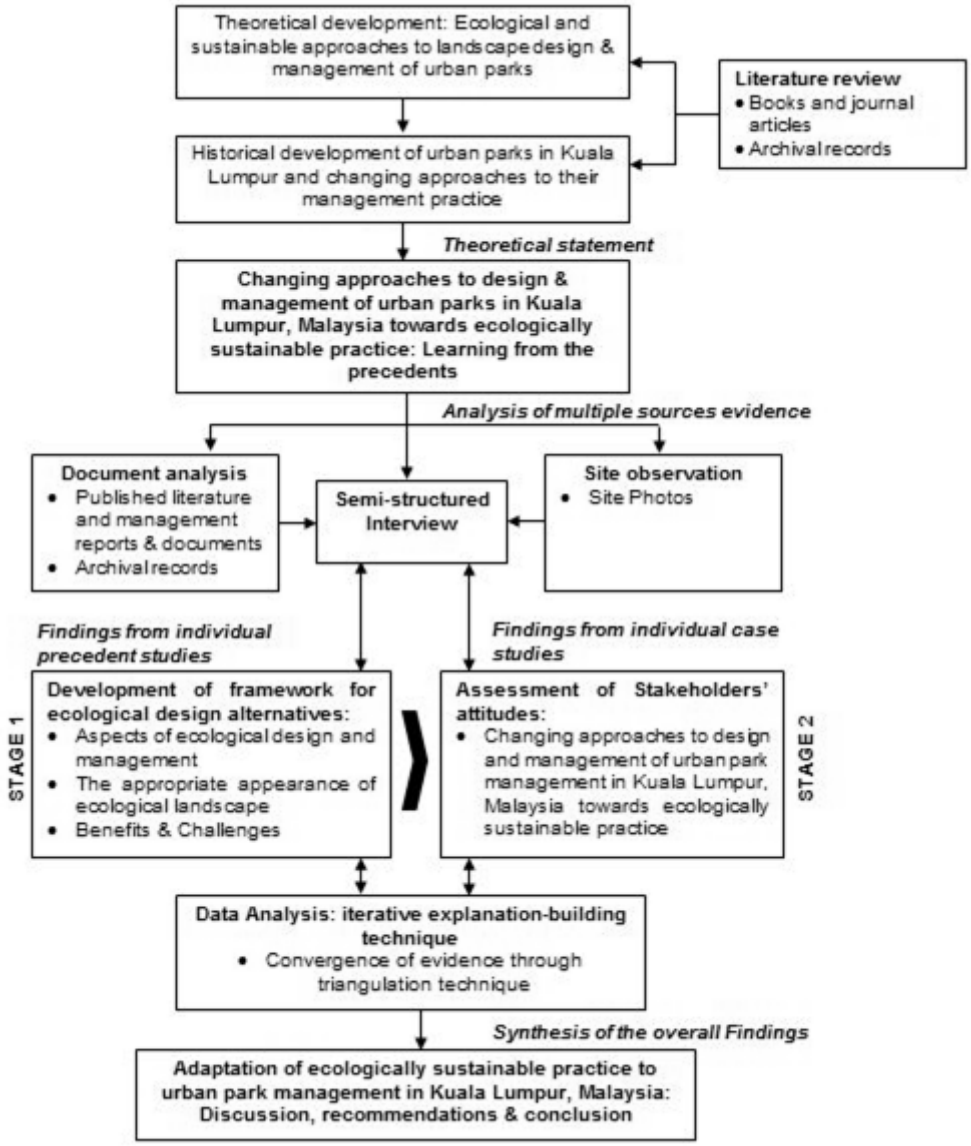


Figure 3.16: The data analysis process for the case studies approach adapted from Yin's (2009) iterative explanation-building technique

The data analysis procedure was divided into two stages: precedent studies analysis and case studies analysis. The findings from the multiple sources of evidence were coded, categorised, and analysed and converged. Triangulation of these data would ensure internal and external validity of the case study (Yin, 1984). Figure 3.16 shows the overall process of data analysis from the initial theoretical development to the final conclusion, as discussed in the next section.

3.6.1 Stage 1: Data analysis of precedent studies

The purpose of the first stage of data analysis was to identify the various aspects of ecological design and management; appropriate appearance of ecological landscape; and the benefits and challenges of delivering ecologically sustainable landscape in the precedent study sites from the experience and perspectives of the respective landscape designer and park manager. The data analysis of precedent studies entailed comparing ecologically sustainable practices in the selected urban parks in the United Kingdom, Singapore and Putrajaya, Malaysia, in order to compare and contrast the ecological landscape design and management practice in relation to the specific local context.

The analysis of multiple sources of evidence started with comparison of the interview findings from all the precedent studies, which was then supported by content analysis of documents, as suggested by Cranz & Boland (2004). The specified themes emerging from the individual projects were combined to form several categories, each coded in a different colour. These findings were supported by photographic evidence of ecological landscape design and management, derived from site observations at each individual project. As data analysis in qualitative research relies solely on the researcher's judgement, it is important to maintain proper integration of these multiple sources through a chain of evidence, as a quality measure to increase construct validity (Yin, 2009). Finally, the results and findings from different cases were compared to identify common and distinct aspects in landscape design and management practices. This evidence was organised and presented in table form for discussion. The outcomes of stage 1 data analysis informed the development of a framework of potential ecological design alternatives for urban parks in Kuala Lumpur, presented via "photo elicitation", as a supplement to the interview questionnaire for assessing local management's attitudes towards ecological approach during the interviews in phase 4.

3.6.2 Stage 2: Data analysis from the case studies

The second stage of data analysis entailed the iterative process of multiple data analysis for each of the current case studies, starting with interview analysis. As with the precedent studies, the analysis focused specifically on management stakeholders' response towards the proposed ecological design framework for Kuala Lumpur's urban parks in terms of the aspects of

ecological design and management that could potentially increase their ecological sustainability, and the appropriate visual appearance of ecological landscape according to the local context. At this stage, however, the aim was to assess the attitudes of the urban park management teams towards the adaptability and practicality of ecological design and management for the particular case study site. The analysis also identified potential benefits and challenges in implementing such approaches in Kuala Lumpur. These data were arranged into several categories and organised in table form before being further reviewed to form sub-categories. Comparison was then made of these categories and sub-categories among the different cases to identify similarities and differences of findings between different levels of management and across case studies. The findings were then discussed to present the overall perspectives from the park managements towards ecologically sustainable practice. The outcomes from multiple sources of evidence were validated through triangulation (Yin, 2009) in the search for the most appropriate solutions for adaptation and possible assimilation into design and management of Kuala Lumpur's urban parks towards achieving sustainability.

3.7 Summary

This chapter presented the justification for adopting a case studies approach to conduct this research. A comprehensive framework incorporating detailed research design and the process and procedures for the different stages of data collection was developed as significant guidance for addressing the main research questions and sub-research questions within the research timeframe. Various data gathering techniques and instruments used to support the collection of multiple sources of evidence from the precedent studies and case studies enabled gathering of rich information, which was then synchronized by an iterative data analysis process designed to illustrate urban park management's overall perspective on changing towards a more sustainable practice. Chapter 4 through to chapter 6 will present these findings, and chapter 7 will then present the overall discussion and recommendations based on the case studies' outcomes.

CHAPTER 4

The historical timeline of urban park evolution in Kuala Lumpur, Malaysia and its influence on the current landscape management practice of these landscapes

4.0 Introduction

This chapter provides an overview of the evolution of urban parks in Kuala Lumpur, Malaysia. It will start with a brief description of the early development of the city to explore how parks developed and evolved during the colonial period and the post-independence era. This historical timeline reveals the influence of urban park evolution in developed countries, particularly the UK and the USA, on changes to landscape management practice in Kuala Lumpur's urban parks, as reflected in adaptation to urban greening and beautification; then this approach was combined with the Malaysian government's vision towards sustainable development through their initiatives in local urban park management. The chapter continues by presenting the current state of urban park management of Kuala Lumpur, as well as issues and problems in managing these parks. An understanding of this evolution will guide future changes towards an ecologically sustainable practice in the city.

4.1 The contextual background of Kuala Lumpur, Malaysia

Kuala Lumpur is located in the Klang Valley, on the west coast of the Malaysian Peninsula. It is the capital city of Malaysia and covers an area of 243 km2, with estimated population of 1.6 million. The local climate is categorised as equatorial, with a temperature range between 21°-31° Celsius with 80% humidity. The average annual precipitation is 2000-3000mm. The seasons are characterised by wet and dry, following the northeast monsoon (October – March) and southwest monsoon (April – September) seasons. During the wet season, from April to September, Kuala Lumpur experiences an intense period of rainfall.

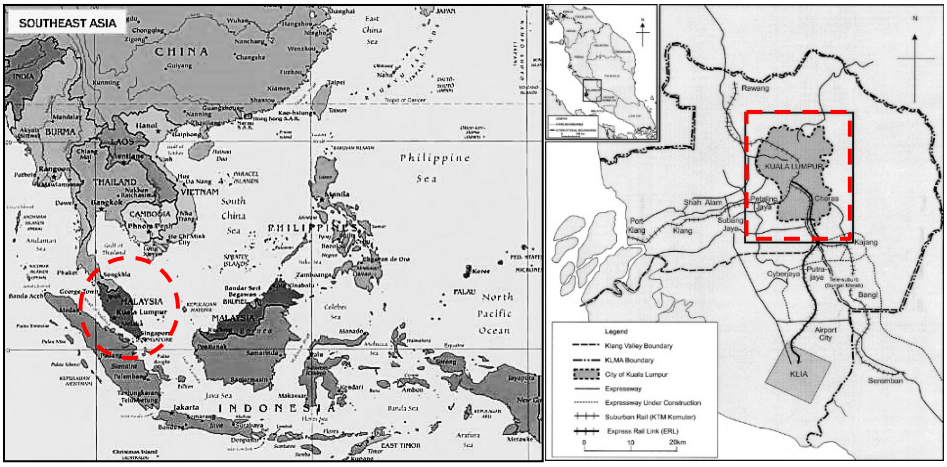


Figure 4.1: Map of Kuala Lumpur, Malaysia
Source: Maps-Thailand.com (2002); Dunnell et al (2002)

The city landscape comprises a blend of former colonial and contemporary architectural style buildings surrounded by undulating topographic hills and river valleys, covered with tropical urban forests surrounding a designed urban landscape (refer to figure 4.2).

Figure 4.2: A photo of Kuala Lumpur City Centre
Source: Khalzuri Yazid, Malaysia MSN (2014)

The following sections will explain how the development of Kuala Lumpur during the colonial period (1884-1957) and then throughout the post-independence era (1957-2015) resulted in significant changes to the city's social, built, physical environment, including the evolution of its urban parks.

4.2 The early development of Kuala Lumpur's urban park during the colonial era (1888-1957)

The first urban park in Kuala Lumpur was built in 1888 and was called the Lake Gardens (refer to figure 4.3). Sir A R Venning, the state treasurer of Selangor, initiated the development of the 173 acre park as a potential site for public leisure and relaxation space (see figure 4.3), with a small grant from public funds approved by the British resident of Selangor, Frank Swettenham (1882-1889) (Gullick, 2000). This effort received huge support from a wealthy Chinese trader, who contributed a large number of white chempaka and orange trees to the park (Gullick, 2000, p.113). Being a garden enthusiast, Venning introduced botanic design elements into the park through "an experimental economic garden" (Gullick, 1955, p. 6). The design and layout of the Lake Gardens was heavily influenced by British design traditions, using displays of ornamental palms and shrubs throughout the river valley park.

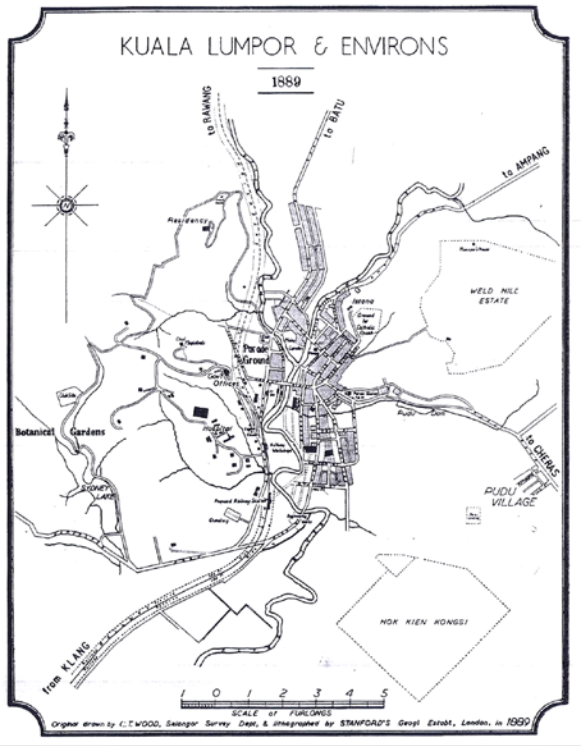


Figure 4.3: The Lake Gardens included in the master plan of Kuala Lumpur in 1889
Source: (Penerbitan Puteries, 1990)

The park was initially designed for the senior colonial officials' residences (Gullick, 2000). However, the increase in colonial population in Kuala Lumpur towards the end of the 19th century created demand for exclusive sports and recreational activities, such as "horse-racing, golf, cricket and football pitches" (Gullick, 2000). The colonial government redefined the botanic role of the Lake Gardens to that of a leisure park in 1890, with the establishment of the Lake Club, an exclusive club for the British community (Jamil, 2002), followed by development of a multipurpose Parade Ground for various official ceremonies, and a cricket ground in 1892

(Gullick, 2000). By the 1930s, the town had its own race course and golf courses to cater for the expatriate community (Butcher, 1979).

The establishment of the Lake Gardens and their later evolution into a leisure park is an exemplar of how social demand has significantly influenced this change. This trend was consistent with the suggestion in previous literature by Conway (2000) and Cranz (1982) that the evolution of urban parks has always corresponded to changing social needs and demands.

4.2.1 The colonial design influence on urban park management in Kuala Lumpur

During the colonial period, urban park development in Kuala Lumpur was designed and managed by the British government, which exported the colonial garden to British colonies, altering the local landscape according to colonial knowledge and preferences. In the early 20th century, they introduced an approach to urban greening and city beautification to Kuala Lumpur for the enhancement of Kuala Lumpur's urban landscape, following trends and movements inspired from developed countries, mainly the UK and the North America. Two major influences on Kuala Lumpur's urban park management that derived from the colonial administration are discussed next.

4.2.1.1 The City Beautification

The City Beautification Movement, which emerged at the end of the 19th century in the USA, inspired the colonial government to adopt this approach as part of their strategies for improving the urban landscapes in Kuala Lumpur between 1900 and 1915, as described by Ignatieva and Stewart (2009):

> *"In the end of the nineteenth and the beginning of the twentieth centuries many former colonial cities experienced the 'beautification' movement based on a contemporary understanding of European forms and the monumental idioms of city planning, architecture and planting design". (p.400)*

This movement focused on improving the urban environment for its citizens and was also seen as a measure of social control through instilling a greater sense of civic culture amongst the urban community. According to Meek (1979), city beautification "implied a range of civic improvement efforts…centred on 3 elements of the City: (1) Streets; (2) civic centres; and (3) parks and boulevards" (p. 5). This explains the colonial government's particular emphasis on strong aesthetic characteristics in their landscape design.

The aesthetics of beautification stressed the visual appearance of the designed landscape as something that was distinctive from the natural habitat. For example, the Lake Gardens were heavily influenced by the picturesque landscape style (refer figure 4.4), characterised by "open spacious lawns with gentle rises and scattered clumps of trees, curvilinear lines of pathways, ponds and lakes, all aiming to create scenic views" (Ignatieva and Stewart, 2009, p. 409). Later

there was a gradual shift towards a more Gardenesque style, introducing a variety of attractive exotic plants to replace the local vegetation.

Figure 4.4: The view of the picturesque landscape style of the Lake Gardens in 1900
Source: The National Archives of Malaysia (1990)

4.2.2.2 The urban greening

Soon after the First World War, the colonial government initiated the city greening efforts of the 1920s and the 1930s as part of the post-war landscape planning for urban landscape regeneration. Major tree planting programmes were carried out in Kuala Lumpur, including its urban park, introducing a variety of local trees that included forest species. The Forestry Department collaborated with the Department of Agriculture to assist tree planting in the Lake Gardens, and with the Public Works Department for street planting (Sreetheran et al., 2006). The joint effort in this greening programme indicates that multidisciplinary collaboration was practised by the colonial government in supporting urban park management.

Through the tree planting programme, existing woodlands in the Lake Gardens were preserved, while other parts were planted with shade trees (Harrison, 1923, cited in Tate et al., 1987). However, due to lack of knowledge on local species, the colonial government introduced fast growing exotic species to expedite the process of urban greenery (Sreetheran et al., 2006). As a result of the greening efforts, more semi-natural woodland was established in the park, while a picturesque style landscape was maintained, with green lawn, colourful trees and shrubs and annual flower beds remaining as the park's main components (Department of Agriculture, 1925). While more effort was made to improve this landscape, no allocation was provided for new public parks, which meant that the Lake Gardens remained the only urban park in Kuala Lumpur during the colonial administration.

4.2.2.3 Impact of urban greening and beautification on Kuala Lumpur's urban park management

In supporting the delivery of an urban greening and beautification approach to urban park design, the Department of Agriculture established a management structure for the Lake Gardens (refer to figure 4.5), with the superintendent of public gardens (with horticulture, agriculture or forestry background) at the top, then the assistant superintendent of government plantation (an agriculturist), supported by a gardener and a sub-foreman with knowledge of botany and special training in horticulture, who were responsible for supervising 45 landscape maintenance staff (Department of Agriculture, 1916).

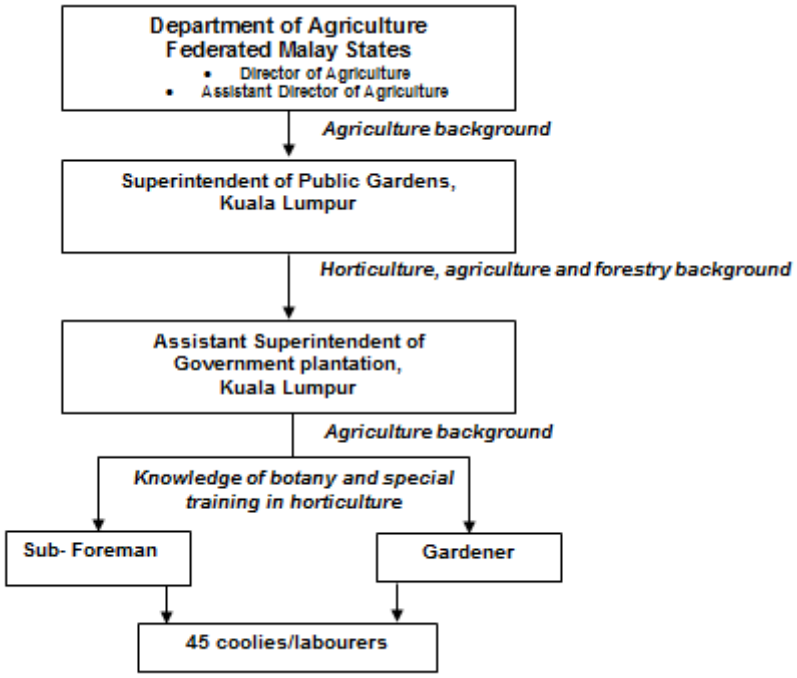


Figure 4.5: The park management of Lake Gardens (1901-1916)
Source: The Royal Botanic Gardens, Kew (2012)

The purpose of the multilevel structure was to allow some flexibility for the garden superintendent and the assistant superintendent in performing their multiple roles of park management, plant cultivation, and maintenance of government plantations of commercial crops (*i.e.* rubber and champor trees) (The Royal Botanic Gardens, 1910). A departing superintendent would be replaced by the assistant superintendent, with prior approval from the British Resident. The review of the recent landscape management document from the park management of the case studies confirms the legacy of this structure is still evident in the current urban park management of Kuala Lumpur.

Adoption of this approach of urban greening and beautification with introduction of new exotic species into the colonial garden style and addition of more trees in the urban park had a lasting

effect on the landscape management and maintenance of the Lake Gardens. The colonial government management had to apply intensive horticultural practice that consumed high resource input and maintenance intensity. This included weeding, trees pruning, lawn mowing, hedge trimming and upkeep of annual flowerbeds in order to maintain the intended scenic view, besides cleaning of the Sydney Lake (Report on the Public Gardens, 1916). This regime is consistent with the scope of maintenance found in the current maintenance specification of the case study sites. Provision of a nursery for species cultivation, and sourcing the exotic species imported from other colonial cities, also added to the cost. More investment was also made to employ park managers and gardeners with horticultural knowledge and skills, who were mainly recruited from Kew Gardens, the United Kingdom (The Annual Report for the Public Gardens, 1897).

Between 1888 and 1925, there was constant replacement of management personnel at the Lake Gardens, besides shrinkage in the workforce due to contract expiry and resignation of staff/labour (Department of Agriculture, 1916). The Annual Report for the Public Gardens, 1925 reported that lack of workforce was affecting the landscape operations of the park (Department of Agriculture, 1925, p.2). The overall cost of maintenance of the Lake Gardens gradually increased each year. The annual reports for the Lake Gardens stated that the initial landscape maintenance cost was $5,500.00 in 1897, a figure that had increased to $7,000.00 by 1904, $9,332.92 in 1916; $11, 509.18 in 1924, increasing by another $1,700.00 by 1925 (Office of Secretary for Agriculture, 1925). It can be inferred that during the colonial period, the overall cost of the park's maintenance of its manicured landscapes constantly rose each year. However, due to the government's commitment to sustaining the picturesque style landscape, they continued to invest financial support and other resources in park management through the selected form of horticultural practice.

It can be summarised that the colonial government expended a lot of effort on imposing an aesthetic appearance on this landscape, an approach imported from their homeland. The next section goes on to discuss how the independent Malaysian government, having inherited this colonial approach, adapted it according to its own knowledge and understanding in the further development of urban park management in Kuala Lumpur.

4.3 The development of Kuala Lumpur during the post-independence era (1957-2015)

After Malaysia gained independence from the British in 1957, the new government's main priority was nation building, concentrated on economic and physical development. From 1957-59, the new city Masterplan incorporated new industrial areas and new townships in order to meet government objectives (Kuala Lumpur City Hall, 1959). The Masterplan also incorporated improvements to major public facilities and infrastructure of Kuala Lumpur (Jamil, 2002).

Despite the economic and physical expansion, Kuala Lumpur experienced a critical social conflict due to socio-economic segregation that caused riots in 1969 (Jomo & Sundaram, 2004). Due to this pressing issue, the Malaysian government developed the New Economic Policy (NEP) (1971-1990), promoting social reforms and poverty reduction (Jomo & Sundaram, 2004). Similar to the experience of developed countries, urban development in Kuala Lumpur was mainly focused on addressing social and economic challenges at this time rather than environmental issues.

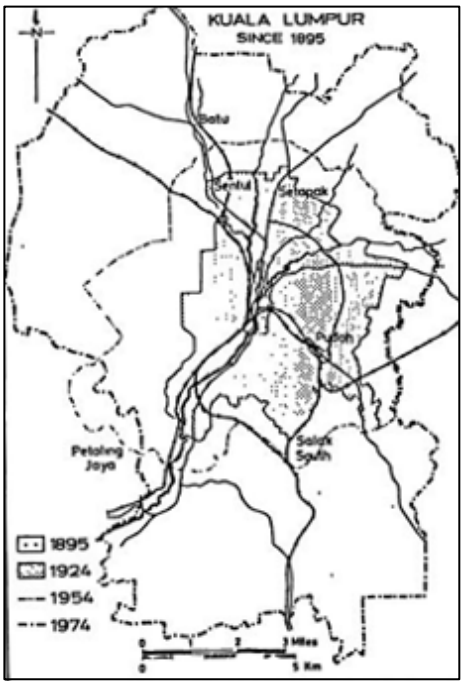


Figure 4.6: The expansion of the boundary of Kuala Lumpur from 1895-1974
Source: (Gullick, 1994)

By 1970, Kuala Lumpur had continued to expand and covered a total area of 93 sq. kms, with a total population of 452,000 (Sidhu, 1978). The city redefined its city status in 1972 and became a Federal Territory in 1974, and the area of the city underwent dramatic expansion to cover 243 sq. km (Omar & Leh, 2009), more than doubling in size in 4 years. The city's expansion led to environmental degradation and loss of green spaces, causing negative impact on its urban environment, and increasing flood events in the city (Webb, 1998). Despite this rapid urban growth, the Lake Gardens remained the only urban park in Kuala Lumpur and no longer had the capacity to fulfil the needs of the city's growing population (refer to figure 4.6). The negative effects of rapid urban development and growing population clearly accentuated the need for more quality urban green spaces in Kuala Lumpur.

In the 1970s, the Malaysian government reviewed their town planning legislation, and developed a new policy and strategy for developing and managing the urban landscape and open spaces (Tahir, 2005). The Town and Country Planning 1976 Act (Act 172), to replace the 1972 Act, introduced "a two-tier Development Plan System: a Structural Plan and Local Plan; a system of Development Control" (Omar & Leh, 2009, p. 31) incorporating proposals for the

environment and tree preservation as well as urban park development and upgrading of existing parks (The Commissioner of Law Revision, 1976). In response to this act, KLCH developed a new policy aimed to transform Kuala Lumpur into a beautiful and clean “Garden City” (Datuk Haji Nordin, 1997), which resulted in the development of new parks and improved strategy for managing the urban landscapes and open spaces in Kuala Lumpur; nevertheless, the focus remained on city greening programmes and urban beautification.

4.3.1 The Malaysia Government’s continuation of urban greening and beautification practices in managing Kuala Lumpur’s urban parks

The Malaysian government continued to adopt similar practices of urban greening and beautification while adding their own distinct ideas and initiatives to further develop urban park management in Kuala Lumpur. However, these developments were still heavily influenced by western thinking. The influence of these ideas on the current design and management of these tropical urban parks is discussed in the following sections.

The establishment of the Beautification Unit under the Urban Services Department, Kuala Lumpur City Hall (KLCH) in 1972 steered the government’s strategy towards resuming the colonial legacy of urban greening and beautification in Kuala Lumpur (Sreetheran et al, 2006). In 1973, this unit was upgraded into the Parks and Recreation Department (PRD), which started to develop a more effective tree planting programme. For example, the “No Road Without Trees” campaign significantly increased the urban greenery of the city, focusing on five strategic areas for tree planting, including roadsides and highways, public parks and open spaces (Webb, 1998).

The revised Town and Country Planning Act 1976 (Act 172) guided the PRD in fostering urban park development in Kuala Lumpur. Recognising the lack of green public spaces in the city, the PRD was inspired to transform abandoned mining lands in the city into public parks (Jamil, 2002). In 1979, the role of the PRD was expanded and it was renamed the Landscape and Urban Cleansing Control Department (KLCH) in order to expedite this effort. This resulted in development of 2 new urban parks, the Titiwangsa Lake Garden in 1980 and the Permaisuri Lake Garden in 1989, both of which were developed on former mining land. This initiative not only promoted regeneration of these abandoned lands into public green spaces but also increased their environmental value in providing ecosystem services for the city.

In the 1980s, there was further expansion of Kuala Lumpur’s urban park network. In 1982, the revised Federal Territory Planning Act 1973 stipulated rules and regulations for city greening programmes in the planning process for Kuala Lumpur. Section 13 (3) of this Act required the formulation of a structural plan supported by more detailed local action plans (Kuala Lumpur City Hall, 2004). In response to this Act, the first Kuala Lumpur Structural Plan (KLSP) was established in 1984, a 20 year city development plan with the aim of transforming Kuala Lumpur

into a “Garden City of Lights”, a rebranding of the city’s image to attract tourism through enhancement of the city’s landscapes (Webb, 1998), focusing on integration of urban parks and other green areas (Sreetheran & Adnan, 2007). The key driver behind these changes was the government’s aspiration to enhance the urban landscape in order to give the city a strong and unique self- identity.

The result of the KLSP 1984 was the transformation of the Lake Gardens through planting of more trees to provide shade, besides establishment of themed gardens and ornamental planting (Sreetheran et al., 2006). By 1988, a total of 231,000 trees had been planted in Kuala Lumpur’s urban parks and open spaces (Ayoub, 1989 as cited in Sreetheran et al, 2006 p. 30). Despite the increasing amount of vegetation, these spaces are still not fully integrated to form a green network for the city (Sreetheran & Adnan, 2007). Similarly, the approach to design and management of these landscapes remained unchanged until the end of the ’80s. This was due to a lack of landscape professionals within the urban park management with the ability to foster changes to the long-standing colonial practice in Kuala Lumpur. This reflected a legacy of colonial design and management that focused on horticulture and plant propagation, and an absence of skills and knowledge in urban landscape planning and design to motivate the park management to initiate its own approach to landscape design and management.

4.3.2 North American influence on urban park management

It was not until the late 1980s that the landscape architecture profession began to expand in Malaysia, which resulted in a change to Kuala Lumpur’s urban parks that was heavily influenced by the urban forest concept that originated in North America. This was an outcome of the National Economic Policy (NEP) policy, through the government’s major investment in tertiary education abroad that resulted in an increase in the number of local professionals including landscape architects trained in the USA and the UK (Jomo & Sundaram, 2004). These overseas trained landscape architects not only brought new ideas and approaches from developed countries into local practice, but also invited international consultants to contribute and collaborate in the development of the city.

An urban forest concept introduced by Justice (1986), a landscape architect and urban community forester from Canada, promoted a “more natural, lower maintenance, less tailored or cared for, self-sustaining vegetation and tree areas that are characteristic of the forest” (p. 178). KLCH was convinced that this concept was appropriate for ameliorating the rapid urbanization, by bringing the forest back into the city (Zakariya and Ainuddin, 1989, cited in Webb, 1998 p. 292), and would work well with the natural topographic character of Kuala Lumpur (Webb, 1998), besides providing strong naturalistic appearance throughout the city as suggested by Justice (1986). Furthermore, KLCH were keen to adopt an approach that would assist them in managing the spiralling costs of maintaining their public spaces. According to

Justice (1986), this concept was more cost efficient than the conventional landscape that required high maintenance in terms of watering, pruning, trimming, mowing and replacing annual plants.

4.3.3 Impact of inclusion of urban forest concept in the constant urban greening and beautification on Kuala Lumpur's urban park management

Inclusion of the urban forest concept into the landscape practice of Kuala Lumpur's urban park in the '80s added to the constant urban greening and beautification. This included the reforestation of certain parks by KLCH in bringing the forest into the city, which was done in collaboration with the Forestry Department (A. A. Hezri & Nordin Hasan, 2006). For example, the development of Kiara Valley Recreational Park was part of the conservation programme of the Kiara Hill Park (Webb, 1998). Other strategies developed to reinforce the delivery of the urban forest concept included the following:

a. Acquired technical support from the Forestry Department on urban forest management and tree inventories, in addition to their technical knowledge on local forest species appropriate for the urban environment.

b. Offered staff enrichment programmes, such as agricultural training at Agriculture Colleges in Malaysia and Indonesia; organising annual training on landscape and arboriculture; as well as short-term attachment to the Forest Research Institute of Malaysia. These training programmes helped equip the staff with appropriate skills for delivering horticultural and arboriculture practice into urban park management.

c. Developed and managed their own tree nursery for tree cultivation and propagation of potentially fast growing forest and ornamental species as an alternative to reliance on plant supplies from the local nursery for planting programmes and tree replacement.

Adoption of the urban forest concept as one of the main approaches for urban park management of Kuala Lumpur showed that KLCH was receptive to new trends and ideas from developed countries in developing more wooded landscapes. Knowledge development and training were provided to assist the park management to keep pace with new approaches to design and management of these landscapes. However, due to lack of confidence to make this change independently, KLCH had to rely on western expertise for consultation on planning and implementation.

There is evidently potential for introduction of a more naturalistic style planting into the existing conventional landscapes of Kuala Lumpur, including its urban parks. However, an unwillingness to take risks and explore beyond the existing management scope and limitations has slowed progress in implementing the new ideas and approach, whilst there have in addition been

negative responses to the new approach from senior management and the public. Nevertheless, the forest concept has brought changes to urban park management by encouraging multidisciplinary collaboration between government agencies and across levels of management, to share new knowledge and expertise in helping to improve the city environment of Kuala Lumpur. The growing numbers of overseas trained landscape architects in the Malaysia by the end of the '80s helped to steer the planning and development of Kuala Lumpur's urban parks following the government's commitment to a global sustainable agenda.

4.5 The development of Kuala Lumpur towards a new vision of sustainable development by 2020

Since the end of the 20th century, a sustainable concept introduced by the World Commission on Environment and Development (WCED) in *Our Common Future* (also known as the Bruntland Report), published in 1987 has driven a global trend towards sustainable development, which influenced the Malaysia Government to develop the Local Agenda 21 (LA21) in 1992: an action plan at local level "in line with Malaysia's commitment at the Earth Summit, Rio de Janeiro, Brazil, to preserve 50% of its total land area as forest or greenery" (Ministry of Housing and Local Government, 2013, p.1).

The government began to review the existing environmental policies that had been developed during the previous two decades of rapid urbanization and population growth since the 1970s. These policies included: 1) the Environmental Quality Act (1974) to regulate water pollution; 2) the National Forestry Act to conserve forest resources, especially in the city (1984); 3) the National Development Policy (1990-2000) to control development and safeguard the environment and ecology (A. A. Hezri & Nordin Hasan, 2006). As development of Kuala Lumpur reached its peak in the '90s, these acts and policies were no longer sufficient to protect the city from environmental degradation problems such as air and river pollution and loss of green spaces.

Lack of "green" policies in its city planning and development has led the Malaysian government to amend the existing acts and to introduce new policies for addressing these emerging challenges facing its cities. Thus, the existing Town and Country Planning Act (amendment) 1995 (Act A933) was gazetted to replace the previous act by giving more emphasis to environmental management in urban planning and development (Omar & Leh, 2009). However, due to poor enforcement at the implementation level, environmental problems continued to affect its hydrological cycle, which could no longer withstand extreme rainfall due to changing climate. Four major floods were reported during this period of rapid development, causing serious environmental and economic impact to Kuala Lumpur (Saw, 2009). In response to this situation, the Malaysian government initiated a more comprehensive plan for sustainable development in Malaysia, towards becoming a developed nation by the year 2020, for planning

and development of urban parks and open spaces in the city, as discussed in the following sections.

4.5.1 National agenda for sustainable landscape development

At a national level, the Malaysian government's commitment to achieving sustainable development was reflected in a strong vision presented by the former Prime Minister, Tun Dr. Mahathir Mohamed, in 1996, for making Malaysia a "Garden Nation" by 2005, which clearly emphasised the government's aspiration to maintain an ecological balance in parallel to economic and social development of the country (Ismail, 1997). This was followed by development of further government strategies to achieve the "Most Beautiful Garden Nation" vision as one of the goals in becoming a developed nation by the year 2020, initiated in 2006 (Tahir, 2005).

4.5.1.1 The government's interpretation of a "Garden Nation" and the "Most Beautiful Garden Nation" vision

The "Garden Nation" vision was inspired by the "Garden City" concept initiated by Ebenezer Howard at the end of the 19th century, which considered urban parks as part of the overall city planning both for beauty and functional purposes (Hinds, 1979; Ismail, 1997). Even so, in adaptation to the Malaysia context, the government has emphasised that this idea needs to blend with the country's own unique identity (Tahir, 2005). Karbodarahangi et al. (2012) suggest that this identity should strongly reflect the natural and climatic character of Malaysia; nevertheless, it is also important for the overall appearance to be made acceptable to the public through instilling local cultural and historical aspects into these landscapes. This is because people's attitudes and culture have a significant influence on each other, as suggested by Nassauer (1995); and each culture has different interpretations of nature and the environment (James et al., 2009).

Figure 4.7: An image reflecting the “Malay kampung” landscape style
Source: Chalet and Resort Pantai Cahaya Bulan, Kelantan (2012)

Therefore, in the search for its own identity for the “Garden Nation”, the Malaysian government referred to the concept of “kampung” (refer figure 4.7), the Malay rural settlement surrounded by natural tropical woodland, in which each house would have its own edible garden (Mustafa Kamal, 1997). This idea was then combined with the concepts of urban forest and “beautification”; because the idea of beautiful colonial landscape had been part of the local culture for over a century, thus an understanding of a “garden” as a beautiful landscape has been instilled in the Malaysian people. Considering all these aspects, it can be conceptualized that the government’s view of a “Garden Nation” should be reflected through the images of combining beautiful and functional gardens or parks surrounded by natural woodland. However, Mustafa Kamal (1997) argues that a drive towards achieving “naturalistic yet beautiful” landscapes may increase the management cost if the interpretation of “beauty” is opposed to “naturalness”, as this would impose high maintenance costs. Aware of this potential challenge, the government’s huge investment reflects their strong commitment to realising this vision, and beautification continues to be one of the components of the image of sustainability for the country. To incorporate both of these two different concepts into urban parks, beautification is more focused towards the entrance thresholds and central areas, whereas the semi-natural and natural woodlands are conserved at the periphery of the new and refurbished parks.

4.5.1.2 The establishment of the National Landscape Department in steering the vision towards “Garden Nation”

The government’s first step in realising this vision was to establish the National Landscape Department (NLD), in 1996. Being the main agency for monitoring landscape development in Malaysia, the NLD works closely with various ministries and local governments in the planning, implementation and management of urban parks (National Landscape Department, 2012). Since its establishment, various initiatives have been carried out by the NLD to improve urban

park development in the country. The roles of the National Landscape Department (NLD) include the following:

a. Development of landscape policy and guidelines

The department is responsible for development of policies and guidelines to assist local authorities and landscape practitioners in landscape design, management and maintenance of urban parks and other green spaces in the country. The first National Landscape Guideline was developed in 1995, and this was further upgraded in 2008. The National Landscape Guidelines have become the main reference for urban park development throughout the country, including Kuala Lumpur.

In 1996, NLD initiated the National Landscape Policy to monitor landscape development and conservation for Malaysia. However, due to the prolonged bureaucratic process through the departmental, ministry and cabinet levels, the revised policy was only gazetted in 2011, some 15 years after its original conception in 1996. The policy was to act as an operational guide for sustainable landscape development for the remaining 9 years towards becoming a developed nation by 2020. The policy defined "The Beautiful Garden Nation" as:

> *"…a country where its physical development is balanced with a well-managed green, beautiful and clean environment. It is also equipped with outdoor physical spaces that are unique, with special quality and identity. The society is also cultured and civilized and appreciates the balance between physical, social, economic and environmental development" (National Landscape Policy, 2011, p.4).*

This policy sets out the Malaysian government's vision to become the "Most Beautiful Garden Nation", with a very strong emphasis on appropriate landscape appearance in portraying the country's own unique identity. Considering the huge investment in management and maintenance to sustain these landscapes, it is arguable that this effort might not reflect an ecologically sustainable practice.

b. Supporting urban park development and upgrading

In accordance with the vision towards the beautiful garden nation, the role of the NLD is to coordinate the creation of new parks and upgrade old parks throughout Malaysia, besides providing financial support for the management and maintenance of these parks, which will be under the management of the local authority. For example, a project initiated in 2007 by the NLD, for Kuala Lumpur, was the Bukit Kiara Federal Park (466.86 acres), a large scale park for public recreation in the Klang Valley. This long-term project includes the upgrading of the Kiara Valley Recreational Park (refer to figure 4.8) and the conservation of the existing forest, which is being carried out in conjunction with the Ministry of Federal Territory and Urban Well-being (MFTUW) and KLCH (National Landscape Department, 2012).

Figure 4.8: The Kiara Valley Recreational Park with a view of the Bukit Kiara Federal Park in the background
Source: Roziya (2012)

These joint efforts enhance multidisciplinary collaboration between various institutional structures, especially when large scale projects are involved, suggesting that similar cooperation could potentially be followed through in other urban park development projects. However, considering the scale and status of these open spaces as federal parks, the NLD decided to take over the management and maintenance of the parks from KLCH, in spite of their shared responsibility. Again, this shows how the bureaucratic system has limited KLCH's power and authority to extend their management capability.

c. Organising Tree Planting Programmes

Apart from urban park management, the NLD is also responsible for carrying out continuous tree planting programmes in collaboration with local authorities and other agencies. The tree planting programme is part of KLCH's agenda for sustainable development by the year 2020 (Performance Management and Delivery Unit, 2012). Achieving annual tree planting targets has been the only positive indicator of the success of the government's vision of sustainability. For example, a total of 253,289 trees were planted in 1993, 10% of them in urban public parks (Hussin, 1993 as cited in Webb, 1998, p. 291). This number had increased by 1997, as KLCH allocated 20% of tree planting funding to urban parks as one of the strategies for enhancing the greenery and quality of the environment. The number continued to rise in 2006, as more than 400,000 trees were planted in Kuala Lumpur, with an increase of 20% in the number of trees planted in urban parks (Sreetheran, Philip, Adnan, & Siti Zakiah, 2006).

It can be concluded that urban park development in Malaysia has been influenced by the urban greening and beautification initiated by the British colonial government, which was enhanced by the American influence of the urban forest concept. In line with the sustainability concept introduced in the 1990s by the Malaysian Government through a vision towards a "Garden Nation" and "The Most Beautiful Garden Nation" by 2020, the National Landscape Department has been responsible for steering local authorities towards the government's vision, resulting in

integration of a sustainable approach into urban park management. Despite the delay in the establishment of the National Landscape Policy, NLD continues to guide and monitor the local agenda of local authorities and other relevant institutions towards sustainable urban park management, as demonstrated in the urban park development for the city of Putrajaya.

4.5.2 Impact of the sustainable development agenda on urban park management in Malaysia

Malaysia reached the "Garden Nation" milestone in 2005. The Malaysian government's strategies and initiatives in The 7th Malaysia Plan (1995-2000) and the 8th Malaysia Plan (2000-2005) successfully achieved this vision by increasing the city's greenery through development of new parks and upgrading the existing parks in the country. The urban park development in Putrajaya is an exemplar of the government's vision of a "Garden Nation", and has become a reference for similar developments across the country. The adoption of new sustainable goals and objectives for urban park development in Putrajaya perhaps signals a national appetite to be more adventurous and forward looking. Thus, reviewing urban park development in Putrajaya is significantly important for this research as it provides a local resource and research based evidence that might help inform future urban park development in the country.

4.5.2.1 Delivering a sustainable approach to development of the new city of Putrajaya through a "garden city" concept

The city of Putrajaya is a model for sustainable development in Malaysia. This new city came about as a result of the Malaysian government's policy to develop a new satellite city on the outskirts of Kuala Lumpur, as a new government administrative centre, whilst also alleviating the pressure on housing in KLC and improving green infrastructure objectives by developing a new model for sustainable cities. The planning for this new city is guided by a structural plan with a comprehensive environmental framework suggesting all development should be in harmony with nature (Perbadanan Putrajaya, 1997). A "Garden City" concept is adopted for the city planning through a basic idea of creating a quality urban environment in the city, characterised by Jebasingam et al. (2006) as follows:

> *"One of the requisites for a quality urban living environment is to create a city in harmony with nature, i.e. a city which contains natural elements within its urban fabric and one which imposes minimum stress onto the ecosystems. This will not only ensure the long-term sustainable development of the city, but it brings opportunities for recreation and the idea of being close to nature" (p.8).*

The Putrajaya Masterplan was approved in 1995 and included urban design guidelines (refer to figure 4.9), policy documents, and local plans to meet the statutory requirements of the structural plan (Jebasingam et al., 2006). Besides benefiting from comprehensive planning policies and guidelines, having this newly planned city on a green field site has provided more

opportunities and advantages for the Putrajaya Corporation (PJC), as the local authority, to incorporate sustainable aspects into urban park development.

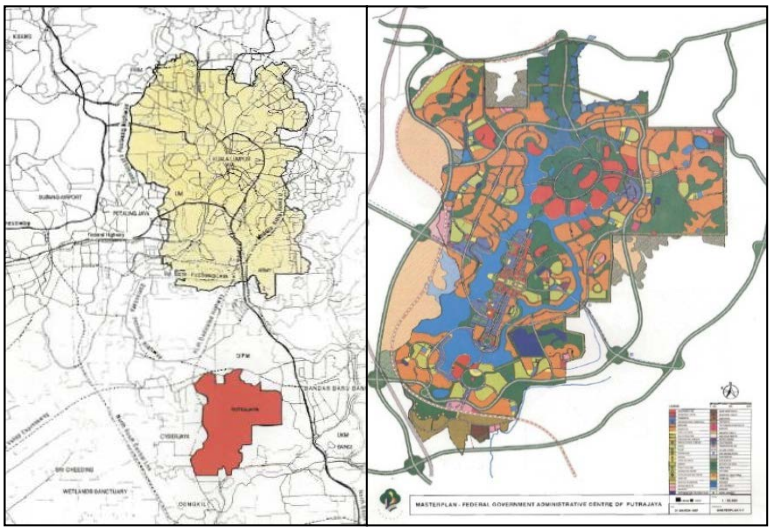


Figure 4.9: The location and Masterplan of Putrajaya
Source: Perbadanan Putrajaya (1997)

The development of this new city began in 1995 on former agricultural land, mostly oil palm and rubber plantations, located 25km to the south of Kuala Lumpur. By 2010, as a result of its sustainability policy, nearly 40% of the completed 49 km2 city was covered with an integrated green and blue network to support the total population of 72,413 residents (Department of Statistics Malaysia, 2011).

a. The "Garden City" concept: Adaptation of urban park management in Putrajaya

The "Garden City" concept reflects an extended role of urban parks in supporting sustainable development by offering opportunities for outdoor nature and greenery experiences for park users, besides other environmental services, such as stormwater control and wildlife habitat, in an aesthetically pleasing environment (Ho, Matsuoka, & Hashim, 2012; Suhaimi, Rasyikah, & Roslan, 2010). This multifunctional design has increased the proportion of green spaces as a major component of the city, with approximately 1,933 ha (39.2%) of Putrajaya city (4931 ha) allocated for an integrated park system consisting of large metropolitan parks, urban parks and city parks, promenade, buffer areas, wetlands and water bodies. parks and open spaces to serve a population of 49,452 in 2007 (Ho et al., 2012).

Within this system, 600 ha is allocated to the lake (400 ha) and the wetlands (200ha) for stormwater control and water storage (Suhaimi et al., 2010) forming the Putrajaya Lake Catchment, covering approximately 34.5% of the total open space area in the city (Normaliza, Mohammad Feizal, & Akashah, 2008). The Wetland Park, Putrajaya is an

integral component of a large ecological water treatment plant (refer to figure 4.10) intended to improve the water quality to an acceptable standard (above the Class IIB Interim Water Quality Standard by the Department of Environment) for recreational and outdoor use (Normaliza et al., 2008).

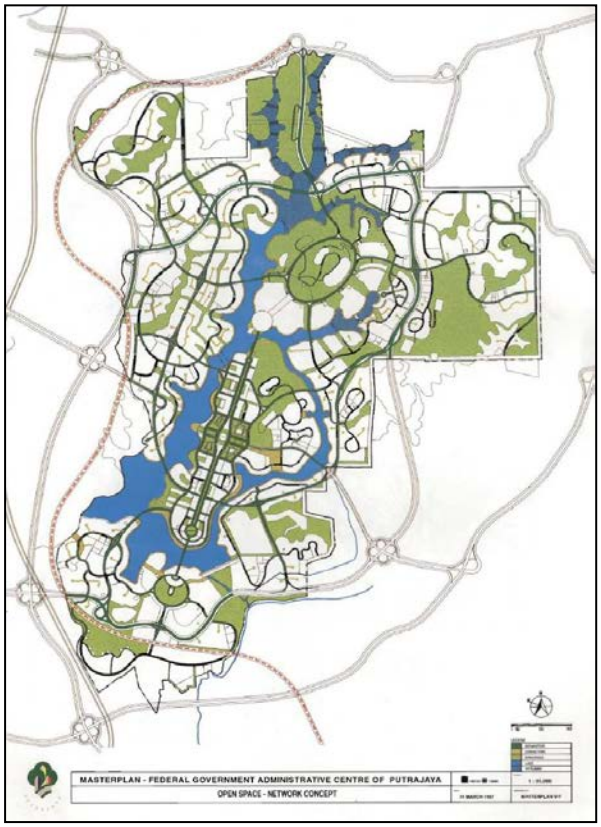


Figure 4.10: The integrated open space network in Putrajaya
Source: Perbadanan Putrajaya (1997)

Besides its technical function, this integrated system creates habitat diversity for wildlife enhancement, further contributing to the multifunctional roles of urban parks in Putrajaya, especially towards creating a more ecologically sustainable environment.

b. The vision of "Green City" for Putrajaya by 2025

The vision of "Green City" by 2025 was announced by the Prime Minister of Malaysia in 2010 for future planning of Putrajaya (PGC2025) prior to the country's commitment to reduce 40% of carbon emissions by 2020 (Ho et al., 2012). This vision would further enhance the "Garden City" concept by focusing on urban reforestation, a similar approach to the urban forest concept as applied by KLCH for Kuala Lumpur but not excluding the beautification element. The urban reforestation was intended to fulfil three targets towards achieving ecological sustainability: reduction in carbon footprint; amelioration of microclimate; and instilling a reuse and recycle culture among the Putrajaya residents, "apart from being aesthetically pleasing" (Ho et al. 2012, p.20).

Numerous strategies for urban green improvement and maintenance were developed as part of the twelve action plans to meet the targets of urban reforestation, which enhance the role of urban parks and open spaces as a green lung of the city, as documented in the Putrajaya Green City 2025 Baseline and Preliminary Study report (Ho et al., 2012, p.20). Among these strategies are:

- Organising more planting programmes and increasing planting targets to expedite urban reforestation in the city.
- Combination of natural conservation through self-regeneration and planting additional buffer vegetation using native species.
- Integration of SuDS as part of a rain water harvesting system for maintenance and outdoor use.
- Development of a comprehensive urban forest management plan for urban reforestation
- Creation of a wildlife corridor through an integrated green network

To steer the implementation of these strategies, in 2014, the Putrajaya Corporation made structural changes to the Landscape and Parks Department by forming an Urban Forest Division to replace the Landscape Planning and Control Division and the City Beautification Division to replace the Management and Maintenance Division (Putrajaya Corporation, 2014).

This “Green City” project reflected the PJC’s commitment to adopt a more sustainable approach in managing the city and to achieve sustainable development by 2025. Putrajaya “Green City” vision adopted a similar approach to that of urban forest and beautification in managing its integrated urban parks and open spaces. Nevertheless, the application of these strategies in the newly sustainable planned city of Putrajaya would be less constrained when comparing them to retrofitting the long-established city of Kuala Lumpur, which has already been subject to continuous social and environmental challenges. The following section will review the policies and strategies adopted by KLCH and the challenges they have faced in implementing the government’s vision towards sustainability.

4.5.2.2 Retrofitting a sustainable approach to the urban landscapes of Kuala Lumpur including urban park

Unlike the new development of Putrajaya, Kuala Lumpur has been facing rapid urban growth for more than four decades. The lack of green spaces and their integration clearly highlight the failure of the Kuala Lumpur Structural Plan (KLSP 1984) to provide environmental policies to regulate and monitor the city’s planning and development in adapting to the changing city (Datuk Haji Nordin, 1997; Sreetheran & Adnan, 2007). Furthermore, the landscape policies in

the KLSP 1984 have not been fully implemented due to “lack of follow-up instruments such as Local Plans as well as urban design plans and development guidelines” (Sreetheran & Adnan, 2007). To address this situation, KLCH reviewed and amended the relevant acts and policies of KLSP 1984, later renamed as Kuala Lumpur Structure Plan 2020 (KLSP 2020), which was followed by the formation of the draft KL City Plan 2020 in order to address the emerging issues and challenges facing the city, discussed as follows:

a. Kuala Lumpur Structure Plan (KLSP 2020) aimed at transforming Kuala Lumpur into a “Tropical Garden City” by 2020

In line with national landscape aspirations, the Kuala Lumpur Structure Plan 2020 (KLSP 2020) acts as a blueprint to guide the development of Kuala Lumpur’s aim of transforming Kuala Lumpur into a “Tropical Garden City”, which is defined as:

> *“a Tropical Garden City sensitive to its natural site and appropriate to its tropical regional location; creating an environment which is rich in its diversity of both built and natural forms and spaces and in the range of inspirational, visual and sensual experiences; and create a city which conserves the best of its architectural and cultural heritage and which offers a rich blend of both the modern and traditional” (Kuala Lumpur City Hall, 2004, p. 14).*

Approved in 2004, this new structural plan addresses the weaknesses of KLSP 1984 by incorporating a sustainable agenda for the future development of Kuala Lumpur towards becoming a “world-class city” by 2020 through a more holistic approach of improving the quality and quantity of green spaces in the city (Kuala Lumpur City Hall, 2008). Urban greening and beautification remain its main objectives by promoting continuous landscaping and beautification programmes, with more tree planting programmes to enhance roadside landscape, and including private and vacant land.

New strategies were also introduced to integrate the city’s natural environment and green spaces with the waterways to form a green and blue network, with eventual reactivation of these spaces to optimise their amenities’ value (Kuala Lumpur City Hall, 2004). Delivery of these strategies is to be supported by Kuala Lumpur City Plan 2020 (KL City Plan 2020).

b. Kuala Lumpur City Plan (KL City Plan 2020): Action plans to support KLSP 2020

Section 13 (3) of The Federal Territory (Planning) Act 1982 (Act 267) stipulated that a local plan with more detailed action plans should be developed to support the structural plan (Kuala Lumpur City Hall, 2004). Therefore, a local plan known as the KL City Plan 2020 was initiated in 2005 with the aim of enhancing sustainability in managing Kuala Lumpur while achieving the following vision:

"Kuala Lumpur's vision is of a network of high quality, accessible parks and green spaces which promote recreation, health, education and economic generation, helping Kuala Lumpur to become a significantly more attractive city in which to live and work" (KL City Plan, 2012, p.8)

The Draft KL City Plan 2020 corresponds to the KLSP 2020 policies by placing emphasis on creating beautiful and integrated green networks in provision of a high quality living and working environment for Kuala Lumpur. To deliver these policies, the Draft KL City Plan 2020 proposed a new approach and guidelines to support the city's greening efforts and is discussed in the following sections.

- ***To establish a new hierarchy of parks and to develop more urban parks in the city***

The Draft KL City Plan 2020 has developed a new hierarchy of urban parks based on the Planning Standard Guidelines for Open Spaces and Recreation (GP005-A) 2013, established by the Town and Country Planning Department, Malaysia, with the aim of increasing provision of open spaces in the city by 2020. Table 4.1 shows the proposed strategy of the Draft KL City Plan 2020 to increase open space provision by 2020 to meet the needs of a projected population of 2,198,400.

Table 4.1: The new hierarchy of parks and open spaces in Kuala Lumpur, 2020
Source: Adapted from the Draft KL City Plan 2012 (AJM Planning and Urban Design Group Sdn. Bhd., 2012)

Hierarchy	Existing size in 2008 (ha)	(%)	Target size in 2020 (ha)	(%)
Population	1,629,400		2,198,400	
Public parks and open spaces				
City Park	397	23	436.43	19
District Park	380	22	390.49	17
Neighbourhood Park	74	4	206.73	9
Local Park	50	3	91.88	4
Local Play Area	273	15	436.43	19
Sports Complex	123	7	114.85	5
Landscape Areas	464	26	357	27
Sub-total	1761	100	2297	89
Private Open Spaces			263.19	**11**
Total Parks and Open Spaces	1761	100	2297	100
% public spaces in KL		**7**		**9**
Ratio of public parks and open spaces to population (sq.m/person)		**11**		**10**

The local plan targets 9% of the total area as public open spaces in Kuala Lumpur, compared to 7% in 2008, with a ratio of open space of 10 square metres per person in 2020, which exceeds the minimum requirement of 9 square metres of green open space per person set by WHO (Kuchelmeister, 1998). However, comparing this 7% allocation of parks and open spaces for Kuala Lumpur's population of 1,629,400 with the 39.2% green

space allocation for Putrajaya's population of 49,452, it can be inferred that the amount of green space in Kuala Lumpur will still be very low.

To address this issue, KLCH aims to achieve the WHO standard of a healthy target of 16 square metres open space per person by providing an additional 11% of green space from private lands (refer to figure 4.11) through private developments such as golf courses, urban plazas and pocket parks, which will be classified as part of the city's open spaces, in addition to the designated public open spaces (Kuala Lumpur City Hall, 2008).

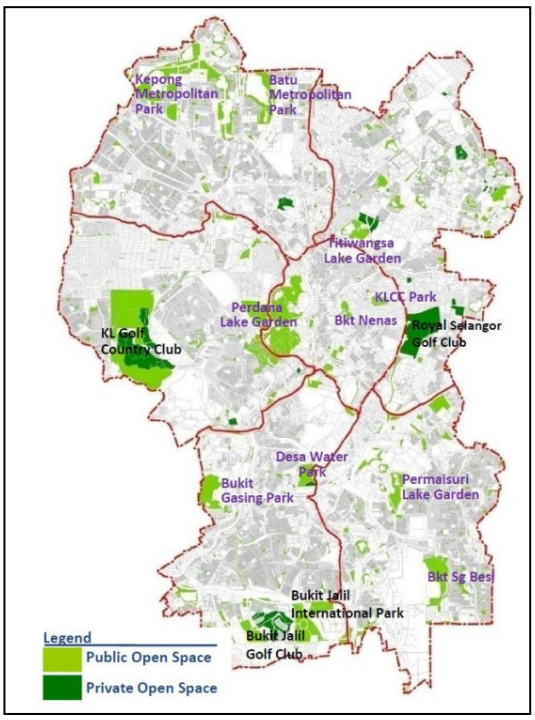


Figure 4.11: Urban park and open space distribution in Kuala Lumpur in 2020
Source: AJM planning and urban design Group Sdn Bhd (2012)

Besides the redevelopment and regeneration of government and private land (188 ha), KLCH also proposes to create river reserves 7m wide along river corridors (120 ha); and another 10% green space requirement from planning approval (616 ha), with a total of 3,578 ha of open spaces in order to achieve this target (AJM Planning and Urban Design Group Sdn. Bhd., 2012). These landscapes will be integrated with other green spaces and waterways to form a green city network.

As a result of this strategy, more public parks were developed with the intention that some would serve as drainage retention, including the Youth Park, Bukit Gasing District Park and Alam Damai District Park; whereas, the Kuala Lumpur Botanical Garden is to be upgraded to offer more recreational facilities to the public (AJM Planning and Urban Design Group Sdn. Bhd., 2012). This clearly shows that besides developing more parks, that KLCH has started to prioritise the multifunctional role of these spaces. The Economic Transformation Programme's (ETP) initial study in 2010 reported that the amount of

green space in Kuala Lumpur had increased to 12 sq. metres per person (Performance Management and Delivery Unit (PEMANDU), 2010). Although this amount is still below the WHO minimum standard of open spaces to achieve healthy provision, it shows a positive outcome of KLCH's greening effort.

- ***To integrate urban parks with other green spaces and river corridor in the city***

To improve the quality of urban parks in Kuala Lumpur, the KL City Plan 2020 proposes to integrate these spaces with other green corridors, such as road and river reserves, through the "Kuala Lumpur One Park System", aiming to increase the biodiversity of the city besides providing recreational spaces for the public (AJM Planning and Urban Design Group Sdn. Bhd., 2012). Besides a continuous planting programme along major roads, an action plan to rehabilitate the city waterways is proposed through a River of Life Programme as a measure to mitigate floods and improve river water quality from class III (hazardous to body contact) to Class IIB (safe for recreational use) (Physical Planning Department, 2012).

The River of Life Programme is one of the nine Entry Point Projects of the National Key Economic Areas (NKEA) in the 10th Malaysia Plan (2011-2015), a five year national development plan with the aim to "transform the Klang River into vibrant and liveable waterfront with high economic value" (Performance Management and Delivery Unit, 2012, p. 29). At the same time, the environmental and recreational value of the site will be increased through this network (Physical Planning Department, 2012). This programme demonstrates KLCH's attempts to adopt a new approach to implementing integrated design and planning projects in collaboration with other related agencies in a river regeneration programme including river cleaning, beautification, and development.

As part of the river cleaning programme, a drainage master plan for Kuala Lumpur is proposed to upgrade the existing drainage into a more sustainable system. Led by the Department of Irrigation and Drainage Malaysia (DID), this project involves 110km of river across two municipal areas, namely Selayang Municipal Council (MPS) and Ampang Jaya Municipal Council (PMAJ). Meanwhile, through the Physical Planning Department and the Economic and Planning and Development Coordination Department, KLCH is responsible for leading the River Beautification and River Development project, aiming to integrate a 10.7 km river corridor with urban parks and other open spaces in a network throughout Kuala Lumpur. This strategy would expand the role of urban parks as green infrastructure of the city. A 7m dedicated reserve along 10.7 km of river, consisting of a 3m transition zone to serve as public space, and a 4m public easement zone as a dedicated pedestrian/cycle route (Physical Planning Department, 2012) would increase

the size of the green corridor that would be linked to urban parks and other open spaces in the city.

c. Greening Greater Kuala Lumpur/ Klang Valley by 2020

Apart from individual action plans to increase the amount of green spaces in Kuala Lumpur, Greater Kuala Lumpur/ Klang Valley (Greater KL/Klang Valley) is an example of KLCH's collaborative effort with the Ministry of Federal Territories and 9 other local authorities within the Klang Valley, including the Putrajaya Corporation (PJC), to deliver more comprehensive plans for greening of Greater KL/ Klang Valley throughout the 279,327ha area of the municipalities. Aiming to achieve a liveable city with high-income status by 2020, they believe provision of more green spaces is necessary for ensuring a high quality living environment as a potential attraction for foreign investment to the country (PEMANDU, 2010). Thus, Greening Greater KL/Klang Valley outlined several strategies for "making the Greater KL/Klang Valley a cleaner, more efficient and vibrant place to live, work and play" (PEMANDU, 2014, p. 23), including the following:

- To "adopt a green-focused development policy" through allocation of 30% of the development of government and private land for green spaces
- To adopt green and innovative landscape design and technology that would identify another 20% of potential green surface in the form of vertical landscapes on buildings (i.e. green walls, rooftop gardens, etc.)
- To add an annual allocation of 30,000 plants for tree planting programmes in the city
- To provide integrated green paths along the road and river corridors for easy access by the public.

The impact of these policies is reflected through collaborative efforts between KLCH and other government's institutions through the Greater KL/KV programme, which have provided the following management benefits:

- Introducing a more holistic approach for addressing issues and challenges in delivering the Greening Greater KL/KV to meet the "Liveable City" status by 2020.
- Acquiring new expertise to support KLCH's local agenda
- Opening up new ideas on green design and technologies to expedite the integrated green strategies
- Providing numerous sources of financial support for implementing the comprehensive green and blue corridor network plan, For example, KLCH received RM149 Million for the Greening Greater KL/KV project, and RM17.9 billion for the River of Life project (Performance Management and Delivery Unit (PEMANDU), 2010) besides allocation of RM 2.2 billion for the river beautification project (Azhar, 2011).

In addition, the progress of the Greening Greater KL/ Klang Valley was measured through a continuous increase in the number of trees planted in the city (PEMANDU, 2014). Meanwhile, the River of Life project, as the first phase of river beautification, was planned to commence in 2014 and targeted for completion in 2017. Despite various strategies outlined for Greening the Greater KL/ Klang Valley and the River of Life programme, tree planting progress has been the only indicator for the performance of KLCH's green strategies, whilst there have been challenges to the delivery of other strategies, which will be discussed in the following section.

It can be summarised that in parallel with the Malaysian government's vision to become the "Most Beautiful Garden Nation" and the National Landscape Policy (2011), the KLCH has further translated this vision in the KLSP 2020 and the Draft KL City Plan 2020. Unlike the previous strategies in the KLCH 1984, which placed the main emphasis on developing more parks and carrying out more planting programmes; KLCH's later policies started to focus on environmental sustainability towards becoming a "Tropical Garden City", while maintaining the urban forest and beautification approach. The new comprehensive planning strategies outlined in KLSP 2020 hope to increase the coverage of green open spaces and to enhance integration with the blue corridor network in Kuala Lumpur by 2020 for multifunctional use for water management, wildlife corridors and as a public amenity. The following section will discuss how these changing policies have influenced the current state of landscape design and management of Kuala Lumpur's urban parks towards meeting these sustainability objectives.

4.6 Current state of landscape design and management practice at Kuala Lumpur's urban parks

Interviews were carried out in July and August 2013 with stakeholders of different levels of urban park management from the selected case studies (*PBG*, *TLG*, *ALG*, *PLG* and *KVP as described in Chapter 3 sections*) within Kuala Lumpur City Hall (KLCH) and the National Landscape Department (NLD) in order to gain an in-depth understanding of current landscape practice in Kuala Lumpur's urban parks, as influenced by changing government policies from the colonial period until today. The respondents were coded as LD, NLD, PBG, TLG, ALG, PLG and KVP to maintain their anonymity. These findings help to explain how these changes have shaped the current landscape of Kuala Lumpur's urban parks.

4.6.1 Current policies and strategies for urban park design and management reflecting the government's commitment to sustainable landscape development in Kuala Lumpur

The interview findings demonstrate strong support for the government's policies and strategies regarding sustainable landscape development for Kuala Lumpur, including its urban parks. They highlighted some of the government's efforts in delivering sustainable practice. One of the key objectives of NDL and KLCH in greening the city of Kuala Lumpur was to achieve annual greening targets through the Greener KL project, engaging private companies to volunteer in tree planting efforts through corporate social responsibility (CSR). LD1 implies this initiative is a reflection of a growing awareness at ministry and state level of the need for more green space provision in the city.

In 2011, NLD carried out a landscape project focusing on development of local and neighbourhood parks in high density population areas, as part of the Ministry of Urban Wellbeing, Housing and Local Government's strategies implemented under the 10th Malaysia Plan. In line with the government policy on National Key Results Areas, this project aims to improve the well-being and living standards of low-income people in Kuala Lumpur. According to NLD1:

> *"This project, called beautiful city, is particularly aimed at high density population areas which have high rates of crime and vandalism. More parks and recreational spaces will be developed within these spaces through a people centric concept to create interactive communities. Meaning that there will be a central attraction for community activities that will promote healthy lifestyles."* (NLD1)

NLD1 believes that this project will increase the quality of the living environment within low income residential areas by promoting healthy lifestyles through provision of recreational spaces and activities, which eventually will reduce crime and vandalism in public places.

The River of Life project is a KLCH initiative to enhance the role of urban parks as part of the green infrastructure in the city of Kuala Lumpur. As reported by LD2:

> *"The Titiwangsa Lake garden is part of the River of Life project, and also the flood mitigation project by the department of Irrigation and Drainage of the federal territory of Kuala Lumpur for mitigating flooding at Tun Razak Road. The aim is to divert the excess water from the Gombak River into the small lake of TLG [that will serve as a retention pond] for water filtration and release back into the river."* (LD2)

These new initiatives clearly show how the government is moving towards sustainable practice, incorporating urban parks with river rehabilitation efforts, in order that integration of these green and blue linkages will help achieve the aim of the KL City Plan 2020 to increase the amount of green space in Kuala Lumpur.

4.6.2 Delivery of sustainable landscape policies and strategies for Kuala Lumpur's urban parks enhances multidisciplinary collaboration as well as financial provision

The Malaysian government has a strong ambition to transform Kuala Lumpur into a liveable tropical garden city by 2020 through various urban landscape developments and greening programmes that involve significant investment. Focusing on landscape beautification as the main objective, LD1 states that KLCH has spent millions of Malaysian ringgit on landscape maintenance contracts to ensure the landscape of urban parks is properly maintained through conventional horticulture practice.

Despite the Malaysian Government's investment, LD1 admits that KLCH has faced some challenges in the implementation stage, suggesting:

> *"The government have provided too much investment [on landscape projects] that we [KLCH] could not always implement …It means that our government has high environmental awareness… We have the mechanisms, but there is still room for improvement to make it successful. Our landscape architect has prepared the design and we target to achieve the full canopy in 3 years. While some of the trees are successfully established, some of them have died during this period, which means zero performance for us."*

Acknowledging its limitations, KLCH has collaborated with other public and private agencies, seeking their expertise to improve the delivery of landscape design and management practice. For example, to improve urban tree management, LD3 states that:

> *"We [KLCH] have signed a Memorandum of Understanding with FRIM [Forest Research Institute Malaysia] and the Forestry Department Peninsular Malaysia to advise us on the best condition, size etc. for tree planting [urban tree management]".* (LD3)

Involvement with other stakeholders has also provided opportunity to draw in financial resources from different agencies as well as contributions from private agencies, especially developers, to support delivery of landscape projects and greening programmes in Kuala Lumpur, including urban parks.

4.6.3 Current urban park management of Kuala Lumpur and its more complex structure

Being responsible for the landscape management and maintenance for the City of Kuala Lumpur, KLCH aims for beautiful urban landscapes that are safe for the public. To achieve this goal, the Horticulture Division was established to oversee maintenance of urban parks and other green spaces in Kuala Lumpur. This division is responsible for supervising urban park management in different aspects of landscape maintenance, specifically in soft-scape, which is divided into three units that comprise the Nursery Development Unit, Tree Maintenance Unit, and Urban landscape Unit. Current urban park management in Kuala Lumpur is organised under the Urban Landscape Unit, together with the maintenance of road side landscapes.

At the city level, LD5 informs that the landscape management is divided into three zones, namely the northern, central and southern zones. All parks located within the same zone will be assigned to one management team, except for *PBG,* taking account of its new status as a botanic garden. Similarly, at the park level, maintenance is divided into several zones, assigned to different groups depending on the role and scale of the park, as well as the intensity of maintenance. For example, due to its current status as a botanic garden, the *PBG* has expanded the number of park management staff to 110, including maintenance labour:

> *"Previously, we had 20 staff to maintain the park. After the transformation into Perdana Botanical Garden, we increased to 110 staff. Previously, we only had 1 horticulture assistant, but now we have 5 of them [each responsible for 5 areas of supervision]".* (PBG1)

PBG has the largest workforce for its 5 maintenance zones, with 14-18 labourers, each supervised by a horticulture assistant. Due to its new role, it is the only park in Kuala Lumpur under the leadership of a landscape architect, assisted by two assistant horticulture officers. At other parks managed by KLCH, there are generally 4-5 labourers for each maintenance zone, as is the case at *TLG* and *PLG.* Despite its smaller scale, *ALG* requires a similar amount of labour to *TLG* and *PLG,* to meet the high expectations of the upper-middle class neighbourhood. Unlike KLCH, NLD assigned a minimum workforce of 2-3 labourers to cover the 5 maintenance zones of *KVP*. While responding to public complaints is a top priority for all the case study parks, there is a lot more pressure on the park management of *ALG* and *KVP* to meet the expectations of their demanding neighbourhoods, as was clearly expressed during the interviews. In KVP for example, NLD1 reports that:

> *"We want to have this type of landscape [ecological landscape], but it is difficult to achieve because there is a challenge from the residents and financial constraint."* (*NLD1)*

Similarly, KVP5 reports that the local community group called "Friends of Bukit Kiara" is very vocal in criticising the park management's decisions for *KVP's* landscape development, which NLD1 referred to as difficult to deal with.

4.6.4 Emphasis of landscape design of urban parks on beautification - defined as landscape that is manicured, clean, tidy, and safe for the public

The research findings confirm that current design and management practice in Kuala Lumpur's urban parks corresponds to the vision for Malaysia to become the "Most Beautiful Garden Nation by 2020", with beautification as the main objective. This vision is interpreted by stakeholders as maintaining manicured landscapes, park cleanliness, and tidiness, to satisfy public preference and safety requirements:

> *"Our maintenance strategy is focusing on beautification. Besides that, we carry out regular upkeep of the vegetation so it gives a good impression to the public".* (PLG3)

> *"Generally, all parks under the KLCH are required to be clean, beautiful, tidy and safe for the public".* (TLG2)

These maintenance requirements are consistent with the objectives of the Landscape Management Division, NLD: "to create a clean, comfortable and safe living environment" (National Landscape Department, 2012, para.1), and the goal of the Landscape and Recreation Department, KLCH:

> *"To develop a beautiful, neat, clean and well-designed city landscape that provides satisfaction to city dwellers and tourists alike." (Landscape and Recreation Department, para. 4)*

Although all the parks place design emphasis on manicured landscapes, some areas of these parks are conserved as semi-natural woodland, mostly located along the peripheral or inner part of the park, which serves as habitat for birds and other wildlife *(PBG, PLG and KVP)*, and also incorporates pathways for walking and jogging. These designed and natural spaces are separated in order to give the public a choice of using either of these two distinct spaces according to their preference. The semi-woodland areas are regularly maintained in order to give the public some safety assurance from harmful wildlife, particularly snakes (PBG1, PLG3, KVP3, TLG2), and also snatch theft, a common crime in Kuala Lumpur (PBG1, PLG3, TLG1, ALG1). Fulfilling these requirements is an important precondition for increasing numbers of visitors to *PBG* and *TLG*, especially tourists, as these parks are located in the centre of Kuala Lumpur.

4.6.5 Maintenance regime for urban parks applying intensive horticultural practice

Currently, Kuala Lumpur's urban parks are applying an intensive maintenance regime through conventional horticultural practice, which consumes a significant amount of resources and labour. As the evolution of urban parks in Kuala Lumpur demonstrates, the park management has always been receptive towards new approaches to landscape design and management, very often merging them with existing approaches. For instance, the current drive towards a "beautiful garden nation" has incorporated a greater emphasis on sustainable landscape practice. This approach, however, must be incorporated into the existing landscape identity, which was inherited from the colonial landscape design and has resulted in continuation of intensive landscape maintenance in Kuala Lumpur's urban parks.

For instance, since it was first developed in 1888, the *PBG* has undergone two major transformations: from the initial concept of "picturesque style landscape" to the initiation of themed gardens in 1975, and then, in 2010, to comply with the latest government aspirations, conversion from a leisure park to a botanical garden. This most recent transformation includes the upgrading of the Anniversary Theatre, addition of a new elevated carpark and a Garden Canopy structure to enhance the new image of the park, and, most importantly, a new commitment to managing the botanical collections, which has increased the scope and intensity of landscape maintenance for the park, as suggested by the park manager:

> *"The maintenance technique is more detailed for this park. We must ensure the species selected have the necessary botanical features. They need to be healthy and require regular fertilizing and watering. This is because the Perdana Botanical Garden is more educational; people come to see our botanical collection. Besides that we need to enhance the visual quality of this garden as this is*

the only park located in central Kuala Lumpur. Everything must be in tip top [best] condition". (PBG1)

In addition to *PBG*, *ALG* was upgraded in 2009 in liaison with the flood mitigation projects for Kuala Lumpur. Although the landscapes of *TLK, PLG and KVP* have remained very much the same since they were first developed, the maintenance of these parks will become more demanding as, according to the park managers, there are redevelopment proposals afoot for each of these parks.

In order to meet the management's 'beautification' objectives and the associated intensive maintenance requirements, the maintenance being practised in Kuala Lumpur's urban parks follows standard specifications and work schedules developed by the park management. KLCH has long had such maintenance specifications in place and they have become a reference for other local authorities, including the NLD when they took over the *KVP* management in 2010. Although the specifications include fixed maintenance scope and requirements, they still allow the park management some flexibility in performing their daily operations, in terms of work urgency.

Figure 4.12: Photo showing intensive soft-scape maintenance carried out by CHKL labourers: cultivating the soil around the botanical collection (left) and collecting and removing grass clippings (right).
Resource: Roziya Ibrahim (2013)

The case study sites apply similar maintenance regimes, which can be divided into two scopes: park cleaning and soft-scape maintenance (refer to figure 4.12). Park cleaning includes sweeping up fallen leaves, collecting rubbish and washing pathways. PLG1 stated that landscape and domestic wastes are collected and sent to the designated dumping site in Kuala Lumpur, which requires high logistic movement that consumes a lot of energy and cost. However, the management have introduced initiatives towards sustainable practice, such as the *PLG* and *TLG* management's pilot project for recycling dry leaves for making compost. In some parks *(TLG, ALG),* clearing rubbish and algae off the lake is done on a daily basis to maintain the clarity of the water and minimise unpleasant smells emanating from stagnant water. These parks include large areas of lawn, which are mown twice per month and include the collecting and removal of grass clippings. In *KVP,* drain cleaning is also done when necessary.

Besides maintaining the cleanliness of the park, soft-scape maintenance that includes watering, weeding and cultivating the soils is carried out regularly. However, tree pruning and shrub

trimming are performed only when needed. Fertilizers and pesticides are applied as per specified method and schedule, which differ between parks. In *PLG* and *KVP,* for example, these works are only conducted when required because in comparison to the established semi-woodland, the amount of manicured landscapes in these parks is minimal.

Interview data also reveal that besides performing their routine tasks, labourers are required to back up maintenance of other zones in order to meet the targeted schedule. Occasionally, they are also assigned ad-hoc tasks such as planting annual plants for preparation of public events, at which the mayor or ministers may officiate. Apart from the maintenance work, the park management are also responsible for the safety of the public while utilising the park and for promptly responding to any complaints.

4.6.6. Landscape maintenance sub-contracted as a package to conserve the local authority's limited physical resources

As a result of an increase in green space provision, more resources are required to maintain these landscapes. Although KLCH has its own nurseries for plant propagation and storage, mainly shrubs and groundcover, LD5 states that this could only provide 40% of the plant materials needed for their urban parks; thus, they still have to rely on private nurseries, mostly for supplying tree species. With regard to maintenance, LD2 claims that:

> *"The landscape areas [in Kuala Lumpur] are increasing, but the workforce has not changed. In one aspect it is good to maintain the same input and budget in providing more output. But now, with more landscape areas and parks we need more input to manage them…because we want to achieve a high quality standard for this landscape." (LD2)*

Expressing a similar opinion, LD4 informs that KLCH is lacking workforce to manage the increasing amount of urban park and open space in Kuala Lumpur, resulting in some maintenance works being sub contracted to landscape contractors. According to LD5, KLCH have to outsource about 60-70% of their landscape maintenance to sub-contractors to cope with the increasing amount of urban park, with these maintenance contracts requiring additional financial allocation.

To cope with such demanding work, the KLCH have split landscape maintenance into two separate packages: cleaning work and soft-scape maintenance. As mentioned by the case study interviewees from KLCH, cleaning work is tendered to landscape contractors based on a 2 year contract, while soft-scape maintenance is carried out by the Department of Landscape and Recreation's park management team. Despite having a similar scope of maintenance*,* however, the whole maintenance package for *KVP* is sub-contracted to a contractor; while the park management of NDL are responsible for maintenance supervision and responding to public complaints. According to the stakeholders, landscape contracts are set by the local authorities, and can be changed according to local authority policy changes or budget constraints. From their experience, contracts may be discontinued due to budget cuts during periods of recession, and will resume once the financial situation improves. The advantage of

having a maintenance contract is that it allocates a fixed budget for 2 years of landscape maintenance, and the park management thus avoids any unexpected financial issues; this was agreed by all the stakeholders across case studies. However, TLG2 suggested that the contract package is a more costly system.

4.7 Current issues and challenges facing the local authorities in managing urban parks and open spaces in Kuala Lumpur

The Malaysian government's aspiration of sustainable development delivered at the local level has had most influence on new urban park developments, such as in Putrajaya, rather than on the retrofitting of existing parks in Kuala Lumpur. Despite efforts by NLD and KLCH to establish and deliver environmental policies and strategies, in reality, retrofitting an ecological and sustainable approach to Kuala Lumpur poses different challenges to park management that need to be explored in the search for effective means of adaptation in managing urban parks in Kuala Lumpur.

4.7.1 Management challenges: Complex institutional structure and bureaucratic procedures delay delivery of a sustainable landscape agenda to urban park management

Review of policy and related documents of urban park management reveal several challenges that could delay the delivery of sustainable agenda to Kuala Lumpur's urban parks. The first challenge is at planning level due to the complex institutional structure and bureaucratic procedures as legislated in the Town and Country Planning Act (Amendment) 2001 (Act1129). The three-tier institutional system in place for greenspace planning has to go through three levels of administration approval before implementation at local municipal level (refer to figure 4.13 shows). At national level, there is a National Physical Plan for guidance, in accordance to the Five-year Malaysia Plan and other sectorial policies, including the National Landscape Policy (Federal Department of Town and Country Planning, 2010). Following the establishment of the national plan, a structural plan needs to be developed, which outlines general policies and strategies for spatial development programmes for the regional government's approval. The preparation of the structural plan involves a long process of revision of the previous structural plan, preparation of draft reports on the proposed structural plan and alterations to draft reports, considering public comments, before gazetting the revised structural plan. In the case of Kuala Lumpur, this process is guided by the Federal Territory (Planning) Act 1982, a specific act to control and regulate development for the Federal Territories.

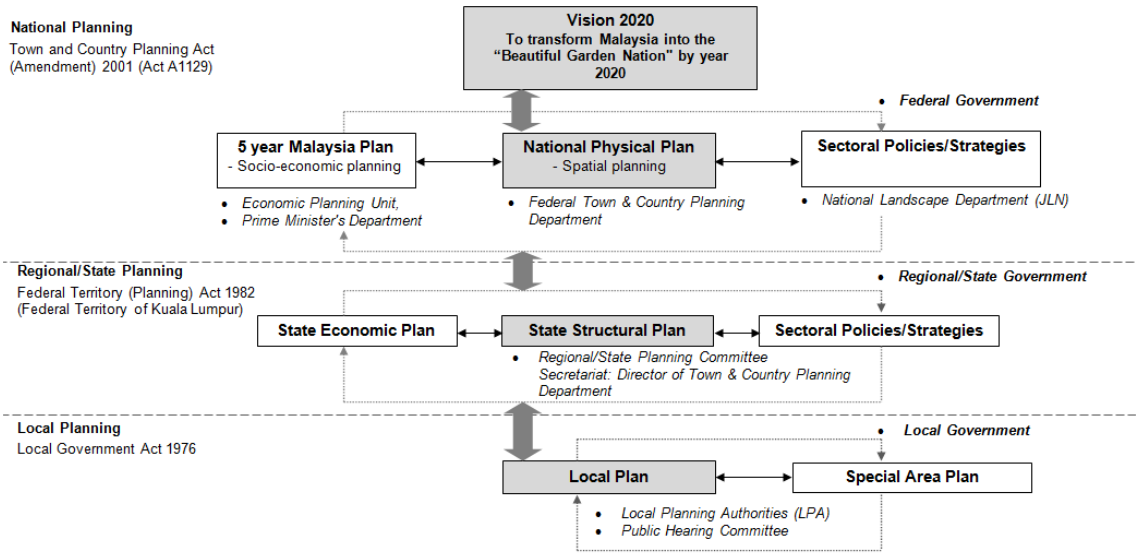


Figure 4.13: The three-tier Institutional System for Greenspace Planning in Malaysia
Source: Adapted from National Physical Plan (Federal Department of Town and Country Planning, 2010)

Taking as an example the experience of planning for urban parks and open space in Kuala Lumpur, this complex institutional structure and bureaucratic process has resulted in a 16 year gap between the initial proposal and approval of the National Landscape Policy since it was first initiated in 1995. As the National Landscape Policy was supposed to guide the structural and local plans, the delay in its approval has left the state and local authorities with no choice but to develop these plans without referring to the policy. This has led to inconsistency between national policies and local plan strategies in regard to the open space requirements for the city of Kuala Lumpur. For example, the approved National Landscape policy outlines a minimum of 30% open space for urban areas by the year 2020 (National Landscape Department, 2011). However, this requirement is not translated in the Draft KL City Plan 2020, because this local plan was initiated five years before this policy was approved and projected a target of only 9% open space in the year 2020, well below the national policy's minimum requirement. This non-compliance could affect the outcome of the government's sustainable vision.

Despite having new environmental strategies to achieve the "Tropical Garden City", the complex institutional structure and bureaucratic process have also extended the approval time for the structural plan and the local plan for the city. The revised KLSP 2020 was only approved in 2004, about 20 years after the first structural plan was developed in 1984, while the Draft KL City Plan 2020 is yet to be approved due to the prolonged review and amendment process in response to objections raised at public hearings that took place in 2008, 2010 and 2012 (AJM Planning and Urban Design Group Sdn. Bhd., 2012). Hence, another ten years can be added on before there will be full implementation of the sustainable agenda for addressing environmental issues and challenges facing the city. The delay in the approval of KL City Plan 2020 has become an impediment for KLCH in implementing KLSP policies at the local municipal level.

Fortunately, despite this delay, collaborations with other government institutions through green initiatives such as the Greater KL/KV programme have provided another channel for KLCH to proceed with their local agenda, in delivering the Greening Greater KL/KV to meet the "Liveable City" status by 2020. In relation to urban parks and open space management, the delay in establishment of the landscape policy has meant the local government has had no proper guidance to regulate and monitor landscape development and conservation, especially in dealing with environmental issues that require holistic integration of NLD, the local authorities and other relevant institutions. Hence, the urban park management still applies a conventional approach to managing urban parks and open spaces in the city.

4.7.2 Social challenges: Stakeholders' attitudes towards an ecological approach to design and management of urban parks

Changing towards ecologically sustainable practice to urban park management in Kuala Lumpur may result in different perceptions on the ecological appearance of this landscape. People are used to judging beauty by the aesthetic appearance, whilst it is also common for ecological design to have a messy naturalistic form. Thus, the government's aspiration to make Malaysia both beautiful and environmentally sustainable by the year 2020 presents a great challenge to local authorities in creating a balance between these two goals. Meanwhile, improper understanding of the meaning of "beautiful" within ecological design may cause failure to achieve the vision. Without this prior knowledge, people may misinterpret the appearance of ecological landscapes as unkempt, which could lead to a perception that the urban park management are not performing their maintenance as suggested by Nassauer (1995). This relates to Parsons' (1995) argument on dealing with different perceptions towards ecological aesthetics among the public and the urban park management, as highlighted in section 2.4.3. Therefore, the ultimate goal of sustainable landscape design should include appropriate plant species with the ability to perform ecological functions, and which are also aesthetically pleasing.

Furthermore, retrofitting sustainable practice into the urban park management in Kuala Lumpur may create a different landscape style from those in temperate climates. "The goal of quality sustainable design is to create aesthetic, functional, maintainable, and cost-effective landscapes that are well suited for a specific location or region" (Cook & VanDerZanden, 2010). This requires appropriate local input and knowledge of ecological design and management, and how these aspects can be adapted to social and environmental change in the city (James et al., 2009), to avoid misinterpretation of the concept and also conflicting preferences regarding the ecological aesthetic amongst those directly involved in urban park management. Thus, it is important to get the local stakeholders' opinion on the practicality and adaptability of implementing such an approach in the local urban parks, based on their experience in park management and maintenance.

4.7.3 Current issues and problems facing urban park management in Kuala Lumpur

Delays in the establishment and dissemination of landscape policies by the local authorities resulted in urban park management continuing to apply conventional approaches to managing these parks, which has led to various issues and problems as the current practice is not always appropriate and cannot adapt to the city's changing environment. The following sections discuss these issues and problems as highlighted by the management stakeholders during the interviews.

4.7.3.1 Top management's control over management decisions restricts staff members' expression of views and opinion beyond the scope of their work

Urban park management currently practise a top-down system of control over management decisions, which allows staff members only to voice their views and opinion on issues and problems within the scope of their work.

> *"We usually address maintenance issues and problems through a bottom up approach. The labour will report to the site supervisor, who will then forward the issues to the Horticulture officer [park manager] during the monthly meeting. Then, the Horticulture Officer will bring this matter to the landscape department and inter-department meeting with the mayor. Any decision for further action will then come down through the same channel. Any new proposal or instruction from the top management will go through the same process… At the park level, the Horticulture Officer is responsible for any decision within (his)/her scope. But usually, any decision related to budget needs to be referred to the Director [of the Landscape Department... For annual budget preparation, we [horticulture assistants] will submit a request form for a list of things [maintenance materials] that we require to the Horticulture Officer, which is then forwarded to the department for approval. So far, we have had no problems with our request in terms of budget." (TLG2)*

The interview findings across the case studies show that each staff member has their own prescribed scope of work and has to abide by the sequential and procedural decision making process. The bureaucratic nature of delivery of current conventional landscape practice has caused inefficiency in implementation of new policies on the ground because of adjournment of solutions to site issues and problems, as discussed in the next sections. Failure to attend to such issues and problems immediately has resulted in the urban park management receiving numerous public complaints and criticisms and put them under a lot of pressure in managing these parks.

4.7.3.2 Inadequate physical resources to support delivery of intensive horticultural maintenance

Conventional practice requires intensive landscape maintenance that consumes large quantities of resources (i.e. natural resources, maintenance materials, workforce, etc.). Hence, providing efficient management is a challenging task for the urban park management in Kuala Lumpur as they are responsible for meeting daily and monthly maintenance targets in fulfilling the

'beautification' objectives. Some of the related difficulties that can affect the operation and maintenance of these parks are discussed next.

a. Lack of maintenance materials and equipment

Although landscape maintenance is carried out by the park management, maintenance materials are procured through the Procurement Management Division, whilst supplies of machinery (blowers, chain saws, sky lifts, etc.) are requested from the Mechanical Engineering Department. However, long delays in the application procedure can lead to a breakdown in supply of materials and equipment, which thus delays essential maintenance operations such as cleaning, tree pruning, shrub trimming, and watering, as stated by TLG3.

Lack of water resources was one of the issues most often highlighted by the stakeholders, from park manager to labourers on the ground. They stated that besides keeping up with cleanliness, most parks require watering to be done on a daily basis. Nevertheless, unlike in *PBG* and *KVP,* which are surrounded by woodland*,* in parks located near the city centre and closer to upper-middle class neighbourhoods, like *PBG, TLG, and ALG,* it is compulsory for watering to be carried out twice daily. Although all the studied parks have waterbodies, most of these parks have limited pipe or irrigation systems in terms of irrigating and cleansing certain areas of the park. Thus, watering is still dependent on water tankers, which not only use potable water resources, but this method again involves high energy and logistic costs, and is not a sustainable practice.

> *"We still use the potable water resources from SYABAS [Public Water Department] besides using water tankers. For certain areas, we are using water pumped from the lake. At the moment we use 30% sprinkler and 70% manual. Watering is carried out twice a day." (PG4)*

As the case studies under KLCH are very much dependent on machinery for their landscape maintenance, supply failures and having to share equipment with park management of other maintenance zones make it more difficult for them to perform daily operations such as tree pruning and shrub trimming. According to PBG1:

> *"For my team, we are lacking proper equipment to maintain the trees. We have a number of big trees and have to borrow the sky lift from other units to carry out the maintenance, which is not easy, because it depends on availability. This sometimes delays our maintenance operation.* (PBG1)

Conventional landscape operations in Kuala Lumpur's urban parks can be further delayed by poor maintenance of necessary equipment, and reliance on outdated machinery.

b. Lack of adequate quantity and quality of labour

An adequate supply of maintenance labour is essential to the successful delivery on the ground of the goals and objectives set by the park management. Currently, the KLCH employs 110 labourers at *PBG*; 40 labourers at *TLG*; 15 labourers at *ALG*; and 38 labourers at *PLG*, whereas the *NDL* only uses 17 labourers at the *KVP*; these numbers are subject to change if someone retires or resigns. Although the park manager and horticulture assistant have no issues in managing the labour according to maintenance necessity and labour availability, most of the labourers claimed that the current workforce is not sufficient. This is because they generally have to cover absentees' work, which adds to their workload. Furthermore, the interview findings also reveal that besides their duties in the park, some labourers are also assigned to maintenance of other zones, such as roadside landscapes. These findings show that because of the need to comply with the current goals and objectives for park maintenance, the park management often have to change the maintenance system, which appears to lead to unequal distribution of work and results in some labourers having tremendous workloads compared to others.

In addition to a shortage of labour, the park management have to deal with quality issues relating to workers' performance, such as lack of skills, communication problems, as well as discipline issues. According to TLG2:

> *"First, we have problems with unskilled labour. Most of them are foreign labour, so it is difficult to communicate with them. Secondly, some of the contractors don't have landscape backgrounds, so they don't perform according to our expectation. This is a major problem to us. Then we are also faced with lack of labour, so we cannot meet our [monthly] maintenance target."(TLG2)*

The minimum qualification for labour posts, set by the KLCH, is possession of a primary school assessment certificate (aged 12), and some of the maintenance labourers hence have no agricultural or horticultural background. Thus, horticulture assistants are responsible for training the unskilled labourers on the ground, as mentioned by PBG. Furthermore, discipline issues arise with some of these labourers, as stated by PBG4:

> *"It is difficult to monitor the labourers as some of them don't follow my instructions"*.

As well as the lack of skills and the discipline issues, communication problems between different levels of management affect the maintenance work and prevent it from being of the expected quality. For example, TLG2 mentioned that instructions to workers can lack clarity as they have to go through different levels of management before being received by the labourers.

Meanwhile, in other parks (*TLG, PBG, ALG*), some of the contractor's labourers are from either India or Indonesia and lack fluency in Malay language, thus their communication with the horticulture assistant is restricted. Usually, the horticulture assistant will give

instructions to those who can understand the language, who then inform their team-mates.

These findings suggest that although provision of more labour could cover the intensive maintenance requirements of conventional parks managed by KLCH, managing such a large workforce is more challenging, whereas in NLD, which has a smaller maintenance team, the park managers and their assistants are less constrained and able to concentrate on other areas of work, such as attending to public needs and requirements.

c. Safety and security issues

Apart from managing landscape maintenance, Kuala Lumpur's park management are responsible for the safety and security of the public while using these parks, for example, dealing with the problem of snatch theft. This issue is most critical in *PBG*, *PLG* and *TLG* as there are many entrances to these parks, which makes it difficult to control this problem. Furthermore, the threat of wildlife and especially venomous snakes is an issue quite commonly raised by the visitors in *PBG, TLG, PLG* and *KVP,* as these parks have large areas of woodland. There are also cases of monkeys disturbing the visitors and trawling through the rubbish bins at *KVP* and *PBG.* Due to its location between a large expanse of secondary forest and a residential area, the park management of *KVP* is taking extra precautions to control pests and diseases (rats, termites, etc.). Moreover, as most of the parks have been developed from ex-mining ponds, the park management are implementing safety measures such as installing fences near steep banks and the water's edge.

4.7.3.3 Dealing with public attitudes and expectation of the landscape of urban parks

Besides responding to public needs, dealing with their attitudes and expectations of the landscape of the parks is one of the park management's priorities. The findings from the interviews with the stakeholders from different levels of park management highlight two distinct types of visitors. The first type is people who are very attached to and concerned about the park. Being used to conventional landscape that emphasises cleanliness and beautification, some people in Kuala Lumpur are very concerned about landscape maintenance in their urban parks. Thus, it is important that the maintenance groups keep up with their daily maintenance routines to ensure the parks are always clean and beautiful; otherwise they will be inundated with complaints from the public.

In contrast, there is a group of people who behave badly in the parks. All the case study sites suffer from vandalism of their landscape furniture and soft-scape. For example, there are cases of the park lighting being cut and theft of the steel gratings (PLG2), stepping on flower beds and even theft of plants (PBG4). Besides, there are cases of illegal fishing and theft of geese in *ALG*

and *PLG*. This usually happens at night when there is no security enforcement or staff on duty to control access to the parks. Therefore, the public can still access the park outside the normal opening hours of 6am-8pm.

Dropping of litter by visitors is another problem facing the park management. People tend to throw rubbish in the parks, and also into the ponds and lakes. According to TLG2, this is more frequent during weekends, because public functions are held that attract huge numbers of visitors to the parks. It is difficult for the management team to control this problem because at the moment the KLCH do not enforce related regulations to penalise the public for such misbehaviour.

As revealed from the reviews of relevant landscape policies and management documents as well as the interviews with management stakeholders, it can be inferred that the issues and problems with the current landscape design and management culture at Kuala Lumpur's urban parks might not be addressed unless the park management take the initiative to change towards a more ecologically sustainable approach to landscape practice, besides strict enforcement to control public behaviour in these spaces.

4.8 Potential for changing towards more ecologically sustainable practices

Despite the issues and challenges, there is great potential for Kuala Lumpur's urban parks to be managed sustainably. Given the advantage of high precipitation, large amounts of rainfall can be collected and stored for outdoor uses, such as watering. This system could potentially reduce maintenance intensity and at the same time enhance the environmental function of urban parks. Putrajaya has become a reference for implementing the urban forest concept and beautification as part of its strategies for urban reforestation towards becoming a "Green City" by 2025. Likewise, there is a possibility for KLCH to adopt a similar approach to PJC for managing the city, to gain similar ecological benefits to those achieved in Putrajaya.

4.9 Summary

This chapter has traced the historical development of urban parks in Kuala Lumpur throughout the colonial period and the post-independence era. From this historical perspective, it can be summarised that as urban parks in Kuala Lumpur have evolved, new concepts and approaches have been introduced to improve their design and management, strongly influenced by the colonial landscape style. The urban greening and beautification concept and the urban forest concept have been culturally accepted and have influenced the current management of urban parks in Kuala Lumpur. Nonetheless, the concept of sustainability is yet to be successfully incorporated into current urban park management of Kuala Lumpur due to management and

social constraints on the local authority. The challenges currently facing urban park management in Kuala Lumpur justify changing their current practice to a more sustainable practice in adaptation to changes in the urban environment and resource availability. Considering this potential, Chapter 5 presents the key findings identified from the selected precedents regarding ecologically sustainable landscape management practices in urban parks that could be used by Kuala Lumpur's urban park management in adaptation of their current landscape practice.

CHAPTER 5

Towards a more ecologically sustainable landscape practice for urban parks through integration of SuDS: Learning from the precedents

5.0 Introduction

This chapter presents the key findings from the selected precedent studies of developed countries (United Kingdom and Singapore) that demonstrate a more ecologically sustainable landscape practice in the respective urban parks, with a strong emphasis on the integration of stormwater management into their landscapes. For reliability purposes, a precedent study set in Putrajaya, Malaysia was also included, being a pioneer urban park development project in applying ecological concepts and an approach in this country that represents an emerging interest in ecologically sustainable practice amongst local landscape practitioners.

The chapter first discusses aspects of ecological design and management that can increase sustainability, followed by consideration of appropriate landscape appearance. Potential benefits and challenges of implementing such an approach into the current practices of the precedent studies are then discussed. The findings contribute to developing a critical understanding of how these more ecologically driven practices might be applied to park management in Kuala Lumpur. Finally, the chapter proposes an ecological design framework for managing urban parks in Kuala Lumpur to inform and guide the interview questions for further evaluation of its practicality and its applicability to local urban park management.

5.1 Delivering ecologically sustainable landscape practice in urban park management through the inclusion of SuDS: Lessons learned from precedent studies

The findings from the semi-structured interviews identify incorporation of sustainable water management as the key motivation towards an ecological approach in the precedent sites, namely, the Manor Fields Park (*MP*), Sheffield and the London Olympic Park (*LOP*); Bishan Park-Kallang River (*BP*) and Tampines Eco-Green Park (*TP*), Singapore; and the Wetland Park (*WP*), Putrajaya as described in Chapter 4 section 4.4.2.1. The following section outlines the aspects of ecological design and management through the inclusion of SuDS from the perspective of the park management according to their experience and attitudes in delivering such an approach. The discussions are supported by the photo evidence derived from site observations, and also landscape design and management documents for each site.

5.1.1 Common aspects of ecological design across precedent studies

The implementation of SuDS in these urban parks reveals some common aspects of ecological landscape design. However, comparison of these sustainable landscape practices across all the precedent studies indicates that different levels of ecological treatment (ranging between *Low**; *Moderate* **; and *Intense****) are implemented at each site according to the park's scale, location, and management strategies (refer to Table 5.1).

Table 5.1: Summary of comparison of ecological design aspects across the precedent studies

Ecological design aspects		Temperate country		Tropical country		
		MP	LOP	BP	TP	WP
1.	Multifunctional and integrated design for managing stormwater, habitat diversity and biodiversity enhancement	***	***	***	***	***
2.	Comprehensive design guidelines for short-term and long-term goals	*	***	**	*	**
3.	Allowing natural regeneration of the existing vegetation	***	***	**	***	**
4.	Promoting species diversity for ecological improvement	**	***	***	**	***
5.	Applying naturalistic landscape style using native species to enhance aesthetic value	**	**	***	***	**
6.	Combination of ecological and conventional design for socio-ecological balance	*	***	***	*	**
7	Adoption of green technology and innovation to support ecological design	**	***	***	**	***

*Legend: Level of treatment- Low*Moderate **Intense****

EDM1: Multifunctional and integrated design for managing stormwater, habitat diversity and biodiversity enhancement

The interview findings suggest that incorporating SuDS flooding and stormwater treatment into urban parks reflects a multifunctional and integrated approach to design, which is the key aspect of ecologically sustainable practice. The multifunctional design elements help address various environmental issues, in order to improve the ecological state of the park, at the same time maximising recreational space, which eventually benefits the public. *LOP*, *BP* and *WP* represent large scale projects that have promoted an integrated design to meet numerous sustainable goals and objectives set up for the parks, including the following:

a. Stormwater management

LOP adopted an integrated sustainable urban drainage system (SuDS) in the ecological landscape at the North Park (i.e. vegetated bio-swales), making full use of the assets of the park such as the waterways and the undulating topography. This integrated design is

displayed as a showcase to educate the public about sustainable stormwater management in a creative way:

> *"The swales are planted with a wetter type of meadow, this side is a little bit dryer and then you have thick plants that slow the water but also give a little bit of pattern as it moves down towards the river. But it gives a story for the water, hitting surfaces and running down, so visually seeing all stages of the hydrological processes."* (PS3)

Among all the sites, Bishan Park-Kallang River, Singapore *(BP)* is a perfect exemplar of retrofitting ecological design to existing urban parks and waterways, which transformed a concrete channel into a naturalized river, creating a flood plain to decelerate the river flow and treat the stormwater. The key driver of the delivery of this project is the strong government aspiration to improve the waterways as one of the green components of the city, as an alternative to expanding the limited open spaces in Singapore. As informed by PS5:

> *"It basically ties in with our strategies of "City of Gardens and Water". So, it is not just about a garden, but it's also maximising the water bodies. The whole idea is to, after you clean the water, you use the water and the design of the edges to activate the space. After you activate the space it is easy to organise programmes so that people interact and engage with this element, so then they begin, over time to take ownership of the water. It's less of a design exercise and more an exercise of making people appreciate what they have, which is this precious resource of water".* (PS5)

In this holistic design, the integration of SuDS as part of the ecological approach to managing the quantity and the quality of the stormwater has also created a larger multipurpose space for nature and water based activities (refer to figure 5.1).

Figure 5.1: Photo showing the sustainable urban drainage system (SuDS) linked to the naturalized river for managing storm water (left); and the same space can be utilised by the public.
Source: Roziya Ibrahim (2013)

WP is another example of an integrated system of green spaces, lake and wetland planned for Putrajaya through a large scale wetland system for treating the incoming water sources into the Putrajaya Lake:

> *"And we have the big lake surrounding the city, so definitely we want clean water for the lake. So, what the concept of wetland is about is that we have two rivers, which collect the water from two northern rivers, from outside of the Putrajaya. And we have constructed twenty four (24) wetland cells to filter the flow of the water until that water reaches a certain standard or quality before it goes to the lake. So, the wetland cells become the kidneys or the filtration system for the water that comes from the rivers up north".* (PS10)

The function of the wetland system is to filter the surface runoff before it enters the lake (refer to figure 5.2). The undulating landform of the park provides the advantage of managing the stormwater in a more sustainable manner by allowing hydrological processes to occur naturally. The combination of these components enhances other ecosystem services for the city of Putrajaya.

Figure 5.2: Photo showing one of the wetland cells located at the upper west wetlands as part of the sustainable water management system for the Putrajaya Lake
Source: Roziya Ibrahim (2013)

MP and *TP* represent smaller scale projects that integrate SuDS for addressing on-site drainage problems economically. Potential water sources or ponded areas were transformed into SuDS components that are integrated with the existing water bodies/waterways using vegetated swales located along the footpath. Such integration has proven to be successful in managing the stormwater on-site; and promotes a self-sustaining landscape in *MP* and *TP,* thus requiring less input for their maintenance.

Figures 5.3: A photo showing the existing water source transformed into a retention pond as part of the SuDS component for the Manor Fields Park, using landscape for stormwater control and treatment, at the same time serving as a public amenity and creating habitats for wildlife.
Source: Roziya Ibrahim (2013)

Even so, the SuDS components, such as the vegetated swales, still require regular maintenance of the inlet pipes to avoid clogging, especially in tropical urban parks such as *TP*. PS7 strongly emphasised:

> *"…in certain areas of the swales sometimes it gets clogged up, because the vegetation is not weeded. But we always ask our contractor to step up on weeding; and we show them why it is important, because sometimes, one of the pond inlets can get so blocked with vegetation that water cannot flow through. And that's when this flooding takes place and,*

you know, mosquito breeding. So we have emphasised the importance of weeding the vegetated swales to the contractor." (PS7)

This helps to prevent mosquitos from breeding, as a preventive measure against dengue fever, a mosquito-borne viral disease most common in tropical climates, which can be life-threatening or fatal.

b. Habitat diversity and biodiversity enhancement

Besides the main function of managing stormwater, the combination of man-made and natural SuDS components in a water treatment system creates the opportunity for promoting habitat diversity, such as the riverine, ponds and wetlands, creating habitats for birds and wildlife. Aiming for biodiversity enhancement, the *LOP and BP* projects have created freshwater habitats on existing waterways, which helps increase the biodiversity of the parks. PS6 suggested:

"In terms of habitat creation, the frog's habitat has been subtly created in our swales. The river is quite obvious in terms of stormwater management; it slows down the water… A lot of plants actually have good thick, dense leaves, great perch spots for birds. There are a lot of holes, nooks and crannies for fishes, even dragonflies also do very well in the river. One of the best things about the park is that it has many types of habitat. There is a river which sustains a certain ecological habitat. We have a big pond that suffices as better fisheries. We have smaller ponds that are very good as a dragonfly breeding habitat. We also have the understorey area that runs along the main road. These are actually dense areas where you get a lot of lizards and squirrels." (PS6)

Similarly, constructed ponds *(MP, TP)* and wetlands (*WP)* have been integrated with naturalistic landscapes of the parks through vegetated bio-swales; this provides shelter and food sources for birds and other wildlife. Eventually, such habitat diversity will support biodiversity enrichment in all these parks (refer to figure 5.4). These ecological landscapes not only serve as a sanctuary for various aquatic life, birds and other wildlife, but also provide an opportunity for nature experiences and education for the public.

"The client wanted the park to be partly educational; that is why they chose plantings from among endangered and rare species…thereby it becomes partly educational [environmental education]. (PS11)

Figure 5.4: Photo showing some of the birds that can be found at the Wetland Park, Putrajaya
Source: Roziya Ibrahim (2013)

The interview findings suggest the importance of multifunctional designs having a socio-ecological balance. Therefore, certain areas of the parks are designated as a high activity zone, while the rest, such as the ponds and river area, are subject to high density

planting to diversify the habitat for birds and wildlife. However, there are also some shared spaces that simultaneously increase the biodiversity of the park while attracting more people for recreational activities. This positive outcome gradually promotes a socio-ecological relationship within the park.

EDM2: Comprehensive design guidelines for short-term and long-term goals

The integration of the multifunctional components of the precedent studies is supported by comprehensive design guidelines, which are translated into short-term and long-term goals that tie in with the city's master plan. These guidelines include technical and operational inputs and requirements, especially in terms of joint components, backed-up by research and preliminary studies.

The establishment of various guidelines is dependent on the size and complexity of the ecological components of the parks. Large scale projects such as *LOP, BP* and *WP* require more complex guidelines compared to smaller projects such as *MP* and *TP*. *LOP* has the most comprehensive design guidelines, developed to take account of its 25 year projections for Olympic, Transformation and Legacy goals. All guidelines and strategies proposed for the development of this three-phase park conform to national and local government policies and plans, as stated by PS3. The overall planning and development guidelines demonstrate new ideas and innovations, guided by a strong design brief that emphasises the targeted sustainable goals and objectives:

> *"At that time it was quite a very well written brief, it was really encompassing, it encompassed not just a design of new park, but it was a very detailed piece of work that was started over a period of time. But it was really well preceded, and it gauged in lots of big scale designs, it was not written by one person. There is a very strong drive that everything should be linked together, and everything should be as exemplar as possible, it should be the best that we possibly deliver within the timescale and to demonstrate forward thinking. So that was underpinned and brought out some of the key concepts."* (PS3)

Similarly, the long-term planning of *BP* is guided by the ABC Waters Masterplan, launched in 2008 as part of the ABC Waters programme. This reflects the national policies and strategies that had begun to emphasise water management in urban planning. As elaborated by the landscape architect:

> *"The Masterplan, it is how we consider the design of our waterways…In the past, we protected our water resources by keeping people away from them; now, we are bringing people closer to the water so they will enjoy and cherish it more…It basically ties in with our strategies of City of Gardens and Water. So, it is not just about a garden, but it's also maximising the water bodies…As part of this Masterplan, we identified Bishan Park as one of the pilot projects"* (PS5)

The "City of Gardens and Water" strategy reflects the new directions of Singapore Urban Planning towards sustainable development through a holistic design by exploring opportunities for the integration of water management into park management. The Bishan Park project was chosen because of this criterion.

The development of *MP* was simply guided by a Masterplan based on the Manor Neighbourhood Development Framework that was delivered in two phases. The first phase of the park's development started in 1999, focusing on site clearance and identifying the remaining types of vegetation that had potential to be kept and conserved. The second phase, which commenced in 2008, involved the development of SuDS and basic public amenities, such as a pedestrian network that would link the surrounding neighbourhood with the transportation network through the park, and conservation of the existing landscapes while providing recreational facilities for the Manor and Castle district.

EDM3: Allowing natural regeneration of the existing vegetation

Natural regeneration of the existing vegetation is another aspect that was emphasised in all the precedent studies. Through this strategy, local vegetation is conserved and restored by allowing succession to occur naturally. For example, in *TP*, most parts of the park, apart from the footpaths, were kept in their natural state:

> *"So if you notice, all the vegetation is actually existing vegetation. The only clearance was done to make the footpath, the toilet and the shelters. The rest is all existing vegetation, except for the front area where about 10% of the whole area was planted up, otherwise it was left alone. That was the aim of the park's development."* (PS7)

Adopting an ecological approach enabled the park management to make full use of a diverse area of grasslands, secondary rainforests, and freshwater wetlands within the site. A biodiversity survey was conducted before the site was developed, to identify species richness within these habitats:

> *"Because there was a biodiversity survey before, the designer sort of knew what there was. So, there were forest species, birds of the forest species, grassland species and aquatic birds as well. So, that is why creating new ponds to cater for the aquatic birds was important. And planting those berry bearing trees was important for the forest species and of course the existing grassland and the newly planted Zoysia are actually providing grass seeds for the grassland bird species."* (PS7)

Ninety percent of *TP*'s natural vegetation was conserved. The park management put considerable investment into the threshold space of the park by establishing an apparent entrance statement that reflects the ecological identity by using a green roof shelter and timber signage. Besides these landscape features, the vegetation strategy demonstrates the "cues to care" concept (J. I. Nassauer, 1995) by using colourful native plants in a naturalistic style planting scheme and cleared footpaths in contrast to the existing grassland (refer to figure 5.5). This landscape approach creates legibility whilst also attracting people's attention to come and experience the park.

Figure 5.5: Photo showing the apparent entrance statement of Tampines Eco-Green that intentionally blends the “cues to care” concept with the conservation of secondary forest in the background (left); and the fresh water wetland surrounded by grassland at the centre of the park (right), creating an apparent ecological identity to attract public attention to the park.
Source: Roziya Ibrahim (2013)

In the case of *WP*, the park was built on a former rubber and oil palm plantation that provided potential for conserving some of the existing vegetation for self-regeneration into secondary forestation. The conservation of this landscape, supplemented with new vegetation, allows afforestation processes to occur at the site (refer to figure 5.6). This natural setting is further enhanced by a combination of conventional and ecological landscape styles surrounding the building and public amenities:

> *“…some of the existing vegetation of some of the areas we still maintained, like some of the rubber trees, just to maintain a green area there. But in some areas that we leave green we mix in new materials. Actually we have still maintained a lot of existing vegetation. We just opened up some areas just for the hardscape components, like the walkway, perhaps the gazebos and the shelter”.* (PS10)

Figure 5.6: Photo showing the existing rubber trees (left) and oil palm (right) foster secondary forestation for ecological improvement in the park
Source: Roziya Ibrahim (2013)

A forest area established in the park is being integrated with the wetlands and parklands, which form part of the green lung of Putrajaya city. This strategy helps expedite the ecological improvement of the park, which has become a sanctuary for birds and other wildlife since its completion in 1998.

EDM4: Promoting species diversity for ecological improvement

Besides conserving the existing vegetation, each of the precedent studies promotes species diversity for ecological improvement of these urban parks. Even so, the vegetation strategy varies according to site suitability and constraints. Management at *MP* and *TP* considered that the ecological assets of the site required only minimal planting, which helps reduce vegetation management in these parks.

The vegetation strategy for *TP* promotes the use of local native species, particularly nectar and fruit bearing plants that provide shelter and sources of food for birds and other wildlife (refer to figure 5.7). Among the species are *Leea rubra, Crotalaria retusa, Dillenia suffruticosa and Syzgium grandis*. Introduction of species variety not only enhances the habitats of the existing wildlife, but also attracts new ones to the park. According to surveys done by the National Parks Board, Singapore, the park has successfully increased its biodiversity, as informed by PS7:

> *"Just by the bird survey, right before we opened, the numbers were around thirty (30) species of birds, but after opening, about a year later, we conducted another survey, our result actually showed over seventy (70) species of birds. For butterflies, when we first started, we only had about 12 or 15 species. Now we have at least thirty (30) species of butterflies. This can only be owing to the plants that we planted, the fruit bearing, making it conducive for the birds to reproduce, and also leaving the existing vegetation where the birds are actually comfortable making their nests and gathering".* (PS7)

Figure 5.7: Photo showing some of the native plants proposed for Tampines Eco-Green as sources of food and shelter.
Source: Roziya Ibrahim (2013)

At *LOP, BP* and *WP*, the park management adopted a more rigorous and intensive scheme in their vegetation strategy to create a range of habitats to meet the management's objectives for biodiversity enhancement. For example, *WP* promotes a diverse range of plant species, both native and exotic, nectar and fruit bearing trees, endangered and rare species to support regeneration of the existing vegetation:

> *"Basically we have the existing fruit trees. We have still maintained them, and added some more fruit trees, especially rare fruit species. Then, we added in some of the water loving plants in areas close to the wetland. And the bamboos, we have collections of bamboos in the wetland park ... So, we have plenty of species. We do have forest species."* (PS10)

This species diversity is distributed throughout the park and the planting gradually changes with the change in terrain from wetland to parkland and woodland, in order to complement the various recreational facilities in the park (refer to figure 5.8):

> *"The edge of the cells, the selection of plants is more natural and they need less maintenance. The planting is quite dense and thick because that is the last frontier before the water goes into the lake. And then further up, the vegetation is quite dispersed, where we used plants depending on the facility and activity that we want to have. In most of the areas we have a plot for open activities and there are a few zones planted with fruit trees and we preserve the existing natural vegetation. Further up it is more towards a collection of the indigenous and rare species".* (PS11)

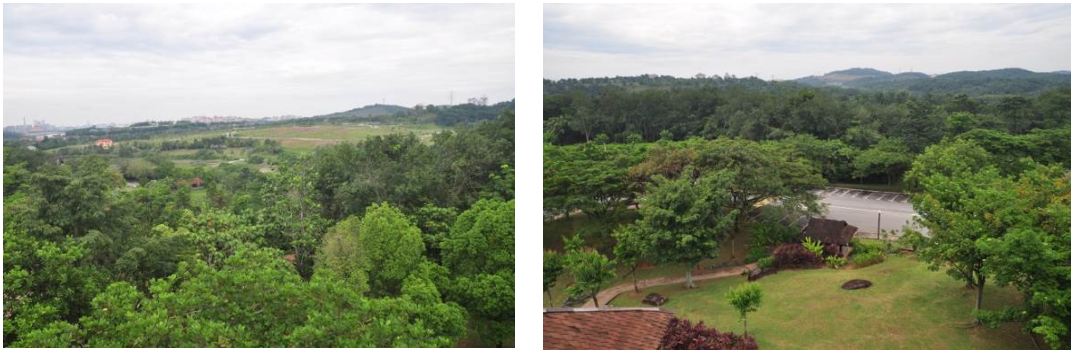


Figure 5.8: Photo showing species diversity from the wetland to the parkland (left) and from the parkland to the woodland (right)
Source: Roziya Ibrahim (2013)

The wide range of plant collections provides abundant food sources for different types of wildlife species. This strategy has significantly increased the level of biodiversity in the park, which in turn contributes to ecological improvement of the site. Besides local species, some of the precedent sites have also become a transition hub for migratory bird species (*WP, BP, and TP*).

EDM5: Applying naturalistic landscape style to enhance aesthetic value

In addition to the existing natural landscape, the adoption of a naturalistic landscape style of ecological design in all the precedent studies not only helps increase the ecological value but also enhances the landscape appearance. For *BP* and *TP,* native species are mostly preferable to enhance a naturalistic form of landscape, which is believed to be more adaptable to the local climate and site conditions (Simmons et. al., 2007)(Simmons et al., 2007). Besides being aesthetically pleasing, vegetation in *BP* also serves certain hydrological functions. The use of different types of species, plant composition and structure has created functional landscapes that gradually change from naturalistic to a more urbanized style (refer to figure 5.9):

> *"…from naturalistic to more urbanized style plantings, that was the planting concept. So, if you walk through the central catchment, you will see the planting there is more natural, high density, multi-layered. And then you will get to more urbanized planting. Then, we show the different tiers, different plant groupings for each area…all these plants are picked specifically for the site, which tied in with our hydraulic modelling".* (PS5)

Figure 5.9: Photo showing the naturalistic river vegetation (left) gradually changing to a more urbanized style landscape (right).
Source: Roziya Ibrahim (2013)

This strategy deliberately helps to represent the natural-style landscape to the public in a more familiar form and aesthetic. Initially, the public were quite resistant to the landscape, but eventually, the park management have successfully promoted their approach to the public through continuous public engagement in the park's events and maintenance programmes.

In contrast, the *LOP and MP* presented their naturalistic landscapes in a semi-natural meadow by introducing a mixed of colourful native and non-native species through large scale plantings. In *LOP,* the ecological landscape gradually changes to urban meadows as the landscape moves from the North Park to the South Park (refer to figure 5.10), which have been implemented on a large scale to give a strong visual impact. The semi-natural meadow looks more urban and aesthetically pleasing, while requiring low input of vegetation management, as mentioned by PS3:

> *"So that's why the large scale urban meadows, the principle and management to this were actually the low touch, very low input in most of its operation. "* (PS3)

Figure 5.10: The urban meadow surrounding the Olympic Stadium provides visual impact in the South Park.
Source: Roziya Ibrahim (2014)

A similar technique was also applied in development of *MP* due to the limited financial and physical resources to manage the park. Thus, a naturalistic planting style was proposed with sustainable vegetation management established through sowing technique. To make it more

presentable to the public, a creative solution was devised to frame the naturalistic landscape by mowing the grass to form a pattern (refer to figure 5.11):

> *"…we do mowing not only on selected areas; it's kind of architectural mowing. So we mow to a pattern that looks nice, we will leave an area that is rough, not because it's an area that we do not want to mow, but also leaving it rough with un-mow looks nice"* (PS2)

Figures 5.11: The ecological landscape of the Manor Fields Park representing aesthetic appearance surrounded by grassland with mowing pattern in the background that has been recognised by the public.
Source: The Green Estate Limited (2014)

Naturalistic urban vegetation was the most appropriate choice for the park as it complements the regeneration of the natural vegetation of the site, and is also high in aesthetic value, which is an important aspect in terms of gaining public approval, similar to the cues to care theory of Nassauer (1995). Similarly, the *WP* promotes both native and non-native species but uses them separately. Natives are more frequently utilised in the wetland landscapes, and in combination with non-native vegetation in parkland areas.

EDM6: Combination of ecological and conventional landscape design for socio-ecological balance

All the precedent studies placed emphasis on designing for socio-ecological balance through a combination of ecological and conventional landscape, appropriate for leisure and recreational uses; at the same time creating suitable habitats for wildlife enhancement. For instance, the LOP is divided into two parts: the ecological landscape in the North Park and urbanized landscape in the South Park.

Similarly, *BP* and *WP* place emphasis on a more natural landscape in the naturalized river, wetland and woodland areas; then, gradually the landscape becomes more conventional towards the parklands and active public spaces. For example, implementation of an

environmental approach to the landscape design and management of *WP* enhances the ecological function of the wetland and forest landscape with the aesthetic element of the conventional landscape of the parkland (refer to figure 5.12).

Figure 5.12: Photo showing the wetland vegetation (left) and the conventional landscape of parkland (right) Source: Roziya Ibrahim (2013)

Although the ultimate goal for implementing this ecological landscape is to sustainably collect and manage the stormwater of Putrajaya, this ecological function has to balance with the role of an urban park. Thus, the park manager stressed the importance of keeping the recreational spaces clean and tidy to ensure the public feel safe and comfortable, as emphasised by PS10:

> *"Because it [the Wetland Park] operates daily, so we have to make sure that the park is in good condition all the time, because we have visitors every day… So, the routine work for everyday is clearing and cleaning so the areas don't look too messy and the visitors can enjoy themselves" (PS10)*

Maintaining a balance between these two components helps educate visitors about ecological design through a more familiar landscape vocabulary, while giving them options for utilising the spaces within these parks.

In contrast, *MP* and *TP* have given priority to ecological elements over recreational provision. Even so, to gain the public's attention and encourage them to visit these parks, a distinct character was created for the park, especially at the entrance. In *TP*, naturalistic landscape design is used to frame the existing vegetation with a more organised appearance of ecological aesthetic. It was done by creating a wider and clean footpath in contrast to the "messy look" of the natural landscape, to have some clear intervention. A clear edge and bio-swale helps separate these two different landscapes; besides, vibrant species are used to enhance the natural greenery of the park (refer to figure 5.13).

Figure 5.13: Photo showing an organised and presentable landscape appearance that enhances the ecological aesthetic of Tampines Eco-Green Park.
Source: Roziya Ibrahim (2013)

This strategy creates a more presentable and safe appearance, appropriate for promoting a wilderness experience in an urban park. This has been very positively received by the public and improves the utilisation of the space.

EDM7: Adoption of green technology and innovation to support ecological design

Another aspect of ecological landscape practice is adoption of various green technologies and innovations to support the integrated and multifunctional designs, mainly for SuDS. However, use of these technologies has been in accordance to the scale, topography and the sources of pollution surrounding the sites.

For small scale parks (*MP* and *TP*), simple SuDS techniques such as vegetated bioswale, overflow channels, detention basins or ponds, and wetlands are mostly sufficient. *TP* has also incorporated green roof shelters as part of this system. More complex technologies and innovations were mostly adopted in large scale projects without any financial restrictions, taking into account their significant contribution to sustainable water management within and beyond the parks.

The *LOP* is an example of a large scale project integrating similar techniques using filter strips. This strategy is appropriate for the North Park where the topography is more undulating and where the soil is more permeable compared to the South Park. A reed bed filtration system (refer to figure 5.14) was also introduced in creating a floating wetland along the River Lea.

Figures 5.14: A photo showing a “floating wetland”, using a reed bed filtration system at London Olympic Park.
Source: Roziya Ibrahim (2014)

BP has applied various green technologies in delivering ecological design. A cleansing biotope and soil bio-engineering techniques were adopted as part of its SuDS component (refer to figure 5.15). These green technologies help to stabilize the sloping river banks, to perform a hydrological function as well as treating water from the naturalized river for landscape maintenance and outdoor use.

Figure 5.15: Photo showing the cleansing biotope (left) and the soil bio-engineering techniques that form the structure of the river plain at Bishan Park (right).
Source: Roziya Ibrahim (2013)

The cleansing biotope helps filters water and removes chemical and biological contaminants from the river water, for recreational and maintenance use. Similarly, soil bio-engineering techniques developed in Germany combine engineering techniques with landscape materials, which help to stabilize the slope of the naturalized river. In the case of the *WP*, the park is part of a wetland system consisting of 24 wetland cells that act as a large natural filtration network for the polluted water from two rivers coming into the man-made lake of Putrajaya.

Most of these green innovations were adopted from western countries, and thus produce different outcomes in a tropical environment. Therefore, the management team had to use experimental designs to ensure that these technologies would adapt well to the local context and environment. This exercise helps the landscape architect to demonstrate the practicality of the design and maintenance and the appropriate landscape appearance for the client’s approval.

5.1.2 Common aspects of ecological management across precedent studies

Table 5.2 compares aspects of ecological management used to increase sustainability in the precedent studies. It also introduces a maintenance regime that is more efficient and adaptable to site changes and requirements.

Table 5.2: Comparison of ecological management aspects across the precedent studies

	Ecological management aspects	Temperate country		Tropical country		
		MP	LOP	BP	TP	WP
1.	Multidisciplinary collaboration and inputs	***	***	***	***	***
2.	Development of long-term strategies	**	***	***	*	*
3.	Apply slow incremental approach and resource efficient landscape management	***	**	*	***	*
4.	Apply dynamic and flexible maintenance regime	***	**	**	***	*
5.	Combine ecological and conventional approaches to landscape maintenance	*	***	***	*	***
6.	Engage in joint management and maintenance			***		

*Legend: level of treatment- Low*Moderate **Intense****

EDM8: Multidisciplinary collaboration and inputs

The overall findings from the precedent studies suggest that multifunctional and integrated design promotes multidisciplinary collaboration and inputs in managing the urban parks that mainly cover monitoring of biodiversity levels, water quality and technical operation of the green technologies and innovations adopted in urban parks.

Regarding large scale urban parks with many integrated elements brought together as a coherent system, the key to successful delivery of an ecological approach in *LOP* in a short timeframe lies in the collaborative effort between different disciplines and groups, including clients, landscape architect, architect, engineers and contractors. According to PS3:

> *"So, lots of work was done in workshops. It was not done in a segmental scheme. From the very beginning, everybody worked together in one space and hitched together for months, to review the design that came before. It was an intensive period where everything was scrutinised and everything was drawn together and the key principles were established. And during that stage, all sub-consultants were drawn into that as a collaborative process…" (PS3)*

Having the design and management team working together in one place through a concurrent process helped in expediting decision making and addressing design issues, which was more time efficient and cost-effective. Researchers from local universities were also involved in transferring their research findings into practice, such as in the naturalistic urban meadow (*LOP*) and the wetland systems (*LOP*, *WP*).

The collaborative effort in development of *TP* signifies modest short-term planning through a bottom-up approach. It was the local community who put forward the idea of developing this vacant land into a community park to the Tampines Member of Parliament (MP):

> *"Actually it was the residents who live nearby. They saw the diversity in the area and they fed this back to their minister. It was the minister, who was also the minister for NParks, who encouraged NParks to develop an eco-park somewhere there…The NParks took over the design. The minister for the Tampines area is the same minister who was in charge of National Parks Board, under the Ministry of National Development; he was also the MP for Tampines. He knows about the management of NParks, so he got this project going."* (PS7)

The Tampines MP fully supported this idea and then promoted the idea of an ecological park to the local government. Tenure within the government agency gave the MP a significant advantage in persuading the local government to accept an ecological approach to the design and management of this urban park. This collaboration effort between the public and the MP was effective in conveying the local people's voice up to local governmental level. This initiative could possibly encourage more public participation in sustainable design of urban parks in the future.

EDM9: Development of long-term strategies

Development of long-term strategies is vital in delivering ecologically sustainable practice. All the precedent studies have developed a long-term strategy that ties back in with the city master plan. For example, the *LOP's* strategy of biodiversity conservation is supported by a 10 year landscape management and maintenance scheme that conforms to the London Plan's biodiversity policy. The *BP* and *WP* both share a similar goal for sustainable water. The "active, beautiful and clean" programme to maximise the function of Kallang River as part of the multifunctional space in *BP* complies with the 15 year Masterplan of Singapore 2003 that requires integration of urban parks and water bodies. Applying a similar approach to Singapore, the *WP* is part of the integrated system of blue and green networks included in the Masterplan of Putrajaya 1997-2012. Meanwhile, in the *MP* and *TP,* strategies of landscape conservation are geared towards enhancement of the ecological image to improve the public's perception and understanding about ecological parks. Apart from these strategies, the park management of all the precedent studies are organising continuous environmental awareness and educational programmes for promoting ecologically sustainable landscape to the public.

EDM10: Apply slow incremental approach and resource efficient landscape management

The extent of ecologically sustainable practice varies among the precedent studies depending on the vegetation strategy of each site. In the cases of *MP* and *TP,* a slow incremental approach has been an appropriate solution to managing the natural regeneration landscape of the parks.

Shrinking budget allocation for landscape from the Sheffield City Council has been one of the key drivers for the park management of *MP* in adopting a slow incremental approach to managing the park. The landscape management team maximised the potential of the site's rich ecological assets (mostly covered with grassland) and proposed naturalistic planting focusing in priority areas, such as entrances and recreational space. Since the first phase of the park was re-established in 2003, the landscape has evolved slowly throughout the years. The management team keep improving their landscape practice by learning from their strengths and weaknesses in delivering ecologically sustainable practice to manage these landscapes:

> *"So, one of the great learning processes that I had on it personally is just watching the grassland over the period of ten years. To see what they do, what plans, is great, what the issues are. And learning practicality, what is achievable on the maintenance side".* (PS2)

In the case of *TP*, the park was designated as interim parkland. Due to this status, the National Parks Board (NParks) realistically decided that an intensive landscape design and management for the park was not practical, thus only a small budget was allocated for its development. Therefore, a low density design was proposed for the park, targeting low public usage and low maintenance. The park management ascertained that an ecological approach represented the most cost effective solution, as suggested by PS7:

> *"…the design of the park actually tells people that 'I [the park] am a nature park, you have to treat me with respect'…There, you cannot have any event space in which to gather or high impact activity that will have negative impact on the ecosystem"* (PS7)

Although an ecological approach provides similar benefits to large scale urban parks (*LOP, BP, WP)*, their adoption of green technologies and innovations such as SuDS, wetland system, cleansing biotope and soil bio-engineering techniques as part of their multifunctional components has imposed new maintenance requirements on the park management. This suggests that the overall maintenance intensity is subject to the park management's goals and constraints.

Due to the management emphasis on conservation of existing vegetation and naturalistic style plantings, all the precedent studies have promoted resource efficiency in their vegetation management. This strategy helps to reduce maintenance intensity and costs because the park management only carries out landscape maintenance in response to complaints or when it is necessary.

EDM11: Apply a dynamic and flexible maintenance regime

Another feature of the ecological management applied in the precedent studies is a dynamic and flexible maintenance regime designed to correspond to environmental changes and social requirements occurring in the urban parks. This approach helps the park management team to review and modify their landscape maintenance from time to time according to changes in the

site and resource availability. For example, in temperate countries with four distinct seasons, this approach has enabled park managers to change their maintenance techniques according to seasonal dictates (*LOP, MP*). Whereas, in tropical climates, the park management could make adjustments to improve the landscapes' adaptation to site changes brought about by the wet and dry seasons, as seen in *TP, BP,* and *WP*.

MP is the best example of applying a dynamic and flexible maintenance regime that allows the park management to maintain the parks on a modest budget. According to PS2:

> *"…it allows you to be flexible in your approach. You can take an area out of mowing and put it back into mowing depending on what resources you have available. It allows you to alter the way in which you manage your maintenance team. In the past we have had a large group of volunteers, apprentices and a training scheme. At the moment we don't have any. So we have to be able to swap between maintenance techniques and with flexible landscape you can alter the physical way that you deliver that maintenance"* (PS2)

In compliance to social requirements, the maintenance strategy is to give priority to certain areas that are noticeable by the public, giving an impression that these landscapes are purposely intended to be highly maintained while other areas remain natural (refer to figure 5.16). Changing the mowing technique is another maintenance aspect being stressed in the park. Following the "cues to care" theory by Nassauer, which emphasises the importance of people recognising the landscape and feeling safe to use the park, the park manager introduced smart mowing.

Figures 5.16: Photo showing "Smart mowing" as part of the maintenance regime adopted to manage the huge grassland area of the Manor Fields Park to make it more presentable to the public.
Source: Roziya Ibrahim (2013)

Considering the huge area of grassland, smart mowing is concentrated on the entrances and boundaries, and path and edges where the area is physically and visually accessible to people. Besides presenting appropriate visual appearance, this exercise has also helped to reduce the amount and cost of mowing throughout the park because it is concentrated only on small areas of the park which are actively used by people, while the rest of the site remains untouched.

A similar approach is also applied in *TP.* To keep the park in its present natural state, the maintenance team only focus on priority areas, such as along the pathway and park furniture (refer to figure 5.17); and carry out maintenance only when it is necessary.

Figure 5.17: Photo showing the smart mowing technique applied along the footpath and seating area of Tampines Eco-Green Park while the remaining areas are kept natural.
Source: Roziya Ibrahim (2013)

Although *MP* and *TP* need to comply with social requirements, their slow incremental approach to landscape maintenance seems to be sufficient to gain public acceptance. This type of ecological approach might thus be considered appropriate for small scale urban parks and those located in sub-urban areas.

EDM12: Combine ecological and conventional approaches to landscape maintenance

Although ecologically sustainable approaches advocate the importance of conserving the environment, in most urban parks, they must also accommodate recreational needs and requirements. Thus, some of the park management in the precedent studies (*LOP, BP, WP*) have mostly preferred a combination of ecological and conventional approaches, with emphasis on intensive but purposeful maintenance, focusing on selected areas while others are left natural. As these large scale urban parks are located in the central part of the city and receive many visitors, it is essential for park management to maintain cleanliness and tidiness in high public usage spaces.

The vegetation strategy for the London Olympic Park focuses on ecological landscape in the North Park, while an intensive conventional approach is applied in the South Park with large scale urban meadows. Thus, landscape maintenance is likely to be more intensive in the South Park than in the North Park. Although the planting is quite intensive in certain parts of the park, overall the landscape maintenance is still much lower than in other public parks. This is because it is only needed in the south area where the landscape is actively used by the public:

> *"Probably still tall sorts of plantings are intensive, but it is intensive through a purpose, and that is the focus of the park, in the area down here (South Park). And what's unique about the park is there is a great advantage in its location, and the person who is the head gardener. And the head*

gardener's responsibility is very much towards the maintenance of the 2012 Garden. Whereas the rest of the park, it is a lot more low input." (PS3)

Similarly, *BP* adopted a dual approach to its landscape maintenance. In general, the parkland area is still maintained through horticultural practice, while the naturalistic landscape allows a more flexible maintenance. This approach manages to achieve some balance between the aesthetic appearance and eco-capacity. In the case of *WP,* Putrajaya Corporation (PJC) also apply a mix of conventional and ecological approaches to their landscape management despite having an integrated design. The distinct maintenance scope and requirements of the park and the wetland cells have resulted in the PJC managing these two areas as two separate packages. The park engages in regular and intense horticultural maintenance of public spaces such as lawns and shrublands, while maintenance of the woodlands tends to be more flexible.

The integrated design of the Wetland Park has expanded the scope of maintenance in terms of the wetland system. Although the maintenance requirements of the natural landscapes have been reduced, maintenance intensity could be similar or higher than in a normal urban park, as PS10 admits that:

"It doesn't actually reduce the maintenance... we have to maintain the park in terms of the operation. In terms of the maintenance of the soft-scape, there is not so much watering because most of them are big trees. They can depend on rainfall. Basically it is just mowing the lawn and pruning the trees and shrubs, and then cleaning up, clearing the branches and things like that, and then sweeping the fallen leaves...In the areas where visitors mainly go, we still maintain them based on a daily routine but the rest of the areas you keep them as natural as possible. " (PS10)

Regular replacement of the wetland species is vital to ensure the wetland system performs its function constantly. As some of the wetland species are not produced commercially, the park management set up a plant nursery in the park to ensure adequate supply of these species for replacement of unhealthy or dead plants.

For those parks that adopted green technologies, the overall landscape maintenance would not be much different from the conventional approach; indeed, it could be more intense during the establishment period. This is because ecological design requires specialist input into its maintenance. As mentioned by PS5, this project (*BP*) was never designed for low maintenance.

"…it was never designed to be of lower maintenance than a concrete drain, because it's just not possible. This is a living growing system, so it requires more regular maintenance. But we can also explain the fact that it is also a self-sustaining adaptable system". (PS5)

PS2 further suggests that that adopting ecological design does not reduce the amount of maintenance work, but instead changes the scope of maintenance (refer to figure 5.18). For instance, the adoption of the SuDS and the green roof reduces the frequency of the maintenance in terms of pruning, grass mowing and watering. However, the scope of work is now shifting to maintenance of the cleansing biotope and soil bio-engineering that imposes different requirements. This suggests that the maintenance team or landscape contractor should receive proper training and supervision during the operation and maintenance.

Figure 5.18: Photo showing the “smart mowing” at certain areas of the Kallang River (left) and the bioswale that requires regular de-silting (right).
Source: Roziya Ibrahim (2013)

The above findings suggest that applying ecological design may not necessarily reduce expenditure. Therefore, it is important that all the stakeholders within the park management understand the concept and the purpose of the ecological design before delivering this maintenance regime. Even so, the park management acknowledge that these landscapes are more resilient to the changing environment, arguing that in the long term it will become a self-sustaining landscape and gradually the cost of maintenance will fall.

EDM13: Engage in joint management and maintenance

Adoption of a multifunctional and integrated design scheme creates multi-task management of urban parks and the storm water management components. *BP* is the best exemplar of collaborative management between the NParks and the PUB. The two authorities are engaged in joint management and maintenance of the transition zone created along the naturalized river, as well as taking charge of their own sections of the Bishan Park and the Kallang River.

In the previous conventional practice, the Kallang River canal and the Bishan Park were treated as different entities and separately managed by the PUB and the NParks. However, the river restoration has created an additional 10ha of green spaces throughout the transition zone, with no distinct border (refer to figure 5.19). This led to the expansion of the project’s scope, under which it is jointly managed by both agencies.

Figure 5.19: Photo showing the scope of management for the Bishan Park-Kallang River according to area zoning.
Source: Roziya Ibrahim (2013)

Despite the advantage of gaining new skills and knowledge about ecological design, sharing management responsibility between the PUB and NParks is not an easy task. According to PS5, it is important that all relevant stakeholders have the same mind-set regarding the ultimate goal of this project:

> *"It is a lot more complex because in our previous regular practice, it was really easy to delineate responsibility, it is standard. You can draw one line and say this is yours and this is mine. But for this project it is very much more difficult. Even before the project starts the stakeholders must share the same vision. It's not about your responsibility and my responsibility, it's about what can we do to make this better for the public. Who does it is not really so important. So, it's really a change in thinking, not about responsibility, but about what you are trying to develop."* (PS5)

Eventually, the ability of the park management team to work with different professional backgrounds and willingness to change the management culture has led to a consensus to share responsibility for managing the transition zone.

Unlike *BP*, other precedent studies engaged in collaboration during the design phase, while still practising a conventional approach that involved separate contracts for management of the landscape and the water management system (*WP*), or assigned all these multifunctional designs as a landscape management package (*MP, LOP, TP*).

In *WP,* the Landscape and Park Division, PJC is responsible for managing the park, while the wetland system is managed by the Wetlands Management Unit of the Lake Management Division, PJC. As the maintenance of wetland components requires specialist input, the PJC engaged relevant experts and landscape contractors to assist them in managing this system, as described by PS10 and PS11:

> *"For the park we have a different contractor to do it [the maintenance], basically taking care of the soft-scape, the cleaning, fertilising, pesticide control, watering under normal horticultural practice. But for the wetland, it is a different form of maintenance…we have a consultant to do a routine check up on the quality of the wetland cells, the quality of the lake water and the plants as well…The care is not the same as the park, cells [wetland] are more technical"* (PS10)

> *"It [the wetland] is under a different contract because for the wetland cells, they have their own experts to maintain it…It is maintained by another department [Wetlands Management Unit], because their maintenance work is quite different. That is inclusive of testing the quality of water and the wildlife [management]".* (PS11)

In some precedent studies, the delivery of the landscape management packages in the urban parks and green spaces is still under the jurisdiction of the local authorities (*BP*, *TP, WP*), thus, the capacity of park management to deliver ecologically sustainable practice is limited and confined to the conventional landscape management system. However, the temperate countries have initiated new schemes for managing their urban parks. For instance, in the UK, a recent approach to park management is to engage non-profit companies, such as the Green Estate (*MP)* and the Olympic Park Legacy Company *(LOP*), giving them more power to generate and manage resources independently for park maintenance.

5.2 Appropriate appearance of ecologically sustainable landscapes

Despite its contribution to sustainable water management and increasing ecological sustainability, integration of SuDS into an urban park creates a more naturalistic landscape, which might not necessarily display favourable impressions among the public regarding aesthetic appearance and safety. From the site observation, all the precedent studies applied different strategies to enhance the aesthetic aspects of their ecological design to make the park's visual appearance acceptable and recognisable to the public. These strategies demonstrate a similar approach to the "cues to care" theory by Nassauer (1995). However, the implementation of these strategies differs between temperate and tropical countries and also depends on the levels of ecological treatment according to their environmental function; thus, it creates a different landscape appearance. The following sections present illustrations of ecological landscape designs extracted from the findings of the precedent studies and used to inform and guide the development of an ecological design framework for Kuala Lumpur's urban parks.

5.2.1 Ecological treatment for lawn and grassland areas

Lawn and grassland cover most of the public space or areas bordering the parkland areas of urban parks. Being part of an active and multifunctional space for recreational activities, the integration of SuDS into these spaces needs to be balanced with public expectations on cleanliness and tidiness. Although the presence of SuDS components for surface drainage may require the grass to be kept a little higher for filtration purposes, it is still necessary to keep these areas up to an acceptable level of cleanliness and tidiness, with some recognisable landscape maintenance conducted regularly in order for people to feel more comfortable with the landscape's appearance.

- ***Moderate treatment***

Figure 5.20 presents a moderate treatment for ecological design of lawn and grassland areas. Alternative 1 provides a clear transition space between pathways and the SuDS component or

natural vegetation, showing the public that the park is being maintained. Some of the vegetation is intentionally left to grow naturally while the existing grass is kept below knee level.

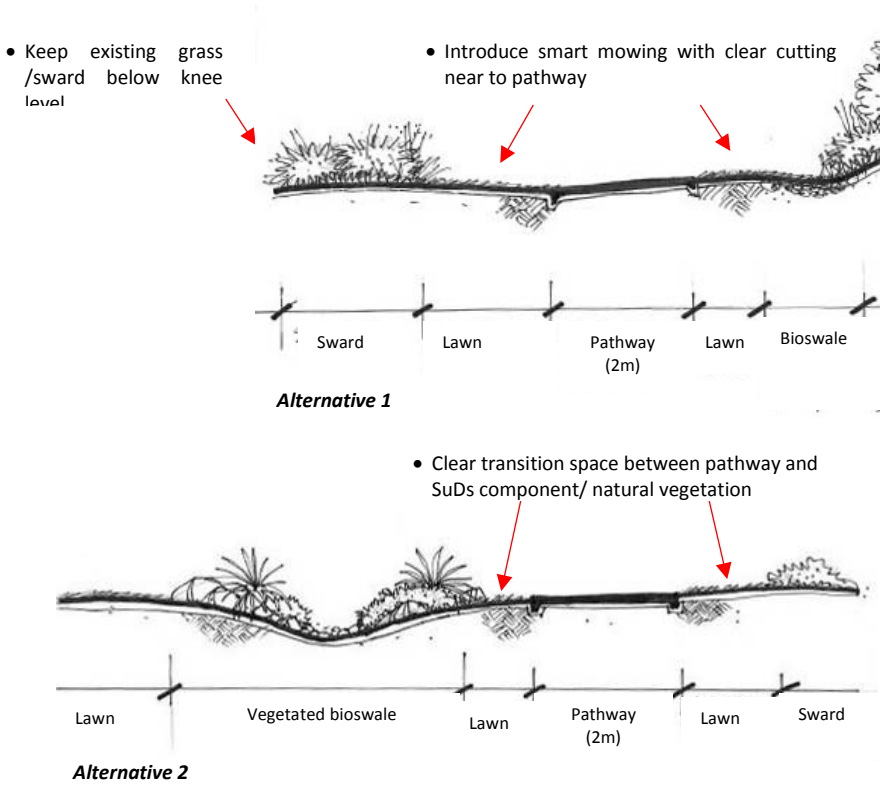


Figure 5.20: Moderate ecological design treatment for lawn/grassland (*Not to scale*)

The transition space also creates an edge to the ecological landscapes. This moderate treatment creates a simple grassed bioswale along the pathway to clearly display its hydrological function to the public. A similar approach is applied in tropical countries, but because of the tropical climate and high intensity of rainfall, a wider vegetated bioswale is required as shown in Alternative 2.

- ***Intense treatment***

As shown in Figure 5.21, the intense ecological treatment for lawn and grassland areas presents a denser and wilder form of ecological landscape that could look messy and unattractive. This treatment is usually applied to areas near to existing vegetation. For example, in Alternative 1, the sward and rank vegetation of the park is left to grow naturally up to a certain height exceeding eye level. However, it is important to keep a clear transition between the pathway and this vegetation as a safety buffer so users feel secure in using the space.

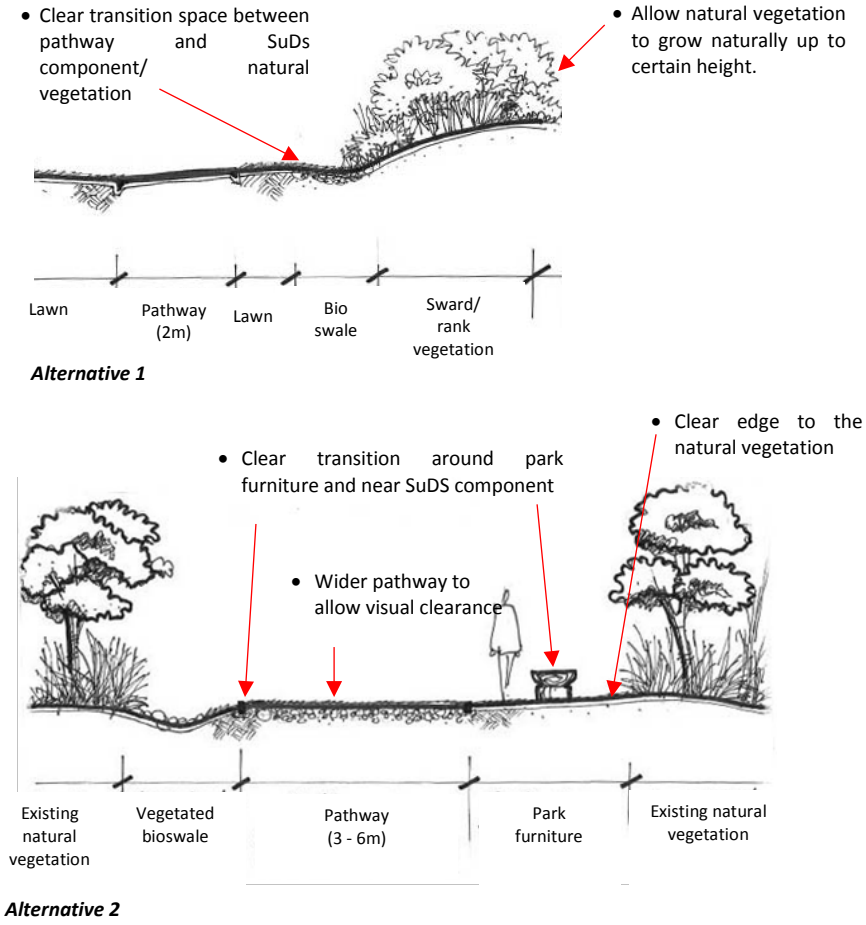


Figure 5.21: Intense ecological design treatment for lawn/grassland (*Not to scale*)

Application of intense treatment in tropical climate countries requires different measures because the extent of the grassland is greater and it grows faster; and its appearance is messier. Therefore, a wider pathway (approximately 3 – 6m) is provided through the grassland areas to allow visual clearance for user safety. As ecological design also aims for habitat diversity and wildlife enhancement, it is important to have a clear transition around park furniture while letting the existing vegetation re-generate into secondary forest for protection from harmful animals like snakes. In addition, clearance along SuDS components, such as the vegetated bioswale helps to avoid siltation and water clogging. These measures give a sense of assurance that the park is properly maintained; and eventually the park users feel more comfortable and safer in utilising the space.

5.2.2 Ecological treatment for shrubland areas

Shrubland is another important space in urban parks. In conventional landscapes, such areas usually have large displays of shrub borders with a mix of colourful ornamental plants, which require intensive maintenance. The SuDS components integrated into this area were enhanced

by introducing a naturalistic style landscape along the vegetated bioswale that replaced the horticultural practice with a more ecological approach.

- ***Moderate treatment***

Figure 5.22 illustrates moderate ecological treatments for this area that include the incorporation of SuDS components as part of the ecological design. To enhance the aesthetic look of the SuDS component, a naturalistic style planting is included in some parts of the vegetated bioswale. In the UK, this style is presented in alternative 1, and involves the introduction of natural to semi-natural urban meadows with a mixture of both native and non-native species. Besides their ecological value, naturalistic style meadows have a big impact in terms of beautiful appearance when applied on a large scale.

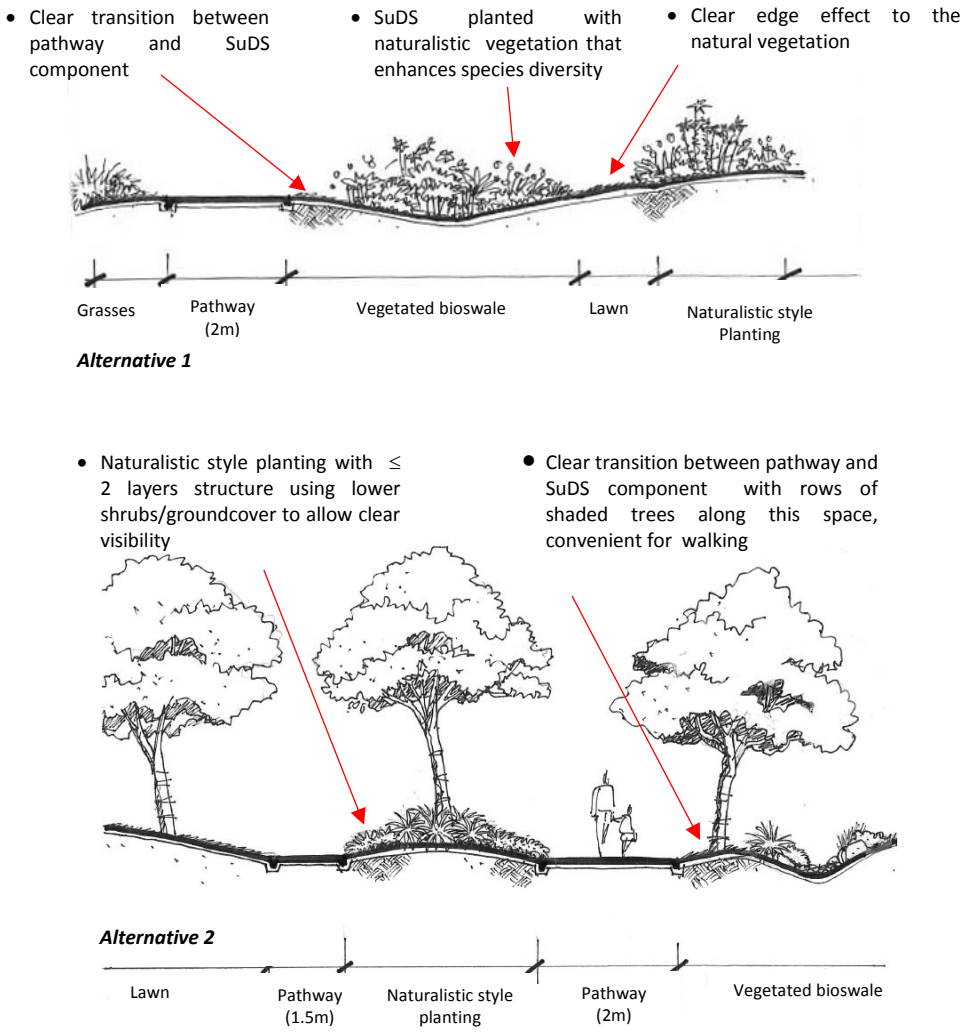


Figure 5.22: Moderate ecological design treatment for Shrubland area (*Not to scale*)

This strategy also helps in reducing vegetation management because the sowing technique creates a more robust landscape. Its integration with SuDS allows the naturalistic landscape to absorb water from the bioswale for its survival. A clear transition is provided between the pathway and SuDS component to frame this landscape. In some areas of shrubland, the park management provide a clear edge and access to the naturalistic landscape.

In a tropical climate, alternative 2 presents a more appropriate ecological design appearance based on naturalistic style planting using several species but in large volumes. This naturalistic style landscape is planted in open spaces or underneath shaded trees. However, it is important to keep this landscape to a height below knee level by using low shrubs and groundcover to allow visibility across the parkland, as the public often utilise this space for their recreational activities. A combination of naturalistic style landscape and vegetated bioswale located along the pathway with a transition space in between helps people to recognise the SuDS function through a more familiar form as suggested in the “cues to care” theory (J. I. Nassauer, 1995).

- ***Intense treatment***

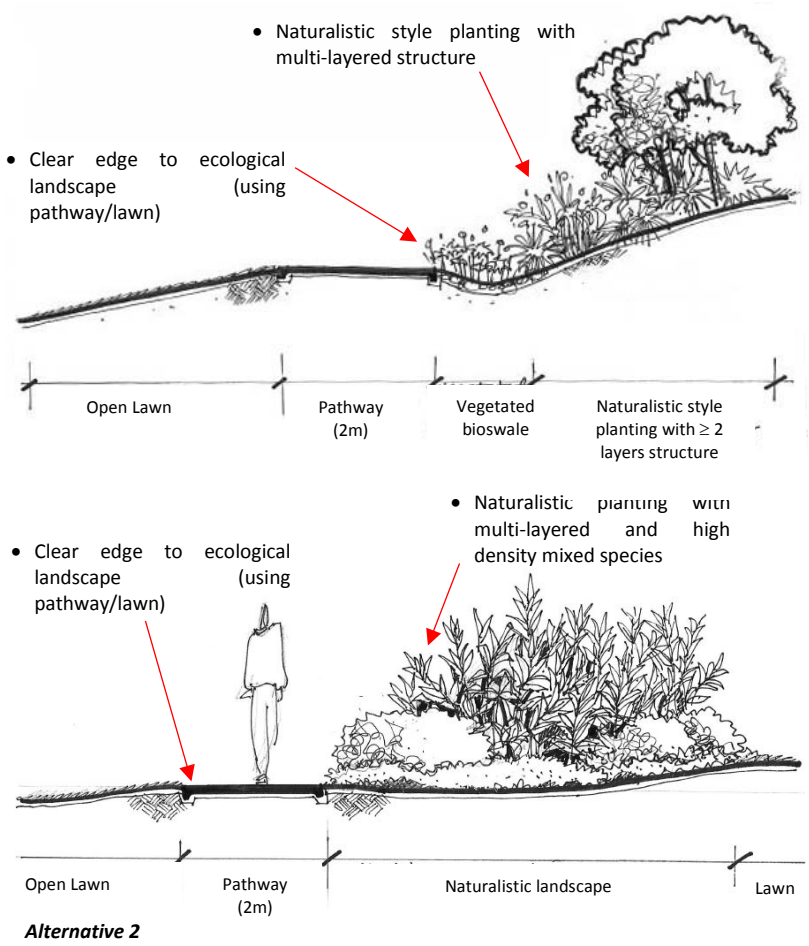


Figure 5.23: Intense ecological design treatment for Shrubland area (*Not to scale*)

Some of the precedent studies have adopted a more intense treatment for their ecological designs of shrubland areas. As shown in Figure 5.23, naturalistic style planting is presented in a multi-layered structure with a combination of trees and shrubs, placing emphasis on a plant community that will create habitat diversity in the shrubland. This ecological strategy requires minimum intervention in terms of vegetation management as it is a more self-sustaining landscape. In some areas, there is no transition space between the pathway and the ecological landscape.

In alternative 1, the naturalistic landscape is located adjacent to the pathway, with a clear edge to show the distinct character of this landscape. In other spaces this treatment is contrasted with open lawn (*MP, LOP, TP*).

Alternative 2 shows a naturalistic style of planting that is used in the tropical urban parks. In precedent studies such as the *WP* and *BP,* where ecological design was a relatively new concept, this landscape style has been introduced in the shrubland in a similar composition to conventional landscape, with a multi-layered structure of mixed native and non-native species. Unlike alternative 1, naturalistic style planting in shrubland may still require regular maintenance to keep up the appearance of this high density landscape so that it meets public expectations.

5.2.3 Ecological treatment for semi-woodland area

The woodland or semi-woodland usually covers a small area, mostly in the peripheral areas of urban parks. Through the incorporation of SuDS, this area acts as natural bio-filtration for managing stormwater. The establishment of more semi-woodland area within urban parks will support the hydrological process. Although people are familiar with woodland landscapes, having this type of landscape in urban park may not be to the liking of some people for safety reasons. To address this issue, park management in the precedent studies applied moderate ecological treatment of this area to gain public acceptance of having more woodland cover in an urban park.

- ***Moderate treatment***

Alternative 1 in Figure 5.24 presents a moderate treatment for a semi-woodland area with tree clusters with understorey planting using native species below knee height. This semi-woodland landscape is integrated with the vegetated bioswale and planted with native species in a natural form. This treatment is most appropriate for passive recreational areas of the park that are purposely designed for low public usage, such as the North Park of the *LOP,* where people tend to accept the unkempt appearance of this landscape. Despite its messy look, a clear edge is provided immediately next to this landscape, such as the pathway, and along its border.

Applying a similar approach, alternative 2 is mostly applied in tropical urban parks like *BP.* However, in this park, the understorey planting consists of a single species. The reason for keeping the understorey plants below knee level is to allow visibility across the semi-woodland area, whilst also keeping a clear transition space between the semi-woodland and the pathway for safety reasons.

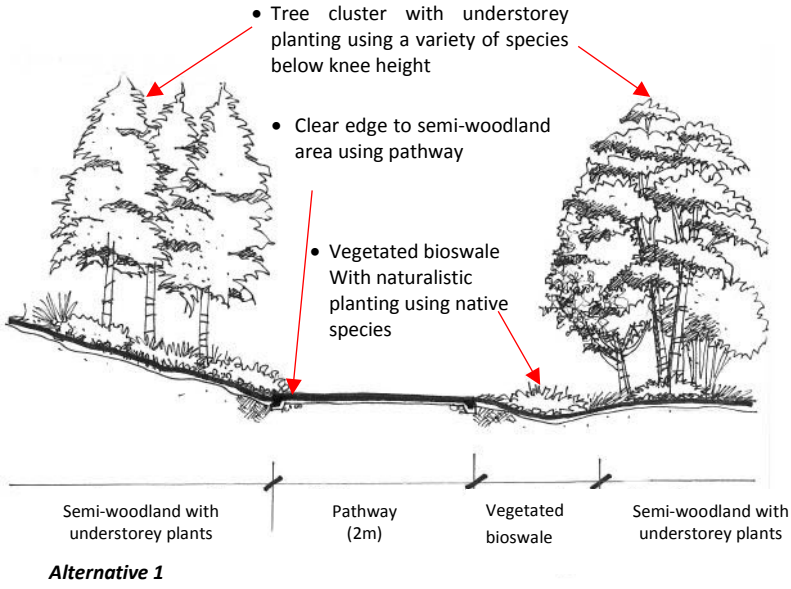
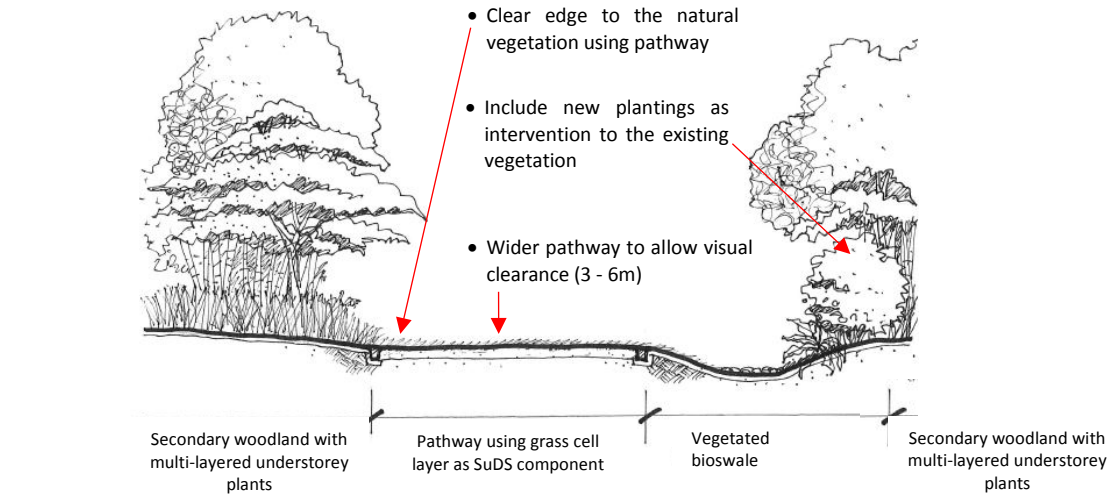


Figure 5.24: Moderate ecological design treatment for the semi woodland area (*Not to scale*)

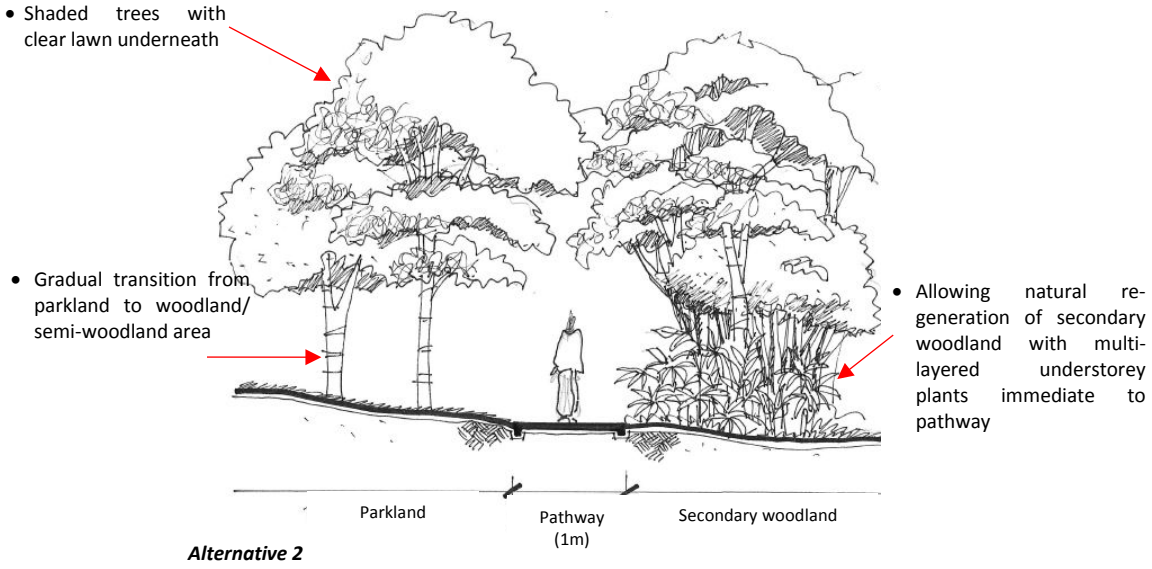
- ***Intense treatment***

Figure 5.25 presents a more intense naturalness of woodland areas to the public. This could be achieved by improving the access to this area as in alternative 1, or by allowing the natural

landscape to be immediately next to a public space and pathway as shown in alternative 2. To improve access to the woodlands, a wider pathway is provided (3-6m) to create visual clearance. When a clear edge to the existing vegetation is provided, people tend to feel more secure to experience nature and observe wildlife.



Alternative 1



Alternative 2

Figure 5.25: Intense ecological design treatment for the semi-woodland area (*Not to scale*)

Putting the SuDS component along this pathway makes its hydrological function visible to public. The park management only focus on the maintenance of the vegetated bioswale and pathway while the existing vegetation can be left to re-generate into secondary forest, with necessary pruning whenever the vegetation encroaches onto the pathway. To further enhance the aesthetic appearance of the woodland, new planting is included at its edge, as an intervention to improve the messy look of the existing vegetation.

5.2.4 Ecological treatment for ponds and water edge areas

Water bodies and waterways play a significant role in establishing ecologically sustainable landscape in urban parks. The SuDS scheme provides an opportunity to sustainably manage storm water within and beyond the park boundary using various green innovations and technologies. Being part of the SuDS component, ecological treatments for ponds and water edge areas use wetland plants according to their specific function, for water retention, detention, filtration, etc. However, as this ecological design also serves an environmental and sustainable education function for the public, it is also necessary to enhance these hydrological functions to make their appearance more evident and presentable.

- ***Moderate treatment***

Figure 5.26 presents moderate treatments for ponds and water edge areas of urban parks. Alternative 1 presents a moderate treatment for a pond that uses a lawn area to act as surface water drainage that requires less mowing. Two layered planting is included, sufficient for slope protection and water filtration, which is also supported by low vegetation. Overall, this ecological landscape is kept neat and tidy (*WP, TP*).

Alternative 2 shows a moderate treatment at a natural water edge area of the *BP*. For hydrological purposes, knee high planting was proposed for slope protection and filtration. As this flood plain area also serves as recreational space for the public, lower vegetation at the river base allows greater access to the river. On some parts of the river edge, higher plants of 2-4m height were planted in clusters according to their specific hydrological function. While the grass within the transition zone is mowed to keep it at a certain height, in some parts of the floodplain terrace area the grass is left to grow higher. The different treatments applied along the water edge are purposely designed to distinguish between the managed and unmanaged landscape so that the ecological design is more recognisable to the public.

Alternative 3 presents an ecological treatment for a river edge with a structural embankment. A lawn area acts as surface drainage and at the same time creates open space suitable for rest and recreational activities. The ecological treatment along the structural embankment comprises wetland reed beds pre-established on coir roll and pallets placed on a buoyant medium designed in organic shapes to form wetlands that not only alleviate stormwater but also display a pleasing, naturalistic floating wetland appearance.

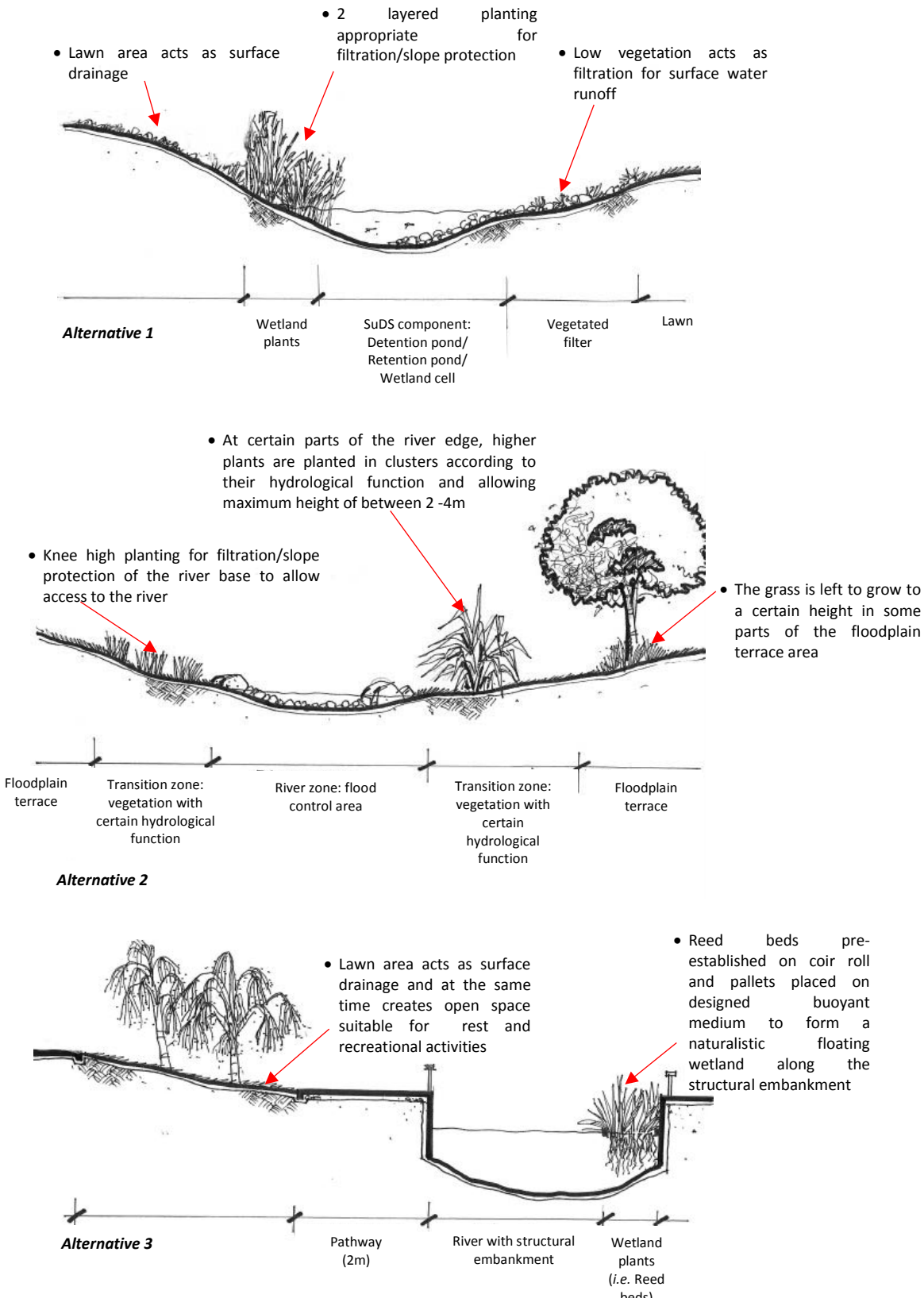


Figure 5.26: Moderate ecological design treatment for ponds and water edge area (*Not to scale*)

- ***Intense treatment***

As shown in Figure 5.27, in alternative 1, intense treatment for a pond involves creating multi-layered plantings using a variety of wetland species to create habitats for aquatic life and wildlife and to perform its hydrological function for SuDS (*BP,TP,LOP*). Applying a smart mowing technique, an area surrounding the pond is left as natural as possible, allowing the grass to grow to maximum height, while mowing is concentrated on a small part of the area (*MP*).

In alternative 2, which is applied at the *TP*, the existing grassland and woodland with multi-layered understorey plants are left to naturally re-generate immediately adjacent to the pond area and act as natural bio-filtration. To balance the unkempt appearance of these natural landscapes, knee high planting was proposed for filtration of the surface water runoff from the pathway and open space, or from bioswale before entering the pond (*TP*).

In alternative 3, which is applied at the *LOP*, multi-layered woodland with a variety of native species is located next to the pathway and park furniture, with no clear transition space or intervention applied between these spaces. The natural river bank is also covered with multi-layered wetland species along the river for slope protection and water filtration. Overall, intense ecological treatment is used in low public usage areas of the park, which are purposely designated for biodiversity enhancement and nature experience.

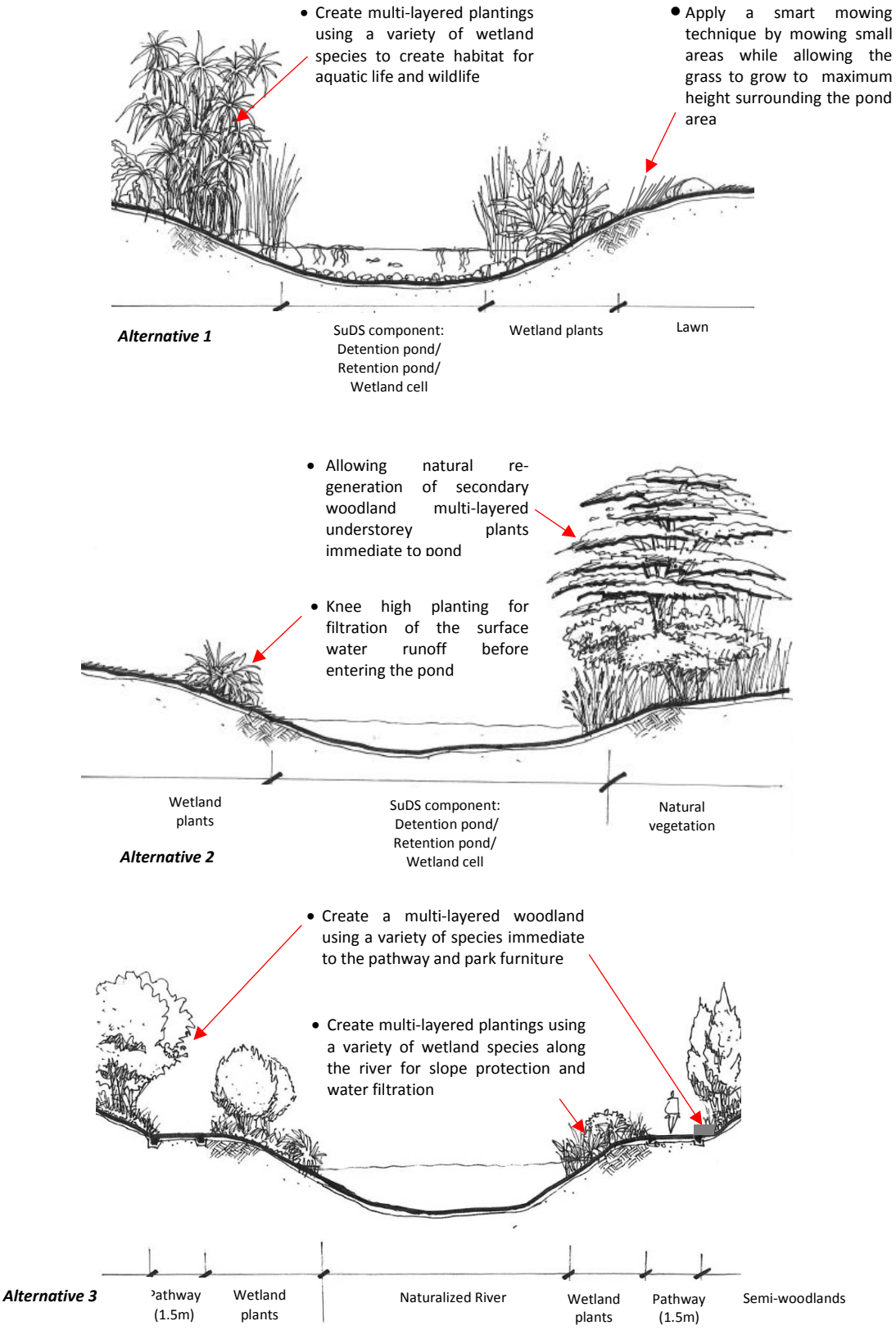


Figure 5.27: Extreme ecological design treatment for ponds and water edge areas (*Not to scale*)

5.3 Stakeholders' attitudes to delivering ecological design and management

Stakeholders' attitudes to delivering ecological design and management were assessed in terms of the benefits and challenges based on their own experience and involvement in urban park management of the precedent studies.

5.3.1 Key benefits and challenges of implementing ecological design and management of urban parks through the integration of SuDS

Overall, stakeholders in the precedent studies recognised the environmental and social benefits of ecologically sustainable landscape practice. The findings from interviews with landscape architects and park managers confirmed that delivery of this ecologically sustainable practice through the integration of SuDS in the urban parks has been beneficial for managing stormwater on-site. Besides performing their hydrological function, SuDS components in the form of landscape elements have created habitat diversity, providing food and shelter for wildlife, which helps to increase biodiversity.

The integration of water and green components creates new space for leisure and recreation. For instance, the transition zone created through the naturalized Kallang River has added approximately 20% of green space to Bishan Park and opened up more access to this public space. Constructed ponds and wetlands in the parks serve as public amenities (*MP, TP);* and a man-made lake offers water-based activities such as boating and fishing *(WP).* The treated water is reused for landscape maintenance, such as irrigation *(LOP, BP, WP) and* outdoor cleaning purposes *(WP)*, as well as a children's water play area *(BP).*

Besides serving recreational needs, these parks have become an educational medium to instil environmental education and awareness among the public. Through these multifunctional aspects, the precedent studies have significantly contributed to creating a city wide green infrastructure in reducing the impact of environmental challenges and climate change in the relevant cities.

However, this research focuses mainly on the benefits and challenges faced by park management in the local context of each of the precedent studies, and comprehending the impact of this ecological approach on the different parks, taking into account the climatic and cultural differences. These findings will be considered further in the case study interviews with urban park management in Kuala Lumpur, Malaysia.

5.3.1.1 Benefits of delivering ecological design and management

Delivery of ecological design provides multiple benefits for urban park management in moving towards a more sustainable practice; these are outlined as follows:

a. Multidisciplinary collaboration encourages smart partnership between public and private agencies

Multidisciplinary collaboration encourages integrated thinking among the various stakeholders in addressing issues and problems related to park design and management, and sharing of special skills and knowledge among the local practitioners (*MP*) as well as international expertise (*LOP, BP, TP and WP*) in delivering ecologically sustainable practice. Such collaboration provides the park management with more opportunity to explore alternative design solutions than would be possible with the normal landscape practice. However, there were distinct variations in the extent of collaboration across the cases. *MP* and *TP* were observed to have a smaller design team and simpler organisational structure because their goals, scale and designs are less complex as compared to the *LOP*, *BP* and *WP*.

In relation to *BP,* such collaborative effort promotes joint management between different local authorities, which is reflected in the management and maintenance of the transitional zone of the naturalized Kallang River. The landscape architect became more optimistic regarding this new approach once full support was gained from the stakeholders in terms of their skills and expertise, along with their willingness to accept changes in their landscape practice.

In some cases, local and international expertise has been brought in from a range of backgrounds to assist in the park's development, such as in the *LOP, BP, TP, WP.* For example, as ecological design and management is a new practice in Singapore, the delivery of this approach to *BP* and *TP* was reliant upon external consultants. Even so, the park manager has the equally important role of advising on the ecological design and management aspects most appropriate for the site in terms of their practicality and adaptability to the local context. Enhancement of these valuable ecological assets also provides an opportunity for the park management to promote this sustainable landscape to the public.

b. Foster research and experimental inputs to support innovative ideas in delivering ecological design and management

All the precedent projects recognised that introducing multifunctional design through the integration of SuDS has potentially introduced new techniques and innovative ideas in delivering ecologically sustainable landscape practices in urban parks. The pictorial urban meadows in the *LOP* and *MP* are supported by research input from the University of Sheffield. They have conducted experiments on-site and developed new techniques to improve the

planting and establish naturalistic style planting (refer to figure 5.28). This is an interesting way of supporting local authorities and management teams in applying new approaches and creatively presenting them to the public.

Figures 5.28: A photo showing a "pictorial meadow" applying a new vegetation management technique, supported by research input from the local university
Source: The Green Estate Limited (2014)

Research and experimental inputs become more crucial when technologies transferred from other countries need to be adapted to the local context because of different climatic conditions. This is true for *BP* as informed by PS6:

> *"It's ultimately a very new thing. In fact, I don't think at the start we were 100% sure that it would take off well, even maintenance wise, whether things could be easily maintained, whether certain planting would sustain over a long period of time. We took a risk. It was very hard for us to incorporate fully western techniques into Asia, because our plants are very different. So, we actually did as much background research as possible to support what we know can happen or will happen".* (PS6)

Such research will make the park management more confident in delivering these technologies and support implementation of an ecological design that is more practical and appropriate for the local environment.

c. Improve ecological knowledge and skills among the park management team

Ecologically sustainable practice offers opportunities for the urban park management team of learning new knowledge and improves their skills in applying ecological approaches. In the *MP* for example, the establishment of "pictorial meadows" using perennial plants has helped the park management to improve their vegetation management through working closely with the local university. According to PS2:

> *"There was actually an early attempt at a perennial system…basically a meadow, but not a native meadow, that was exotic. That was done by the Council's landscape architect, and that was a very useful learning tool, because they were put in early on in the life time of the park, and that was very long term maintenance. From those we have learned an awful lot about how to maintain perennial systems, through several researches done by James Hitchmough and Nigel Dunnet. The issues were how do you take that knowledge and apply it on a large scale with limited resources, and sometimes a limited skill set".* (PS2)

Applying ecological design in the *BP* also yielded the same response. As illustrated by the park manager at Bishan Park:

> *"So you begin to learn how to manage the site when it's a bit of an unknown, with such a difficult area, you just don't know what you are going to convert, it is slowly feeling your way in, growing your management knowledge and skills as the park develops (MP1).*

Skills and expertise in ecological design and management developed on one project could also be transferred and applied in other parks and open spaces in the city:

> *"…the knowledge that you acquire, the experience that you acquire, this is invaluable knowledge that would help develop a pool of expertise that can be harnessed in other similar developments elsewhere". (PS9)*

This will not only improve landscape management of a specific park, but also could begin to promote ecologically sustainable practice in other urban park developments.

d. Promote adaptive design and management that reduces landscape maintenance

Applying a slow, incremental and light touch approach to ecological design can enable the urban park management to develop and maintain a small part of the urban park within a limited budget, while allowing existing vegetation to re-generate naturally. Thus, the naturalistic landscape will be more adaptive to environmental and social changes. This approach has been very effective in promoting self-regenerating landscape in the *MP* and the *TP.*

Another advantage of the slow incremental approach is that it enables the park management to maintain urban parks with a smaller team, which will also make staff training and supervision much easier. At the same time the team will have more opportunity to be directly involved in decision making in relation to the maintenance work. Through this approach, the park management saves on costs of landscape maintenance for the park in the long term, as was suggested by the landscape architect for *MP*:

> *"Actually, yes cost per square metre of the site is a lot less than in other parks, than in Graves Park [another park in Sheffield]".* (PS1)

Applying a flexible maintenance regime by placing emphasis on priority areas has become one of the best solutions to gain public acceptance of these parks.

> *"Our slow incremental approach has been appreciated by people in the park…I think it is not an easy exercise, and the Green estate has been absolutely significant in the success of the park because they have been willing to stick their necks out and challenge people and their behaviour on the site".* (PS1)

Despite it being time-consuming, their strong efforts and commitment to educate the public about the park have eventually led the public to begin to appreciate this landscape style.

It was noticed that this slow incremental approach has yielded more significant management benefits for the *MP* and *TP*, compared to the *LOP, BP and WP*. This infers that smaller scale parks located on the outskirts of the city, with little maintenance allocation, as well as those with natural and derelict site characteristics, lend themselves to this approach.

e. Generate multiple sources of funding for the urban park

Multidisciplinary collaboration provides an opportunity to generate new sources of income and funding from respective government agencies involved in urban park development (*LOP, BP, TP, WP*). Besides receiving allocated budget from relevant local authorities, involvement of other organisations (i.e. Trusts) could bring additional funding for urban park management. The *MP* is the best example of this practice, with the project receiving additional funding from the Wildlife Trust and the Manor and Castle Development Trust for the SuDS scheme, apart from the allocation by Sheffield City Council. Unlike most other parks in Sheffield, which are owned and managed by Sheffield City Council, this park is managed by the Green Estate, a public enterprise that generates its own income from landscape services to support the management of the park, as suggested by the landscape architect:

> *"…the model of the social enterprise can support the management of spaces through a range of activities. They actually have businesses like maintenance of schools, or other landscapes; or contract management, building things, green roofs and all sorts of things. They do that to earn profit which they can use for this park…the fact is that it is still surviving and still delivering".* (PS1)

This public enterprise was formed by the Manor and Castle Development Trust and the Wildlife Trust, through the park regeneration fund and the sustainable urban drainage system (SuDS) fund. The sustainable drainage system brings income into the park on an annual basis from the housing developer. PS2 strongly believe that:

> *"…so, on a long term basis, we will be receiving funding from that (SuDS) towards the maintenance of the park that is independent of public funding, which is very important".* (PS2)

These additional sources of income can support the park management in securing its own financial back-up for park maintenance in the future, without having to depend on government funding.

5.3.1.2 Challenges of delivering ecological design and management

Despite the many benefits generated by integration of SuDS into urban parks, the precedent studies highlight several challenges facing the urban park management in delivering this ecologically sustainable practice, which are discussed as follows:

a. Disputes over ecological design and management

The main challenge facing the urban park management is to gain mutual consensus among all the relevant stakeholders involved in urban park management on the key concepts of ecological design and management. Convincing the relevant stakeholders of the advantages of an ecological design has always been a challenging task for the park management, especially when they are not familiar with this approach. As the nature of the project involves multidisciplinary collaboration, each agency may have different goals and objectives in regard to development of the park, as well as their needs and requirements:

> *"…a park shouldn't stand alone, It shouldn't have a boundary around it…It should be part of the landscape stretching beyond itself, which is a difficult thing to achieve because then you will start involving all sorts of other organisations, many of them have their own vision"* (PS2).

This is more critical in large scale projects like the *LOP*. Despite inclusion of the long-term vision for East London in their planning, the design and management team had to keep pace with the short-term goal of the Olympic Games 2012 milestones, which required their full commitment to a demanding collaborative works environment, with a lot of interphasing works during the construction period, as explained by PS3:

> *"…the Olympic Park is not a typical project. So, the stages of works obviously vary in terms of their length, and with the Olympic Park, because you have this leading deadline there are already was a design that they were starting to implement on site. So, that process (conceptual stage) had to be really quick because they had to tell the people on the ground that they need to stop building that landform, and actually build a very different landscape. In terms of that stage, the conceptual stage, it probably lasted for two months. That is a very unique situation, normally a conceptual design, the timescale will be a lot longer".* (PS3)

Thus, PS5 suggests that it is not possible to satisfy everyone's needs without mutual tolerance and compromise over the design and management of *BP*:

> *"First of all the person who maintains the park must appreciate that there are many competing needs. Here it's not just about the aesthetic, it's about eco-capacity, biodiversity, ease of maintenance, all these together. I think there is a challenge here in that finding balance is a really critical thing. Because, if one aspect gets overly emphasised the rest will suffer…you need to hear from everybody. Then combine all their requirements and come out with a model that best fits everybody's needs. They all have to make compromises…at the end this is something that the majority will benefit from."* (PS5)

In the face of differences in background and expertise, the *MP* is the best example of achieving mutual consensus in delivering ecological design and management:

> *"We all shared a vision on a naturalistic approach to landscape, which this site lends itself to very much, because it has been left abandoned for decades. So, there was natural regeneration, which is going on…It became apparent as we moved to the site that any kind of approach that was not ecologically based would make no sense. Because the park is 25ha, and a very large part of it is unmowable. So, it needed a light touch approach. And it was through my involvement in the management and maintenance that the idea about how we should approach the maintenance of the site was developed…it seemed obvious to us all that this was the route that we should take. There was no argument about it"* (PS2).

However, there is also evidence of contradictions between the stakeholders in managing the park in terms of planting strategy. For example, in the *BP*, PS5 believed that plant selection has been very effective in managing the stormwater, besides providing ease of maintenance. To the contrary, PS6 thought that some of the plants selected were not suitable for certain portions of the river area and the shrublands and that eventually they required high and labour intensive maintenance, thus increasing operational costs.

> *"I have got to say, in the start when the consultant proposed a certain planting scheme… but they don't work very well when it comes to a maintenance point of view. I think that is, being consultants, they do not do operations. They come from a design point of view. What they design and what actually will happen to these plants and how they are actually maintained are actually very different. For example, some of the planting, if you look at our island, is actually planted with some nice plants, but after a while, weeds take over. The easiest way to maintain weeds is you just mow... So, regarding plant choice, after a while we see the result is that it has actually resulted in higher maintenance."* (PS6)

Another challenge that could impede ecologically sustainable practice is discontinuity in the park's management or arrival of new management personnel with a different attitude, as this might change the approach to management and maintenance of the site. As PS1 mentioned:

> *"I suppose the danger might be if somebody moved on, or a few people moved on who had the original ethos of the park. It may be, somebody might come or go. Well I like my rose beds perfect, look at this, limy, let's just mow all this out and get rid of it all. Not thinking actually what this site is about".* (PS1)

This suggests that the success of these collaborative efforts relies on the landscape architect and park managers playing major roles in convincing all the stakeholders to push forward the idea of ecologically sustainable practice. Therefore, they need to provide necessary knowledge and guidance to the operation and maintenance team to ensure delivery of the landscape maintenance is according to the stipulated requirements.

b. Difficulty in changing the management culture among stakeholders

Changing the mentality and management culture is another challenge for urban park management in delivering ecological designs. Landscape architects and park managers have faced certain issues in introducing new ecological ideas to the management team as they are used to a more conventional approach. In the case of *TP*, getting approval for the eco-toilet from the respective local authority was difficult because the waterless concept does not comply with the Building Plan on Environmental Health approval requirement for public toilets set by the Central Building Planning Department, National Environmental Agency, Singapore. This suggests that, in future, ecological design and management aspects should be included as part of submission requirements to respective local authorities.

The park managers have also experienced difficulties in getting their landscape contractor to deliver ecologically sustainable landscape practice during the construction and maintenance period because these contractors are used to conventional design and therefore find it hard to adapt to ecological practice.

> *"… when it comes to implementation [of ecological design], getting the contractor on board is very difficult…Because they are very used to doing normal conventional parks, where they can use lots of machinery, can drive around. Whereas in this park we told them that it's minimal machinery, and you cannot drive your lorry around because of the turf. So, everything has to be done sort of manually. So, in the first instant, they were quite reluctant. But later on as they began to get the hang of it, they knew how to deal with the situation. So, they know how to properly allocate their resources".* (PS7)

Because the park management is trying to establish new ecologically sustainable practices, educating the contractor is time consuming. By the time a contractor has adapted to this new maintenance culture, their two year maintenance contract has ended; thus, the park manager has to go back to square one to train a new contractor.

c. Ecological design, especially using green technologies, requires elaborate maintenance

In relation to other techniques for promoting efficient and sustainable vegetation management, some of the SuDS components demand more technical knowledge and expertise. For example, the cleansing biotope and soil bio-engineering adopted in *BP* both require intensive maintenance involving constant pruning of the biotope plants and clearing *hydrilla* out of the pond. Maintenance operations consume a lot of energy, which means the system is no longer sustainable (refer to figure 5.29).

Figure 5.29: Photo showing maintenance staff clearing out *hydrilla* from the pond.
Source: Roziya Ibrahim (2013)

Similarly, in the *WP*, building flexibility into management of the natural landscapes helps the park management to reduce soft-scape maintenance. However, the wetland cells still require regular and thorough maintenance to ensure the wetland vegetation is always in sufficiently good condition to perform its hydrological function, which entails specialist input and additional maintenance costs.

In some urban parks, plant selections and sourcing are always problematic because these projects place emphasis on local species in large volumes, and supplies are very limited. For example, the *TP* and *BP* have an issue with sourcing native species as they are not produced commercially in Singapore due to low demand in the local landscape nursery.

> *"I think this is one of the challenges we are facing, because native plants don't have much commercial value in the whole of Singapore. Just NParks wanting to plant natives but in terms of the commercial value, I don't think it's very high. So, availability of these plants is one of the issues, but so far we are ok for Tampines Eco-Green in the sense that not many of these plants are dying. They are actually self-propagating by seed dispersal".* (PS7)

However, The *WP* has established its own plant nursery for cultivating the wetland species as planting stock for their landscape operation. Meanwhile, in the UK, the park management of the *LOP* and *MP* work together with the local universities on research into new planting techniques, such as sowing techniques that can produce these species on site through massive planting.

d. Quantifying cost for ecological design is subjective

The cost of the ecological designs varies among the precedent studies. The cost of delivering ecological designs for *MP and TP* is less expensive because the slow incremental approach applied to these parks requires lower resources and labour inputs. However, in large scale urban parks, such as *LOP, BP* and *WP*, the value of their ecological designs is based on a long-term view, not only considering the fixed costs of design and management but also the long-term benefit to the people and the urban environment. According to the landscape architect of the *BP*:

> *"…in this kind of holistic system where the boundaries are no longer clear, the cost and benefits extend beyond dollars and cents and beyond boundaries. This is a study we are doing right now, for another project with the Urban Renewal Authorities. This is something interesting where we compare all the cost, but holistically, the quantifiable cost as well as unquantifiable cost."* (PS5)

Therefore, delivering an ecological design at these parks entailed significant investment in developing the wetland systems (*LOP, WP*), soil bio-engineering technique and the cleansing biotope (*BP*), which means that the maintenance costs could be similar to those in a conventional park until the landscape becomes established. According to the park manager of *WP*:

> *"I think the cost of maintenance is quite low compared to other parks…it is a little bit cheaper because we use a lot of natural vegetation and the maintenance programme is not as extensive as other parks…but the total cost is almost the same because of the facilities…For the wetland cells it is another cost."* (PS11)

Furthermore, sustaining a socio-ecological balance in the parks in the future will require more investment, for example, to improve people's experience of the parks through programmes and activities, and at the same time to manage their ecological elements to provide other ecosystem services, as suggested by PS1:

> *"To go from what it was [derelict land] to being a park is a 30-40 year project…So, I think there will be more investment to improve the people's experience of the site. That might include expanding the mowing a little bit, creating more access, the naturalistic vegetation".* (PS1)

Aware of the indirect cost of ecological design, some of the precedent studies have tapped into an alternative source of income to support the management of these urban parks by incorporating sustainable water management. The SuDS scheme incorporates responsibilities and costs for what was previously carried out by the water authority into the scope of landscape work. Although this may increase maintenance costs for the park management, this extra cost is actually taken out of the drainage funding from the water authority, as in the case of *MP and BP*.

e. Dealing with public preferences and safety perceptions on ecological design

Dealing with public preferences and safety perceptions on ecological design is a challenge for urban park management in both temperate and tropical countries. There are always misconceptions among the public regarding the appearance of ecological designs, particularly at early stages of development. This is because people often do not appreciate this landscape type as something that should have a place in an urban park.

> *"But you have an issue with rough grass and the naturalistic look; people often don't recognise it as being something that you should have in the park. So to improve acceptance of that kind of landscape, and to improve access to it, we mow paths. So, in a large area of rough grass, we would mow a path through it. So, it looks like it is a maintained landscape rather than abandoned landscape and that makes a huge difference."* (PS2)

Although the public recognise the importance of nature, the idea of ecological design of urban parks, with natural and "messy" landscapes, is still an unfamiliar concept for them. In the *WP,* for example, this is possibly because, for many years, Malaysians have been instilled with the concept of beautiful ornamental urban parks, which are presented as clean and tidy landscapes. It is important to foster public acceptance and encourage people to start utilising ecological parks, yet this has created a challenge for the park management:

> *"The challenging part is the utilisation of the park by the public…I feel that Malaysians are not willing enough to try new things as compared to western people. Westerners like to try everything out there...So, this is one of the challenges in terms of management. Some of them [public] don't even know that we have this kind of park in Putrajaya. This is actually a challenge to us in promoting and publicising the park. We are doing that with the Tourism Ministry."* (PS10)

The public also fail to appreciate the naturalistic style for safety reasons. This is obvious in the *WP*, Putrajaya. Because of this perception, the public have been slow to accept ecological landscapes. Most local people prefer to engage in recreational activities in parks that are conventionally designed. Thus, the public are hesitant about the naturalistic appearance of this landscape, which makes them feel unsafe in coming to the Wetland Park and other nature parks in Putrajaya:

> *"Perhaps, I just want to explain that people sometimes feel more comfortable and safe when they go to parks that are more open compared to the Wetland Park. The Wetland Park has a lot of trees. We have the Heritage and Forest Park that also have a lot of trees, but people are not very keen to go there because they feel unsafe, except for those who are actually doing research and those who like adventure. Malaysians, in general, like to go to parks in the middle of the city which have park amenities so they can really enjoy themselves, with a lot of people surrounding the area. So, they feel safer. In the wetland, if they want to go cycling or picnicking, or to just go walking, they need to go in a group, and then they can go around and feel safer".* (PS10)

The park management admit that the presence of wildlife such as snakes and monitor lizards near public spaces creates safety issues that they have to deal with. To overcome this issue, the park management provided a clear transition area in between these natural landscapes and buildings or other public amenities (refer to figure 5.30). This transition area is regularly maintained compared to other areas of the park, to ensure the public's safety when they use the park.

Figure 5.30: Photo showing a clear transition area in between the natural landscapes and buildings Source: Roziya Ibrahim (2013)

However, not all the precedent studies have received negative feedback from the public. *LOP* is an example of an ecological design that has been very successful and received positive feedback from the public because the landscape includes some local elements that are familiar to them, besides the aesthetic attraction of the landscape:

> *"I think the public was particularly drawn to this idea because it is familiar vocabulary. They were very familiar with woodlands and meadows. They are not very familiar with the bright colour, but people are very drawn to colour, they are drawn to that kind of aesthetic…they probably did not understand that was so ecological, the reason why it became like that, but they got the appearance; they got the part of the British landscape character. Which is always going to be critical, if they don't maintain somewhere so highly as they might have perceived, there is always disturbance when people think that it is unkempt, so it is always very difficult balancing it."* (PS3)

Similarly, in *TP,* this ecological concept received a positive response from the public after the park was opened. Lack of natural environment and green spaces in Singapore is a reason for the public being more receptive and appreciative of having an ecological park in proximity to their neighbourhood area.

While instilling public understanding of the appearance of ecological landscape is significant for the public, making them aware that this landscape might not always look attractive requires a lot more effort. It is important to educate the public that the landscape will physically and visually change through time, as suggested by the landscape architect of the *LOP* (refer to figure 5.31), and that this could be a challenge for the management of the park.

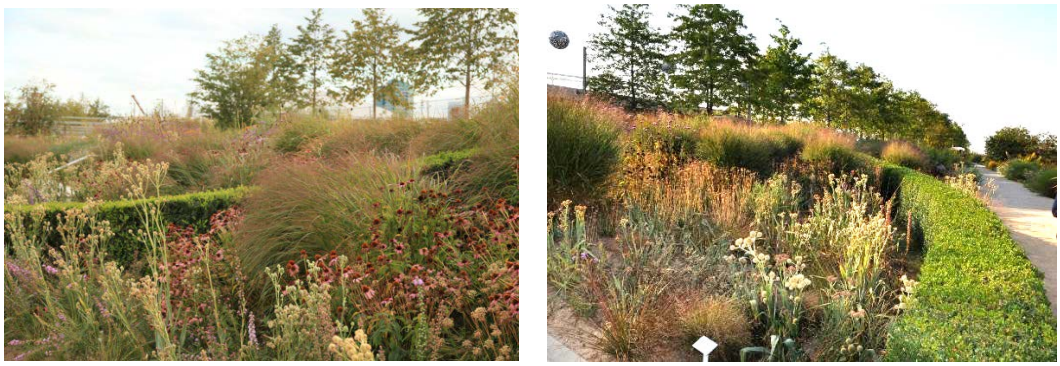


Figure 5.31: The North American Garden in the South Park, London Olympic Park in summer 2012 (Left) and in summer 2014 (right). The trees in the background are increasing in density

while the appearance of the urban meadows is becoming less attractive due to the changing season.

Source: Sarah Price Landscapes (2012) and Roziya Ibrahim (2014)

The park management admit that it took some time for people to recognise and accept the introduction of this idea into the urban park. In *BP* for example:

> *"Ten years ago, they would have taken this plan out because it is untidy, but now it is considered as part of a natural landscape. So, this shows the really important role of the landscape architect in educating not only the public, but the people who are implementing the project, the stakeholders…Yes, previously people considered this landscape as weedy, not maintained, unkempt. But now people accept it as part of the landscape" (PS5)*

Through their involvement in park management and activities, the public's attitude gradually improved and they started to give positive responses and show acceptance of the ecological park. All the precedent studies suggest that providing education and continuous publicity about this park through various programmes and activities will eventually gain the public's acceptance of the park, and instil environmental awareness and attitudes among them, as suggested by the park manager of *WP*:

> *"We always go for education. As we move towards the sustainable green city, the first thing we have to do is to educate the public. There is no point in creating a park with all kind of functions, if the public do not really understand or appreciate it. That is why we are introducing recycling, reuse of the water that we collect from the lake…We have this in our design and show the public that we can save the world by these practices".* (PS10)

The high level of publicity given to this park is not only to encourage the public to visit the park, but also to interest other agencies to implement this approach in their landscape practice, be it in other urban parks or landscape development projects. However, in *WP,* to attract the public's interest in coming to and learning about the park is another challenge, which requires a more interactive approach:

> *"…when we use the interpretive centre, we cannot become too technical in terms of the information given to the public. The exhibition must be designed in such a way that is easily understood by the public. It can be fun, entertaining and interactive…If it is too technical or difficult for them to comprehend, they will not come back or recommend the place to their friends and relatives".* (PS10)

These strategies have successfully promoted the park's ecological landscape and instilled environmental awareness among the public. Due to this positive response, the park management is planning to involve the public in volunteering in the park's operation and maintenance in the future (*BP, TP, WP*). This could contribute to lowering future maintenance costs of the park.

It could be inferred that delivering a design that would compromise both socio-ecological needs is a challenging task for the park management. There is an incentive to hold organised events and programmes to encourage more people to come to the park, which will help generate money for managing the park, but this must be weighed against keeping the park ecologically balanced and adaptable to the changing urban environment in the future.

5.5 Summary

Overall, the findings from the comparison of the precedent studies revealed that incorporation of SuDS into urban parks has demonstrated many aspects of ecological design and management that potentially increase sustainability. The findings also indicate that different levels of ecological treatment have been provided to form an appropriate landscape appearance of ecological design that is acceptable to the public. The management benefits and challenges in delivering ecologically sustainable practice in urban parks were also highlighted, showing some similarities and differences between the precedent studies in terms of their different climatic and cultural contexts, besides the scale and location of the parks. These outcomes inform and guide the development of an ecological design framework for further evaluation by the urban park management in Kuala Lumpur, Malaysia, which is presented next in chapter 6.

CHAPTER 6

Evaluation of ecological design and management framework for Kuala Lumpur's urban parks: Results of the case study semi-structured interviews

6.0 Introduction

This chapter presents the findings from semi-structured interviews with the urban park management of Kuala Lumpur, Malaysia on changing their approach to a more ecologically sustainable landscape practice through integration of sustainable water management. The chapter starts by presenting the key themes gained from the across-case evaluation of ecological design alternatives for Kuala Lumpur's urban parks based on the ecological design framework informed by the precedent studies' outcomes presented in chapter 5. The attitudes of stakeholders from different levels of urban park management towards adoption of a more ecologically sustainable landscape practice were compared and discussed. These views include their responses to ecological design and management aspects, the landscape's appearance, as well as the impact of this approach on their current practice. The chapter ends with a discussion on potential benefits and challenges of implementing such practice in Kuala Lumpur's urban parks.

6.1 Changing towards more ecologically sustainable landscape practice: Across-case evaluation of ecological design alternatives for Kuala Lumpur's urban parks by stakeholders from different levels of urban park management

Evaluation across the cases starts with presenting the stakeholders' background, followed by a quantitative overview of the data collected. Stakeholders' attitudes towards ecological design and management aspects are discussed in general terms and specifically across each case study, to identify common key themes in relation to ecological design and management across the case studies. The findings are presented and discussed in a bottom-up manner, starting with the ground staff, support staff and the park manager, all of whom are directly involved in landscape operations. Then the responses of senior management responsible for landscape policy and design decisions relating to Kuala Lumpur's urban parks are considered. The rationale of presenting the findings in a bottom-up manner is to enable the data presented for the different tiers of management to be grounded in the practicalities of working in the urban park.

6.1.1 Stakeholders' background

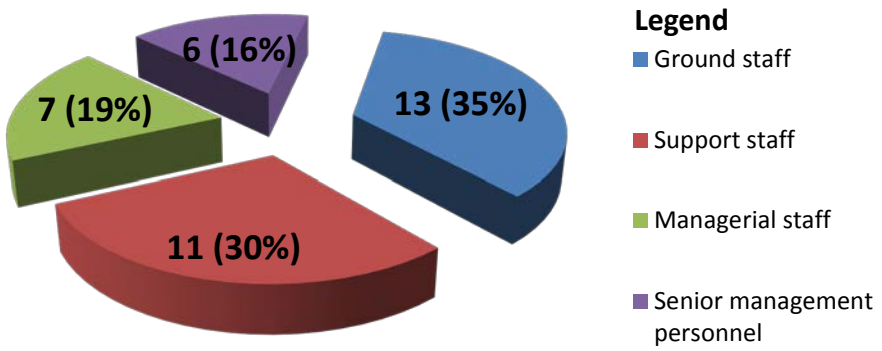


Figure 6.1: Stakeholder grouping according to different levels of urban park management

A total of thirty seven interviews were conducted with stakeholders representing different levels of urban park management across the case study sites, who were grouped according to their designation. As shown in Figure 6.1, the interviewees included ground staff (foreman and maintenance labour, 35%); support staff (horticulture assistants/ site supervisors, 30%); park managerial staff (park managers/ assistant park managers, 19%), and senior management personnel (16%). They were selected as available respondents who were directly involved in landscape design and management at the case study sites.

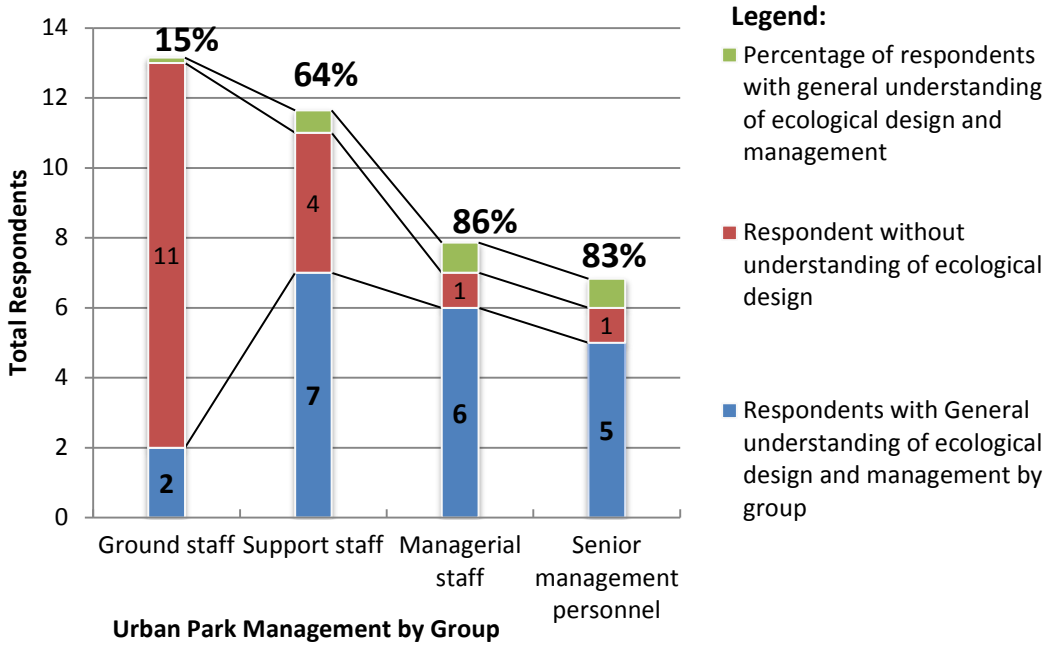


Figure 6.2: Percentage of stakeholders with understanding of ecological design and management

As seen in Figure 6.2, the interview findings show that, in general, some of the stakeholders recognised the importance of this sustainable approach. The overall percentages indicate that the majority of urban park management stakeholders had a general understanding of ecological landscape design and management. However, only 15% of the ground staff had an understanding about this ecological approach, which they had gained from TV and newspapers. Although some of the ground staff understood the contribution that such an approach could make to the urban environment, their understanding was limited by their education when compared to other staff and limited exposure to ecological design practices.

Compared to the ground staff, 64% of the support staff had a wider understanding of ecological design and its contribution to sustainability. This was mostly gained from attending landscape courses and further training. The majority of the managerial staff (86%) demonstrated a good understanding of ecological design and management to perform environmental functions in their particular parks. Similarly, about 83% of the senior management could provide a broader perspective on sustainability strategies in relation to urban park management in Kuala Lumpur. They highlighted the Malaysian government's strong commitment towards sustainable landscape development in the city by giving examples of relevant government policies and strategies, as well as the action plan being carried out by the local authority for enhancement of sustainable landscape design and management of urban parks and other green spaces in the city.

6.1.2 Stakeholders' response towards changing approaches to ecological design and management of Kuala Lumpur's urban parks

Despite the different levels of understanding on sustainable landscape practice, it is interesting to note that the various stakeholders' attitudes to the proposed framework for changing towards more ecological and sustainable design and management of the parks are similar, and reflect their concerns relating to the current park management goal and objectives in terms of public safety and the need to accommodate the public's perceived preferences. Hence, a comparison of the stakeholders' attitudes towards changing to an ecological approach to design and management shows that approximately half (51%) of the stakeholders were sympathetic to this new idea, mainly the support staff, park managers and the senior management personnel.

Regardless of any personal preferences, pessimistic attitudes towards applying this approach to Kuala Lumpur's urban parks were exhibited by the majority of the stakeholders (87%), and particularly by the ground staff (30%). Stakeholders were not confident that an ecological landscape could be successfully implemented at these parks, considering that this idea contradicts the park management's goal of creating a clean and beautiful landscape.

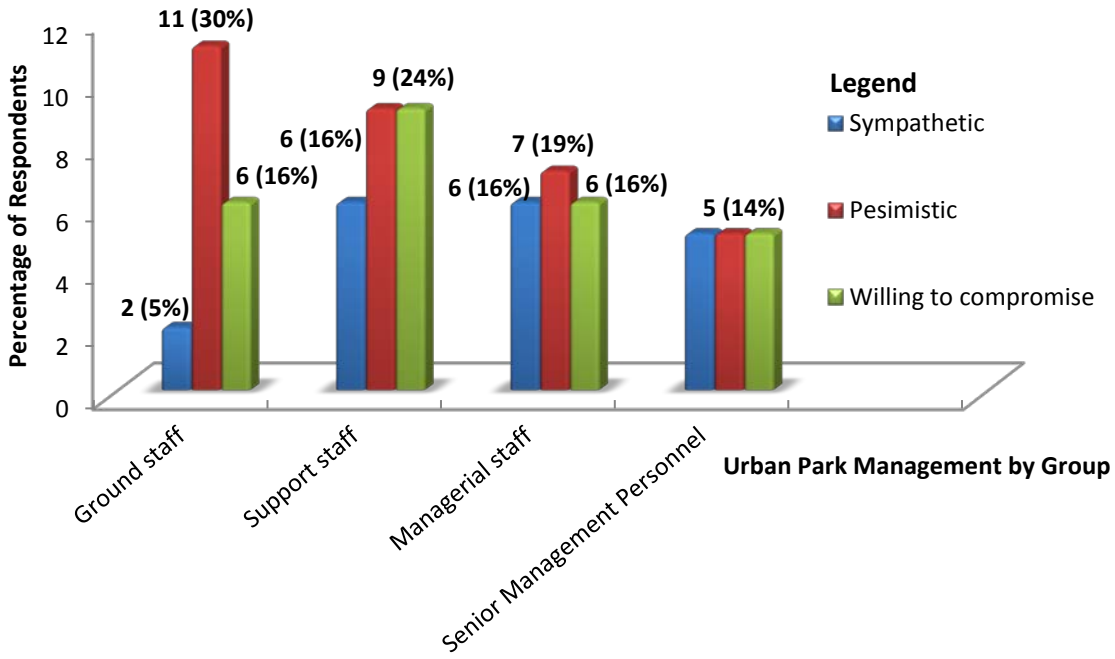


Figure 6.3: Comparison of stakeholder's attitudes towards changing to an ecological approach to landscape design and management

Despite this mix of sympathetic and pessimistic attitudes, the majority (70%) of the stakeholders expressed their willingness to compromise on this idea, especially the alternative 1 treatment, provided certain alterations are made to accommodate the maintenance requirements, as well as to ensure that the appearance of this naturalistic landscape meets public expectations on aesthetic and safety aspects. The following sections, 6.1.3 through to section 6.2.2, will further elaborate and discuss common key themes that were identified across different management levels from the analysis of the stakeholders' attitudes to ecological design and management.

6.1.3 Stakeholders' response to ecological design and management aspects (EDM): Key common themes across different levels of management

6.1.3.1 Common responses to aspects of ecological design and management (EDM)

EDM1: Ecological landscape design contradicts the park management's goals and maintenance requirements

The ground staff's disagreement with certain aspects of the ecological design framework suggested for their parks related primarily to the following factors:

a. Opposed to clean and beautiful landscape goal

Most of the labourers felt that ecological landscapes are messy and crowded (refer to figure 6.4), and go against the maintenance objective of not allowing grass and vegetation to become overgrown (PBG4).

Figure 6.4: Photo showing the alternative 2 treatment for lawn area at *PBG* (right), which the labourers at this park felt contradicted the current maintenance objective of having a clean landscape (left).
Resource: Roziya Ibrahim (2013)

Because of the littering habit among park visitors, having this dense landscape will increase maintenance requirements at these parks. (KVP3) insists that vegetation in the park must not be too dense and there should be spaces between the plants to allow labourers to clear out the rubbish.

Particularly at *ALG* and *TLG,* where this approach was previously implemented, the labourers shared their experiences of maintaining the water-edge vegetation (refer to figure 6.5). According to TLG2:

> *"Alternative 2 [for water-edge] is overcrowded [with plants]. It was implemented before but the park management had problems in maintaining the lake. It is difficult for us to collect the algae and rubbish trapped between the aquatic vegetation".* (TLG2)

Figure 6.5: Photo showing alternative 2 treatment for the water-edge (left), where maintenance access is required for clearing the algae, which is part of the daily maintenance routine at *TLG* (right).
Resource: Roziya Ibrahim (2013)

ALG1 commented that if planting is too dense at the water-edge, not only does more rubbish become trapped between the aquatic vegetation, but also this delays work to remove algae from the lake, which needs to be carried out daily.

For the same reason, a minority of the support staff expressed uncertainty about introduction of ecological design at their park as some aspects would go against their current maintenance scope and requirements. PBG9 argued that:

> *"Alternative 1 [for lawn treatment] is natural but messy. Our scope of work requires the landscape to be neat and clean besides being natural".* (PBG9)

Although the support staff feedback was quite similar to that from the ground staff, they were more positive and willing to compromise on some of the proposed ecological design alternatives, provided the changes made would not interrupt daily maintenance routines. They would therefore be willing to adopt ecological landscape provided the implementation is not too extreme. PBG10 suggested that alternative 1 would be better for *PBG* because it is a mild treatment and less intricate compared to alternative 2 in terms of maintenance requirements, although he personally preferred the alternative 2 treatments in terms of their ecological functions. Whereas, TLG4 was willing to tolerate the dense and messy look of a naturalistic landscape provided it did not disrupt the regular maintenance routine by preventing access, especially for tree maintenance.

Among the senior management personnel, LD1 commented that management of Kuala Lumpur's urban landscape and urban parks is already achieving satisfactory outcomes, but there is still room for improvement in the current landscape practice in terms of achieving sustainability. Therefore, he would be willing to consider some of the ecological design alternatives proposed for the urban parks to enhance their environmental functions. Similarly, LD3 provided an observation on the current unsightly condition of the open understorey area at *PLG* and thought that ecological design could help regenerate landscape in urban parks (refer to figure 6.6):

> *"I think some of our urban parks are getting bald, especially underneath the shade trees. In Permaisuri Lake Garden, most of the shaded areas are bare ground. I think it is good to introduce understorey plants [treatment for semi-woodland area], such as ferns and piper, so we can improve the site."* (LD3)

Figure 6.6: Photo showing the bald patch in the understorey area in *PLG* (left), which could be regenerated with the proposed ecological treatment for semi-woodland (right)
Resource: Roziya Ibrahim (2013)

Similarly, in shrubland areas there is a suggestion that alternative 2 treatment is preferable as it will give more structure (LD4) and increase the density (LD5) of the vegetation, which would enhance the natural characteristics and ecological potential of the park.

Besides its naturalness, the senior management personnel recognised the environmental functions of ecological design. They believe alternative 2 treatment is more appropriate for creating habitat diversity in the park because of such as its treatment for lawn (LD2, LD4); semi-woodland (LD3); besides ponds and water-edge areas (NLD1). As for the water management function, senior management personnel seemed familiar with SuDS and its benefits, thus they were willing to consider applying this system to help improve on-site drainage, as well as to collect non potable water resources for usage in landscape maintenance. NLD1 stated that whilst the park management intend to implement SuDS in KVP in the future, plans are yet to be finalised.

Most of the senior management personnel would consider moderate treatment for urban parks because the maintenance requirements are more manageable. For example, alternative 1 provides minimal treatment for lawn area that would prevent it from becoming too crowded (LD4), and creates a more organised landscape for shrubland (LD2), besides being easier to maintain (NLD1). For semi-woodland treatment, LD4 would choose a light treatment, but only for location at the edge of the park, while the entrance would need to have a clean landscape.

This suggests that although the respondents are aware of the benefits of ecological design for the overall management of the park in terms of such as conserving resources, across the case studies the park management seemed unwilling to accept drastic changes to their current practice, and would prefer a simpler alternative that is easier to maintain. Nevertheless, they could tolerate some aspects of ecological design being applied in certain areas of the park.

b. Conflict with public recreational needs and requirements

The interviews indicated that all the respondents prioritised visitors' recreational needs and requirements. As people come to the urban parks mainly to relax and engage in recreational activities, introducing ecological design functions such as water management and wildlife enhancement would entail compromising some of the public activity spaces in the parks, which most of the support staff and managerial staff considered unacceptable.

Due to their concern over preserving the social function of the parks, some of the support staff would accept introduction of ecological design features, serving environmental functions, only in certain areas of the park (PBG10, KVP4, KVP5, TLG4, PLG2, and ALG3). Their interaction with the public makes them more aware of the spaces in the park that are highly utilised. They were worried that introducing ecological principles within these areas would cause negative reactions among the visitors, especially regular park users, as it would potentially limit the available recreational space. As the lawn area is the most utilised space in the park, it must be clean, tidy, and maintained in a manner appropriate for the public's convenience (PBG6, ALG3, and KVP5). For this reason, having dense shrubs (PBG6) and long grass (PBG6, PBG9, ALG3, and KVP5) was not considered desirable for public activity spaces (refer to figure 6.7). This issue is more critical at smaller scale parks, such as *ALG* and *KVP,* because these parks have a higher density of visitors, especially during weekends.

Figure 6.7: Photo showing the existing lawn area at *KVP* (left), and the proposed Alternative 1 treatment with the incorporation of SuDS (right).
Resource: Roziya Ibrahim (2013)

Likewise, the social demand for recreation has resulted in most of the managerial staff setting modest goals for their landscape management that focus on simple designs and basic ground maintenance. For example, because *KVP* has a low landscape maintenance budget, KVP7 claims that ecological design would not fit in with the current park management goals, and that a highly intense ecological treatment is therefore not appropriate:

> *"I agree with this approach, but it must not be too intense. Our aim is to reduce the cost of maintenance. I prefer having shade trees with lawn, but no shrubs."* (KVP7)

For these reasons, it was suggested that applying an ecological approach was only appropriate in particular park settings. For example, one of the ground staff, KVP2, suggested that situating this landscape in a passive area far from the jogging track would be more appropriate. It was also suggested that some space should be allowed between this landscape and public areas to enable visitors to feel more comfortable being around this naturalistic landscape (TLG1). The support staff, meanwhile, would prefer ecological landscape to be in areas that are not being used by the public as recreational space (PBG6, PBG7, KVP4, and KVP5). For instance, KVP5 suggested that applying this ecological treatment at the edge of the park would be more appropriate as this would avoid disrupting the public's recreational activities. On the part of the senior management personnel, NLD1 would mostly prefer pond and woodland ecological design treatments at *KVP* because the selected area is quite distant from public utilised areas.

These findings show that most of the respondents seemed unwilling to prioritise ecological design ahead of public recreational requirements. Nevertheless, some were keen to change towards ecological design practices, preferring more intense treatment for optimum environmental functions to be located in semi-woodland areas (TLG5, PBG11, KVP6, KVP7) as well as ponds and the water-edge (KVP7, TLG6). But, considering the management's commitment towards public needs and expectations, they believe it is in the first place important to make ecological design more acceptable to the public.

c. High vegetation structures tend to block visibility and accessibility for visitors in the park

Ponds and lakes are visual attractions of the local urban parks, as well as offering water-based recreational activities, such as boating and fishing. Therefore, more than half of the ground staff disagreed with having dense shrubs surrounding these spaces because they tend to block visibility and accessibility near the lake (ALG1, TLG2, and KVP3). Furthermore, having vegetation with several layers near a recreational area (TLG2) and public facilities like toilets (TLG3*)* will restrict public access to these spaces (refer to figure 6.8*).*

Figure 6.8: Photo showing alternative 2 for water-edge treatment at *KVP* (left) that could block joggers' view of the lake; and semi-woodland treatment at *TLG* (right) that limits access for public and the maintenance crew.
Resource: Roziya Ibrahim (2013)

The support staff concurred with the ground staff on this point. There were a few comments that the water-edge and shrub treatments could affect the visibility in certain areas of the park. For this reason, KVP4 and KVP5 suggested that alternative 1 would be more appropriate for water edge treatments in certain areas of the lake, to allow some visual clearance towards the lake and surrounding hills. Reflecting a similar opinion, ALG3 was critical of the proposed shrubland treatment (refer to figure 6.9):

> *"This [shrub treatment] is not suitable for this park because we want people to have a view of the lake. This place is for relaxing so let it be uniform and have a clear view [towards the lake]. If we have mixed planting, it will distract the visitors' attention".* (ALG3)

Figure 6.9: Photo showing the alternative 2 treatment for shrubland at *ALG* (left), which, it was claimed, would distract visitors' attention from the view of the lake (right).
Resource: Roziya Ibrahim (2013) and Google Map (2015)

Although this ecological treatment could offer potential benefits in terms of slowing down and filtering the surface runoff into the retention pond, ALG3 suggested that the naturalistic landscape of the shrubland might distract people from enjoying the view of the park.

EDM2: Naturalistic landscape style could pose a risk to the safety of park visitors

With public safety being one of the park management's priorities, the majority of respondents raised their concern that improper execution of ecological landscape could pose a risk to the safety of the park visitors. Concern over crime and wildlife threats was comparable throughout the different levels of urban park management across the case studies, particularly regarding the following issues:

a. Increases opportunities for crime

As snatch theft cases are frequent at *TLG* and *PBG*, some labourers at these parks thought that alternative 2 treatments for lawn area (TLG1), semi-woodland (TLG2), and water-edge (PBG3) might not be appropriate because they would create a shady, enclosed and isolated space that could become a hiding place for thieves. Several support staff (PBG7, PBG9) and managerial staff (TLG5; PBG11; PBG12) also raised a similar issue. Referring to figure 6.10, TLG1 suggests that:

> *"This landscape [alternative 2 for lawn area] looks a bit untidy and messy. If you want to implement it, make sure it is not too enclosed like this...This area is quite isolated. So, it is unsafe because snatch theft has been a problem for this park."* (TLG1)

Figure 6.10: Photo showing existing open lawn (left), and the alternative 2 treatment that is presumed to be unsafe for the visitors to *TLG* (right)
Resource: Roziya Ibrahim (2013)

The managerial staff pointed out that crime and misbehaviour among park users are common problems in Kuala Lumpur's urban parks (*PBG, PLG, and TLG*). Consequently, applying an intense naturalistic landscape is considered inappropriate for lawn and shrubland because it could increase the tendency for homeless people to take shelter in this landscape (refer to figure 6.11) and could create a threat to the safety of park users (TLG5, PBG11).

Figure 6.11: Photo showing the existing landscape (left) and alternative 2 treatment for shrubland at *PBG* that could be misused by homeless people as a shelter or a hiding place for thieves (right)
Resource: Roziya Ibrahim (2013)

According to one of the senior management personnel (LD5), the ecological design framework proposed for Kuala Lumpur's urban parks goes against current maintenance requirements for ensuring public safety, especially in the case of the semi-woodland treatment:

> *"The secondary forest could be unsafe. So, Alt2 might not be appropriate in terms of safety. Alt1 is more acceptable. Currently, the local agenda places emphasis on public safety. So we don't want to create things like this because this area could be a crime prone area. People can hide and do many things there [behind the trees]."* (LD5)

LD5 also expressed senior management's aspiration for landscape design and management practice to prevent crime and other misbehaviour in the park and ensure public safety. This implies that the importance attached to ensuring the public's safety in urban parks is consistent across different levels of management.

b. Threat from wildlife

Wildlife threat is another issue highlighted by the majority of respondents in response to the ecological design framework. According to some labourers, having an intense landscape like alternative 2 will increase the safety risk as some people might not be aware of the wildlife presence; for example, snakes could be hidden by the vegetation (ALG1). Parks with large woodlands like *KVP* and *PLG* already have a considerable amount of wildlife; thus, having ecological landscape near to public areas could increase the risk to public safety. The majority of support staff shared this view. Although dense landscape is good for encouraging habitat diversity, it also creates a concealed space that could provide shelter or breeding space for harmful animals (PBG7, PBG10, PLG2, and KVP5). Moreover, while having dense vegetation near public spaces could potentially promote park visitors' nature experience by bringing wildlife into close contact (refer to figure 6.12), this would also increase exposure of visitors to harmful wildlife (PLG1, TLG6, KVP7). According to KVP7:

> *"The Dillenia is too bushy and high. As this is public space, we are concerned about pests. If it's too near to the forest border, snakes and other wildlife can easily cross over to this space and make it their shelter. They might attack the public, especially joggers."*(KVP7)

Figure 6.12: Photo showing the existing landscape (left) and alternative 2 treatment for semi-woodland at *KVP* that could bring wildlife into close contact with the public, which might cause some visitors to feel insecure (right)
Resource: Roziya Ibrahim (2013)

Although some people might appreciate and enjoy the presence of wildlife, two managerial staff feared that the majority of park users are not prepared for the consequences of being surrounded by wildlife (KVP7, TLG6). Similarly, a senior management respondent, LD5, suggested:

> *"In terms of wildlife, we need to be aware of the type of wildlife [that is safe for the public]. If snakes come, it will be harmful to the public ... So, we must consider this aspect, I don't mind birds and squirrels but if we encourage snakes to come that will have a negative effect [on the park's visitors].*

Therefore, the respondents suggested that the park management would need to focus on the safety aspects of ecological design. As NLD1 commented:

> *"…we have monkeys in the park, so we need to consider the visitors' safety as well. So I prefer Alt1 because it is more open and clean."* (NLD1)

If given a choice, NLD1 would prefer lawn to long grass; but would be willing to apply alternative 1 because in comparison to alternative 2 treatment the presence of wildlife would be more noticeable. KVP7 and TLG6 strongly suggested leaving a clearing between public space and naturalistic landscape to avoid potential threats from wildlife. In addition, having a transition space between these spaces would make the public feel safer and more secure in this naturalistic landscape (TLG1).

c. Risk to safety of visitors near water bodies

The support staff suggested that having ecological treatments at the ponds and water-edge would be possible but public safety would need to be the first consideration, especially that of children. While, an intense treatment would provide a good habitat for the tortoise population near the water-edge of *KVP*, it might attract children's attention to these areas, which could threaten their safety if not properly supervised (KVP4, KVP6). The same would apply to the pond, with KVP6 suggesting a mild treatment would be more appropriate:

> *"I prefer Alt1 [for pond treatment], but if possible keep the vegetation slightly more minimal than this for safety reasons. This area is open, I am afraid for the children's safety...This landscape can attract children's attention, so if it's too dense it might be dangerous for them. So, just use minimal planting for safety's sake. Don't include the tall plants."* (KVP6)

However, the park manager of *TLG*, TLG6, expressed the contrary view that applying an intense treatment for water-edge areas at *TLG* would create safety barriers that would prevent children from falling into the lake. This difference in opinion implies that in relation to safety measures the intensity of ecological treatment could be varied at different parks or in different areas of the park, depending on its particular function.

d. Risk to safety of labourers carrying out maintenance near to water-edge

As well as public safety, there were concerns among the ground staff about their own safety while carrying out landscape maintenance at the water-edge area, as raised by TLG2:

> *"The edge of this lake is steep. So, we installed a concrete embankment. I am worried that labourers might fall into the lake while doing the maintenance work. But it is possible to have this at the water-edge with a gentle slope".* (TLG2)

The finding confirms the importance of prioritising safety measures when applying ecological design and management at Kuala Lumpur's urban parks.

e. Naturalistic landscape could pose a health threat

The managerial staff and senior management personnel are concerned that ecological design could create potential threats from urban pests, such as the spread of leptospirosis by rats. Being close to a residential area, *KVP* places strong emphasis on urban pest management as part of its preventive measures for avoiding health threats to both the local neighbourhood and park visitors. According to KVP7, this justifies having more lawn area in the park:

> *"The reason we have more lawn is to avoid garden pests. If planting is too heavy, it will become a shelter for snakes, and also squirrels and rats, which could spread leptospirosis [a bacterial infection spread by urban pests].* (KVP7)

There is also concern that having ecological treatments at ponds and water-edge could create mosquito breeding sites. PBG12 shares the public's concern that having aquatic vegetation covering the pond would create mosquito breeding areas that could expose park visitors to mosquito-borne disease. Senior management personnel also voiced concern over public health and safety, which is an integral part of the local government's plans for sustainable development for Kuala Lumpur and has therefore been translated into the current maintenance regime of urban parks managed by NLD and KLCH.

This justifies demands for the current maintenance regimes at the parks to be maintained in order to ensure the landscape is in compliance with public safety and expectations. For this reason, KLCH has designated personnel at each urban park to attend to all public requests and complaints (LD5). To prevent ecological landscapes from posing a health threat to the public, PBG12 suggested regular maintenance of

ponds and the water-edge to prevent clogging or stagnant water that would create an ideal breeding environment for mosquitos.

EDM3: Ecological design and management could conflict with the parks' original concept and identity

Another issue highlighted by the managerial staff and senior management personnel is the conflict between ecological design and the original concept and identity of the urban parks. Clearly, all the studied parks were developed based on a concept embodying strong design aesthetics and beautification, with provision of sports, recreation and leisure facilities for the public. There is a view that introducing naturalistic elements to urban parks would change the original identity and concept of some of these parks. According to one of the managerial staff:

> *"To implement this approach [retrofitting ecological design] in this park requires some alteration to its landscape, which is different from new developments, such as the Wetland Park. We understand that with the wetland concept [referring to ecological landscape] we do not expect the grass to be short all the time. But this park [Permaisuri Lake Garden] is known for jogging, picnicking and family day events, so we need to keep the lawn short. If we apply this treatment their reaction will be 'what is this, why don't you cut the grass, where is our space for activity if the grass is overgrown?"* (PLG1)

As *PLG* was developed according to a traditional Malay concept of an ethno-botanical landscape, it was suggested that applying ecological design and management would alter the existing landscape and recreational space in the park to such an extent that the public would deem the park's social function to be impaired and would react negatively. Therefore, retrofitting ecological design requires careful planning and implementation to ensure the park's ecological and social functions are well integrated and balanced, and the public may need to be educated for this change.

While the senior management personnel were mostly agreeable with applying ecological design, they were very concerned that implementation of some ecological treatments might be restricted in order to retain the original concept and identity of certain parks. If the park management decided to focus on environmental functions, intense treatment would be the best strategy to adopt (refer to figure 6.13). But, the implementation of ecological design needs to tie in with the character and intended role of the parks, as LD4 suggested:

> *"Each park in Kuala Lumpur has its own image or identity…what is the goal that we set for these parks [referring to the case study sites], is it for habitat diversity or stormwater control? If these are our goal, I will choose Alt 2".* (LD4)

Figure 6.13: Photo showing water pollution at *ALG* (left), where alternative 2 treatment is suggested as a better solution for meeting the goal of creating habitat diversity and stormwater control, yet it may not be appropriate if the area is being utilised by visitors (right)
Resource: Roziya Ibrahim (2013)

Hence, the senior management personnel responded most negatively to ecological treatments at lawn and water-edge areas because they are popular for leisure and recreation. According to LD3:

> *"Lawn areas should not be like this. They should look like tranquil spaces because people come here to rest. Although it is functional [for SuDS] people will see it as messy landscape.* (LD3)

> *"The lawn area must be more properly maintained…Our visitors usually come for picnics, so they prefer lawn areas".* (LD2)

They therefore felt that it is important to keep the lawn area neat and tidy otherwise the public will not feel comfortable when engaging in their leisure and recreation activities.

Furthermore, lakes and ponds are major elements of most urban parks in Kuala Lumpur, including the case study sites. They offer panoramic views within the park and beyond. Therefore, it was suggested that having intense water-edge treatments surrounding the lake could potentially block these views (D4) and limit access to the water-edge (NLD1). NLD1 believed that alternative 1 treatment would be considered more preferable by the public because it is a more orderly, tidier and less messy landscape; thus, recommended leaving spaces in between the water-edge plants to enable people to sit and enjoy the view and to approach the water's edge.

These findings show that lawns and water bodies, as important elements of picturesque landscape style in Kuala Lumpur's urban parks since the colonial period, have become integral to the social functions performed by these parks. This could explain why some of the senior management personnel felt that altering them extensively would not be acceptable.

6.2 Stakeholders' response to ecological landscape appearance (LA): Key common themes across different levels of management

Generally, responses from the interviews reveal that respondents' judgement of ecological landscape's naturalistic appearance was based on their reflections of how the public would

perceive this type of landscape. For example, ALG2 preferred the existing landscape because the visitors like it. Referring to his experiences in park maintenance, *"we always follow what the people want"* (ALG2); otherwise they will not come to the park (KVP4). Meanwhile, according to PBG3:

> "*For me, change is good; every park must go through certain changes. But the success of the changes depends on public acceptance and their preferences."* (PBG3)

TLG6 further described the perception of an ecological aesthetic as being very subjective, and although it might be accepted by the park management staff, it would be rejected by park visitors. For instance, PLG3 shared his experience in dealing with this situation:

> *"Some people may either like or disagree with our approach. For example, when I cleared the water lily from the lake [in response to public complaints], there were some queries over my action… I cannot satisfy every single need of the public. Every decision is based on the majority. If most people prefer to have the water lily removed, we will do it".* (PLG3)

This implies that any decision made by the park management should meet the majority of visitors' expectations. The mixed reactions to certain aspects of ecological design and management are presented in the following section.

6.2.1 Positive response to ecological landscape appearance

LA1: Ecological landscape enhances the natural characteristics of the urban parks

There were positive responses from the respondents regarding visitors potentially accepting sustainable landscape practice in urban parks. Among the support staff, PLG2 commented that he had experience of being approached by visitors suggesting that he should not sweep up the fallen leaves so frequently. Even if people rejected the idea during the early stages, PBG7 was positive that in time they would gradually accept it. The majority of the managerial staff agreed that applying an ecological landscape design would enhance the wild natural beauty of urban parks (PBG11, PLG1, TLG5, TLG6, and KVP6). KVP6 considered that applying ecological design at the park area is not actually a rejection of the existing landscape but rather, in improving the park ecologically, it complements the park by enhancing its natural and seasonal qualities. Similarly, some senior management who expressed a preference for intense ecological landscape suggested that it offers greater visual impact that complements the naturalistic landscape style (LD3, LD5, and NLD1).

Furthermore, some support staff would endorse the intense treatments of alternative 2 for use in shrubland (KVP5), semi-woodland (ALG3, KVP4, KVP5, PLG2), ponds and at the water-edge (TLG4, PLG2, KVP4), because they feel that these treatments are appropriate to their park's setting. Some of the managerial staff also expressed a preference for a more intense treatment in some of the landscape areas to achieve a stronger naturalistic effect, such as at shrubland (TLG6, PLG2); semi-woodland (TLG5, KVP7); pond (KVP7); and water-edge (TLG5, TLG6, KVP6). Similarly, one of the senior management personnel suggested that alternative 2

treatment for shrubland would create layers and density to replace the lawn and enhance the natural look of the water-edge area (NLD1).

However, considering that meeting public preferences and expectations regarding maintenance is a priority for the park management, all respondents were less confident that ecological design could deliver in this regard. They indicated that the public would not be comfortable with the landscape style of this approach unless they perceived it as aesthetically pleasing, as suggested by TLG5:

> *"As long as the landscape is beautiful and clean, our public will not complain. So, species selection is important. I have seen a local grass species displayed at the FLORIA [local garden show]. That species has potential to create a nice view, the public may love it."* (TLG5)

LD3 preferred an intense ecological treatment at the semi-woodland area, yet expressed concern over the tendency of naturalistic landscape to grow in dynamic forms, arguing the importance of creating a hierarchy in presenting this landscape:

> *"Hierarchy is important, keep lower plants for areas closer to the pathway and gradually increase the height for background planting, so it becomes a backdrop.* (LD3)

It was also suggested that providing a clear gap between ecologically designed landscape and public access or activity spaces would help frame this landscape, which would help park visitors to understand this naturalistic landscape style.

To gain public understanding and acceptance of ecological design, the majority of the support staff would consider beginning by applying alternative 1 for lawn (PBG10, ALG3, KVP4, PLG2); shrubland (ALG3, KVP4); semi-woodland (TLG4, KVP4, TLG4); pond and water-edge treatment (PBG7, ALG3, KVP5). For the same reason, a few of the managerial staff recommended moderate treatment for lawn areas (PLG1, TLG6, and KVP6). However, if given a choice, PBG11, PLG1, KVP7 would prefer to keep the existing lawn without any treatment because they feel very strongly that the public do not like the parks to be messy in appearance. Among the senior management personnel, LD3 considered that both alternative 1 and 2 treatment would provide visual quality regardless of the different levels of intensity; therefore, he preferred alternative 1 as it looks more organised.

The above findings strongly suggest that public opinion, which has a significant influence on park management decisions, is driven by the aesthetic appearance of the landscape. Thus, the park management must address this issue in relation to ecological design in order to gain public understanding and acceptance of this approach.

6.2.2 Negative response to ecological landscape appearance

LA1: The natural look of ecological design contradicts public expectations of urban parks being beautiful, clean and tidy

Generally, the park management perceived that the public expect urban parks to be beautiful, clean and tidy. This could explain the finding of similarity in the landscape management goals and objectives at Kuala Lumpur's urban parks. It was suggested by the ground staff that visitors' preference is to have more open lawn (PBG3), a clear space with fewer shrubs and clean landscape (ALG2); they also felt that this makes the park more aesthetically pleasing to visitors by enabling them to enjoy the view (TLG2, KVP3). Therefore, introducing naturalistic landscape would cause negative reactions among park visitors.

Moreover, some of the managerial staff believed that regardless of its environmental potential, ecological design could go against public expectation and preference for urban parks to have more open spaces (KVP6, KVP7, PLG1), and for their landscape to be beautiful, clean and tidy rather than 'bushy' and naturalistic (PLG1, KVP7, and TLG6). As PBG12 suggests:

> *"… I personally feel this landscape should be incorporated in the Botanical Garden. However, from the perspective of a layman or maintenance people [those without landscape background], people in Kuala Lumpur don't like this type of landscape. They don't like bushy landscape; they prefer a clean cut landscape" (*PBG12)

This suggests that the naturalistic look of ecological design is not what the public expect to see in Kuala Lumpur's urban parks. According to KVP7, the public in Kuala Lumpur have established their own criteria for how the urban park should look, and ecological design needs to fit in with these:

> *"The public may like this approach provided it doesn't affect their safety, is convenient for them to do their activities, aesthetically pleasant, and does not involve high cost; otherwise they will query it and claim it is wasteful".* (KVP7)

All the labourers except for KVP1 disagreed with the ecological treatments for lawn (refer to figure 6.14) and shrubland as the look would contradict public expectations. Although they would be willing to compromise over the alternative 1 treatment, these landscapes types would, in their view, receive negative feedback from the public.

Figure 6.14: Photo showing the existing open lawn (left) presumed to be mostly preferable by the public compared to alternative 1 treatment (middle) and alternative 2 treatment (right) for *PBG*. Resource: Roziya Ibrahim (2013)

A number of support staff suggested that some visitors would reject this approach because of its disorganised appearance, and because they are not used to having this type of landscape in urban parks. The unfamiliarity of this landscape's appearance could lead to negative responses, leading ALG3 to claim that the park needs to look beautiful:

> *"Usually, the visitors expect this park to be clean and tidy. If they see this [lawn treatment], they will make a complaint…I prefer Alt1 but it needs to include attractive plants and flowers. It would be nicer if we planted Portulaca [Japanese rose ideal for groundcover] along the walkway."* (ALG3)

Similarly, the public would not want dense, untidy shrubbery in the park (ALG3, KVP4, PLG2).Thus, PBG6 proposed inclusion of a tall and flowery grass (*Pennisetum purpureum*) for the lawn area treatment, which he believed to be more attractive and preferable to visitors.

Among the managerial staff, TLG6 described people in Kuala Lumpur as having issues with unmown grass; the public would perhaps prefer alternative 1 for lawn treatment as it looks cleaner than alternative 2. It was also claimed that the perceived messiness of intense ecological treatment would lead to complaints by the public (PLG1, TLG6). Being used to having wide open spaces and neat lawns, Malaysian park users would not be comfortable with their surroundings being too naturalistic in appearance (KVP6, KVP7, and PLG1). Similarly for shrubland, PBG11 points out that:

> *"Maybe someday, once people can accept this approach, we will implement it [completely]…I prefer alternative1 [treatment of shrublands] because we need to balance sustainability with visitors' expectations.* (PBG11)

In response to the proposed treatment of semi-woodland areas, the majority of labourers suggested that this treatment would be more appropriate for areas closer to existing nature or unutilised space. That being the case, they would be more willing to accept alternative 1 than alternative 2 (refer to figure 6.15), considering that it would enable people to be more aware of the presence of wildlife (KVP3); in addition, there would be less obstruction (TLG2) and it would be tidier (ALG1). ALG2 suggests that, if possible, this treatment should not be used near the entrance as people might be put off by its unattractive appearance. As perceived by the support staff, having more intense and diverse landscapes beneath the tree canopy might not seem appropriate to some people. The public may feel this type of landscape is "messy" (PBG9, PBG10, PLG2, KVP5).

Figure 6.15: Photo showing labourers' preference of alternative 1 treatment for semi-woodland (middle) over alternative 2 (right) for *KVP,* considering public safety and public preference. Resource: Roziya Ibrahim (2013)

Similarly, most of the labourers responded negatively to proposals for naturalistic treatments for ponds and the water-edge. KVP1 and KVP2 raised the concern that some visitors would strongly object to the pond and water-edge treatments because the naturalistic landscape would look unattended (PBG3), messy (PBG4, KVP1, KVP2) and overcrowded (ALG1, TLG2). KVP1 was alone among the labourers in preferring the alternative 2 treatments, on the grounds they would provide instant ecological impact and a more beautiful appearance that would enhance the natural characteristics of the existing park (refer to figure 6.16).

Figure 6.16: Photo showing labourer's preference of alternative 2 treatment for pond (right) at *KVP,* for its ecological and hydrological functions and aesthetically pleasing appearance. Resource: Roziya Ibrahim (2013)

Similarly, the top management personnel were concerned over public expectations of urban parks, especially near ponds and the water-edge. According to NLD1:

> *"This is an urban area. We need to consider public perceptions. This area is not a wetland, so we must keep it clean and tidy. For wetland, yes you can have longer grass. But here, people like to run around, so this type of landscape is not appropriate. I think Alt1 is better than Alt2." (NLD1)*

LD2 presumed the public would prefer the water-edge area to be beautiful and therefore suggested keeping the existing landscape because lawn is more appropriate for this area. However, alternative 1 would be acceptable because it is more organised (LD3), tidy and more open and thus would provide clear views toward the lake (NLD1). Despite their differences in composition, NLD1 believed that both ecological treatments would still serve a similar water filtration function; therefore, considering public preference, alternative 1 is the best choice for application at the water-edge. Otherwise the public will assume that the naturalistic landscape is being neglected, which will give a bad impression of the park management (NLD1, LD5).

However, there was a suggestion among the managerial staff to add more plants to pond treatments for immediate ecological impact, but it would be necessary to keep the grass in the surrounding vegetation short (PBG11) in order to for the public to feel comfortable. Likewise, KVP6 proposed applying a mixture of intense and moderate treatments along the water-edge to avoid the design being monotonous, whilst TLG5 advised applying a similar water-edge treatment but only in certain parts of the lake, to avoid it blocking the scenic view towards the natural forest surrounding the park.

The above findings strongly support that any ecological approach applied to Kuala Lumpur's urban park must fit in with public requirements otherwise it will not be successful. Indeed, *PBG*'s park management have responded to the public's expectations by clearing all the wild and dense vegetation in certain areas of the park. According to PBG12:

> *"8 months ago, when I first took charge of this park, the landscape was too bushy and uninteresting, especially near the Planetarium [secondary entrance to the park]. We took the approach of crown lifting as we wanted head height clearance. Since then, people have started to utilise this space…Honestly, for 2013 we want to have a clean cut landscape."* (PBG12)

It was confirmed that the implementation of this maintenance strategy at *PBG* has received positive feedback from the public and also increased the number of park visitors.

Some managerial staff disagreed with having more intense ecological treatment for lawn (TLG5, KVP7) and shrubland areas (PBG11, TLG6, KVP6). It was presumed that such treatment of lawn areas would give an impression to the public that this landscape had been abandoned (PBG11). For shrubland areas, PBG11 considered alternative 1 treatment to be preferable as it would fit in with both sustainable goals and visitors' expectations. While believing that having more shrubs is better than having long grass, TLG6 would go with alternative 1 to gain general acceptance by the public. Likewise, the park management could perhaps start with mild treatment and progress towards meeting the ecological target, to allow the appearance of this intensive design approach to become more recognisable to the public before applying it fully.

LA2: Perception of safety regarding naturalistic landscape

Instilling a perception of safety is another important factor in influencing the public to visit Kuala Lumpur's urban parks. Besides wanting clean and beautiful landscapes, some of the respondents stated that the public expect to feel safe while engaging in recreational activities at these parks. The support staff felt that the "wild" and "messy" appearance would cause some visitors to feel unsafe (PBG6, PLG2, PLG1). TLG4 expressed his particular concern regarding public perceptions towards this landscape style:

> *"We are dealing with human attitudes. If we have this bushy landscape, they will be afraid of snakes and start to complain to us. They don't understand the real concept and function of this landscape."* (TLG4)

This indicates the importance of instilling positive perceptions of safety among park visitors alongside providing safety measures through ecological design, in order to encourage the

public to visit Kuala Lumpur's urban parks. Although some of the urban parks in Kuala Lumpur have existing woodland cover, the parks were developed for leisure and recreation purposes and visitors need to be assured of their safety while carrying out their activities, as stressed by PBG11:

> *"We want a sustainable park but at the same time people need to enjoy themselves and feel safe, so Alt1 is the best [to fulfil these criteria]".* (PBG11)

While people may have concerns about their personal safety, provocative views from public groups or their representatives towards the appearance of naturalistic landscape could also create general negative perceptions of public safety in the parks. Sharing an experience of having a naturalistic landscape at the pond area of *PBG*, PBG12 confirmed that:

> *"This area was previously filled with aquatic plants. But the NGOs remarked that this site was becoming a mosquito breeding area. So, people were scared to come to this area. Now we are trimming the plants and clearing the area, people are starting to sit over there. I guess the public in Kuala Lumpur like a clean cut landscape, not too bushy or too many species."*

The majority of the senior management personnel believed that, unlike the landscape architects, the public are not familiar with ecological design. Lacking prior knowledge of ecological design and its environmental functions, the public would therefore perceive this landscape solely based on its appearance. According to LD3:

> *"Only landscape architects can value and appreciate this natural style. For the layman, this is not a landscape and has no function…If you apply this design, they might not appreciate it."* (LD3)

It was perceived that the public of Kuala Lumpur prefer a designed landscape with a stronger design aesthetic for urban parks, an expectation which KLCH have gone to great effort and expense to satisfy (refer to figure 6.17). Comparing the different landscape styles of urban parks in Kuala Lumpur and Jakarta, Indonesia, LD3 further suggests that:

> *"Our people like a more designed landscape so it looks more attractive in terms of texture, form and colours. I have been to Jakarta, Indonesia, they don't have conventional parks organised with colourful flower beds; they only have greenery. They are not like us; we spent millions on shrub bedding. Their landscapes are more natural and green compared to ours.* (LD3)

Figure 6.17: Photo showing a designed landscape that places emphasis on a stronger aesthetic and beautification using a colourful display of shrub borders in combination with hardscape elements
Resource: Roziya Ibrahim (2012)

This response shows that although some of the respondents are aware that neighbouring countries have already changed towards ecologically sustainable practice, Kuala Lumpur's park management are still focusing on their 'beautification' policy, which involves huge investment. LD3 believes that the Wetland Park, Putrajaya is successful because of the aesthetic enhancement. This confirms that elements of beautification are vital in implementing ecological design and management at Kuala Lumpur's urban parks.

In addition, it is important for the park management to inform the public about this approach before implementing such a design; otherwise they might be shocked by this type of landscape appearing in the parks (PBG9). While allowing the landscape to grow naturally, it is also important to give an impression that this landscape is being correctly managed and is safe for use, by making the public aware that appropriate maintenance is being carried out. However, in contrast, LD5 is more optimistic that the public might be willing to accept this approach because they have not made many complaints about the vegetation and are most concerned about park cleanliness and vandalism to park furniture.

It could be inferred that Kuala Lumpur's urban park management are more concerned with public perceptions of the naturalistic appearance of ecological landscape than its environmental functions. This implies that delivery of an ecological landscape design that meets public expectations is generally determined by its look as a clean, beautiful and safe landscape. Thus, because the majority of the respondents prioritised the need to satisfy public expectations, with alternative 1 treatment potentially capable of meeting these criteria, this infers that a mild treatment is the most appropriate method for introducing ecological design to Kuala Lumpur's urban parks.

6.3 Impact of ecological design on the current landscape maintenance practice

Alongside the implications of the parks appearance, the interview findings confirm that introducing an ecological design approach will have a significant impact on current landscape practice in Kuala Lumpur's urban parks. The stakeholders' various opinions on the impact of ecological design on maintenance operations, particularly in relation to scope and level of intensity of maintenance, as well as the cost, will be discussed in the following sections.

6.3.1 Ecological landscape design and management will change maintenance scope and intensity

The interview findings suggest that the different characteristics and requirements of an ecological approach could have both positive and negative impacts on the current landscape management practice in Kuala Lumpur's urban parks. As seen in Figure 6.18, the majority of the ground staff (69%), support staff (100%), managerial staff (86%) and senior management

personnel (67%) believed that introducing ecological design and management would change the scope and intensity of landscape maintenance.

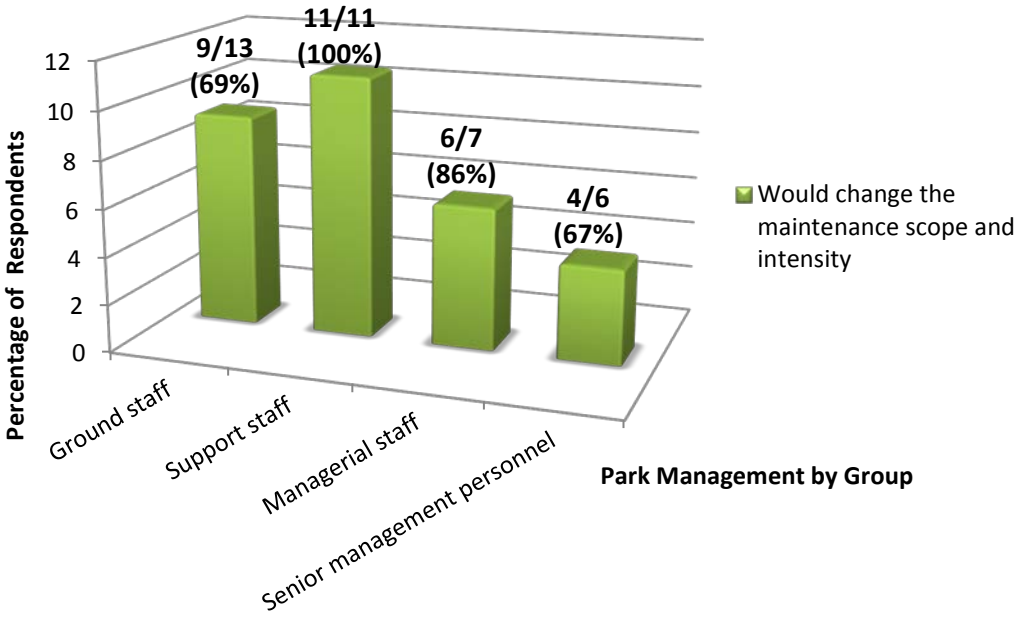


Figure 6.18: The impact of ecological design and management on maintenance scope and intensity

The varying responses of the stakeholders on the effect of sustainable practice on the scope and intensity of maintenance of their parks will now be further discussed:

a. Would reduce scope and intensity of work

Some of the labourers commented that this approach would reduce watering (ALG1, TLG3) because the non-potable water resource provided by the SuDS would aid the vegetation's survival (KVP2). The labourers also suggested that grass mowing, tree pruning and trimming would be done less frequently (KVP1, PLG1). TLG3 suggested:

> *"The maintenance will be easier, we won't have to rake the dry leaves; they can become compost. So, we won't need to use fertilizer [non-organic]."* (TLG3)

For the above reasons, most of the support staff believed that an ecological landscape would be easier to maintain (TLG2, PBG9, PBG10, PLG3, KVP4). According to PLG3:

> *"Maintenance will be reduced. For instance, now we do pruning every 2 months, but with this concept it might change to once every 4-5 months. We cannot leave it naturally to grow too long; it will look messy and unpleasant."* (PLG3)

Because of the reduced maintenance intensity, management of the park would not require so much input in terms of maintenance tools and labour resources (PBG9). However, it is important to set a limit to determine the extent of naturalness, so that the appearance is acceptable to the public.

Some managerial staff suggested that ecological treatment would reduce some aspects of regular maintenance. For example, it would reduce the frequency of mowing and clearing of dry leaves in semi-woodland areas (TLG6), and the water-edge of ponds (TLG5). Also, as ecological design allows vegetation to grow naturally, pruning would only be required if vegetation encroached onto the pathway; in addition, less watering and fertilizing would be required (KVP6, KVP7).

The senior management personnel highlighted that applying ecologically sustainable landscape practice would change the landscape policy, which would in turn change the scope and intensity of the current maintenance practice. According to NLD1:

> *"For me, when we have a new approach, the policy will also change in order to achieve the new goal. At the moment we don't have that, so the maintenance is more standard."* (NLD1)

LD3, LD4 and LD5 were also agreed that ecological design would require less maintenance. According to LD3:

> *"This landscape will be low maintenance in terms of time, energy usage and the amount of labour will be low…Everything will be low intensity. Time for example, the mowing routine will have a longer cycle in the natural landscape compared to the conventional landscape... I think that is its strength [of applying the ecological approach]."* (LD3)

However, considering the long-term nature of planning urban park development in Kuala Lumpur, LD4 considered that changing towards an ecological landscape design would only cause minimal reduction in landscape maintenance.

b. Would increase scope and intensity of work

Despite potential reductions in some maintenance tasks, almost all the labourers disagreed that ecological design would reduce their workloads (TLG2, PBG3, PBG4, KVP1, KVP2, and KVP3). They believed that increasing the amount of natural vegetation would involve more cleaning work, particularly in clearing fallen leaves (TLG2, ALG1, and TLG3); otherwise the park will become messier − although this is actually a feature of ecological design.

A minority of the support staff shared a similar view that removing the trimming debris (ALG3) and raking up fallen leaves (TLG4) would be necessary for maintaining the cleanliness of ecological landscape. Based on current practice, PLG3 reported that his maintenance team usually collect and remove about 50 sacks of dry leaves daily at *PLG*, and the amount increases during the dry season. He presumed that ecological landscape would require more cleaning work to ensure the ground and pathway are always clean and tidy. All these maintenance works would still have to be done regularly (PBG10) in order to meet the maintenance objective of retaining a clean and beautiful landscape.

In addition to their regular work, establishing this landscape would require more attention (TLG1) as some of the maintenance tasks would be more intricate than others. PBG4 commented that the ecological treatment for the lawn area would require a different mowing technique:

> "*For example the grass, they need to tell us the exact height that is required"…It gives us extra work and it is more complex".*

Only a minority of the support staff suggested that maintenance of an ecological landscape would not be significantly different from maintaining a conventional design. Although the use of naturalistic forms might reduce some of the current maintenance works, more focus would have to be given to the new scope of maintenance. According to KVP4:

> *"The maintenance will remain the same [as conventional practice]. But we need to add more labour. For example, if we don't maintain the pond, it will easily get overgrown. For the shrubland, we need to remove the dried leaves, fertilize, and apply fungicides. But for lawn area, we don't have to do frequent mowing. We can reduce the frequency of fertilizing from once a month to every 2 months."* (KVP4)

One of the managerial staff claimed that ecological landscape design would require more maintenance because naturalistic style landscape needs more cleaning work, as PLG1 suggests:

> "*…we need to place more emphasis on cleaning. If we just leave the fallen leaves scattered on the ground, it will create an eyesore…I prefer Alt 2 [Intense treatment for water-edge] because it is more dense and beautiful. But we need to keep it tidy. To make sure the roots do not encroach onto the steps".* (PLG1)

With cleanliness remaining as a priority for Kuala Lumpur's urban park management, most of the respondents considered that a naturalistic landscape would still require frequent maintenance in order to keep it clean, suggesting that there would be more work for the maintenance labourers, especially clearing the dry leaves and removing tree roots and branches from public routes and spaces (refer to figure 6.19). In some parks, like *PLG*, almost the entire park has to be cleaned intensively, including the semi-woodland areas. The concern for cleanliness shows a lack of understanding of ecological design among these respondents.

Figure 6.19: Photo showing the intense ecological treatment for semi-woodland area at *ALG* (left); and for water-edge area at *PLG* (right) that requires frequent cleaning, such as clearing of dry leaves and removal of roots and branches that encroach onto public routes and spaces.
Resource: Roziya Ibrahim (2013)

In addition, some respondents presumed maintaining naturalistic landscape to be more demanding than conventional horticulture practices. For example, TLG6 claimed that unlike the current mowing that keeps the lawn at standard height, maintaining the lawn through an ecological approach would require more attention to which areas would need cutting and the maximum height to which the grass should be allowed to grow.

Dealing with public littering would further complicate the maintenance work (refer to figure 6.20). Giving an example of the case of pond maintenance, TLG5 stated that:

> *"To maintain the aquatic plants in the lake can be difficult…We used this approach in Ampang Hilir Lake Garden. We planted Typha, but it became a rubbish trap, it is very hard to clear the rubbish trapped in between these wetland plants."* (TLG5)

Therefore, in delivering ecological design the park management need to enforce strong preventative measures to eradicate this behaviour among park visitors.

Figure 6.20: Photo showing rubbish trapped between the wetland plants at the *ALG* (left), requiring the park management to clear out the vegetation at drainage inlet sources into the lake (right)
Resource: Aiman Amani (2010) and Roziya Ibrahim (2013)

PBG12, meanwhile, reported similar difficulties in maintaining the understorey planting below trees, this time caused by encroachment of invasive species making weeding work more difficult:

"This type of landscape will be difficult to maintain because it looks too bushy. At one time we planted kaduk (piper sarmentosum as understorey plants). As the park is so fertile, invasive species took over this plant. When we do weeding, there is a lot of empty space. But, we can try to implement it, it does look nice". (PBG12)

In addition to these extra maintenance tasks, the intricacy of some ecological design aspects suggests that eventually ecological design will require the same maintenance intensity as current practice. Having a similar view, LD3 suggested that certain maintenance operations will still require regular attention:

"We will still have to do watering and fertilizing. In terms of maintenance routine, weeding and cultivating the soil is not required because we want the natural look. But, we will still need to remove the wild plants [invasive species] when necessary." (LD3)

As KLCH is committed to developing more parks as one of its strategies to increase provision of open space in Kuala Lumpur by 2020, LD4 commented that significant investment will be needed to accommodate the increase in maintenance to sustain urban parks in Kuala Lumpur in the future.

"Although the maintenance will be reduced, we have new parks to develop. At the moment we have approximately 400 lots of open space, which are already reserved as green spaces but yet to be developed. Once these areas are developed, we need to maintain them, so the maintenance will keep increasing." (LD4)

These findings suggest that applying ecological design might not necessarily reduce maintenance scope and intensity. However, achieving a proper balance between investment in the execution of this approach and the accompanying benefits to the people and the environment could assist urban park management in justifying the adoption of ecological design and management to other stakeholders.

6.3.2 Ecological landscape design and management will require changes to current maintenance specifications

Acknowledging that the multifunctional aspects of ecological design will require different maintenance techniques, a few stakeholders suggested that maintenance specifications will need continuous review and amendment in order to adapt to the dynamic nature of ecological landscape. As shown in Figure 6.21, the senior management personnel were mostly (50%) aware that the scope of work is different from that of conventional horticulture maintenance and that specifications will need to be changed, as identified by LD5. Expressing a similar view, NLD1 states that:

"The maintenance will change because the design has changed…when we develop the maintenance specifications we need to understand the purpose of this ecological design, identify the function and work towards it. Different functions have different types of maintenance, that's why I said it will keep on changing." (NLD1)

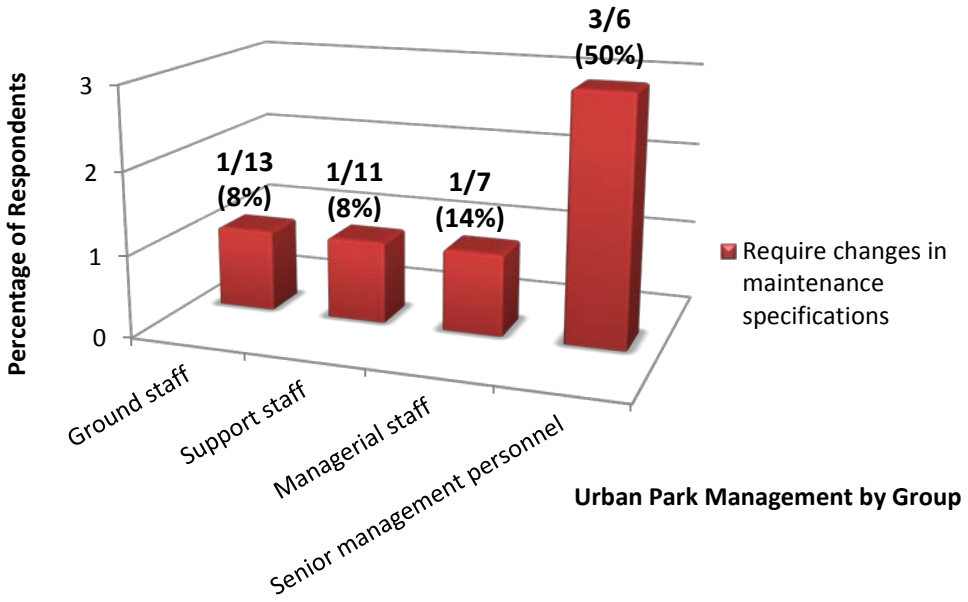


Figure 6.21: The impact of ecological design and management on maintenance specifications

Although the managerial staff and support staff were aware of new techniques of the ecological approach, less than 14% suggested that new specifications would need to be developed to guide the labourers in carrying out their daily maintenance work (PBG3). KVP7 particularly suggested that applying SuDS might require new specification on maintenance of the drainage system. This would introduce more flexibility into landscape operations and maintenance by reducing the level of vegetation management. Referring to a field trip to some precedent projects in other countries that were practising ecological approaches, LD2 recognised that in these countries landscape maintenance practices were more flexible compared to those implemented in Kuala Lumpur, suggesting that ecological design specifications would differ from the typical standards of conventional horticulture maintenance.

6.3.3 Ecological landscape design and management will require more maintenance resources

Due to a lack of knowledge about this sustainable approach, there was a misconception amongst some of the stakeholders that ecological design and management will require more maintenance resources, mostly among the ground staff (69%) (Refer to Figure 6.22). Almost half of the support staff (36%) believed that regardless of the type, all landscapes require constant maintenance in order to survive, which consequently has resource implications. For instance, ALG3 believed that:

> *"…all living things must be maintained be they big or small. If we don't maintain them, the land will become derelict. The public may have different views [about ecological landscape]. Some may like natural landscape while others prefer a more organised landscape. So, the best approach is to keep both types of landscape, with maintenance…Except for big trees, we still need to water the shrubs,*

especially when there is no rain; this is compulsory. Otherwise, after a week they will die. So, we need to water the plants at least once a day." (ALG3)

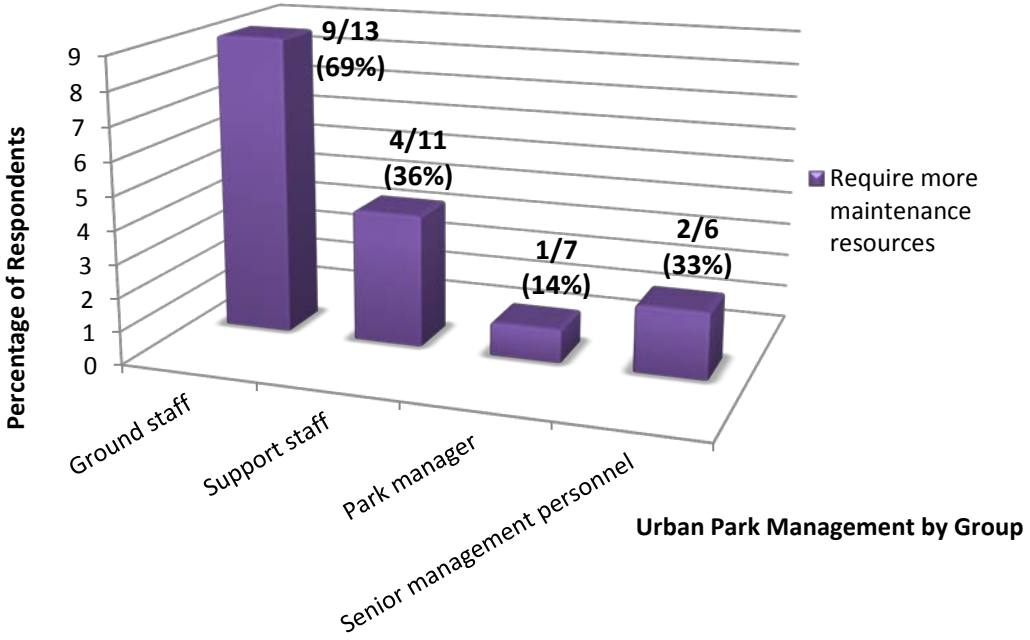


Figure 6.22: The impact of ecological design and management on maintenance resources

Water is considered as an important resource for the landscape, especially during the dry season. Although introducing ponds and water-edge treatments as part of SuDS components would reduce the need for watering, ALG3 suggests a proper irrigation system would still be required in order for this landscape to survive the establishment period, which lasts a minimum of six months. For the same reason, a few of the managerial staff (14%) suggested that an irrigation system might need to be installed in certain areas of the park that might not be accessible to maintenance vehicles, such as water tankers, otherwise more labourers would be required to carry out the watering (PBG12). These responses were duly based on the current conventional approach to landscape maintenance at Kuala Lumpur's urban parks that is highly dependent on potable water resources, with the park management having to cope with the burden of ensuring the understorey plants establish and survive, especially during the dry season.

As an ecological approach introduces different maintenance techniques, PBG10 suggested it needs to be supported by specific tools and machinery. At parks with limited service access (*PBG, ALG, KVP*) some of this equipment could not be used because ecological landscape may be inaccessible for maintenance vehicles and machinery (PBG9). In addition, PBG10 suggested that if ecological design were to be implemented in *PBG*, more labourers would be needed to carry out the maintenance. Expressing a similar view, ALG3 stated that having to rely solely on manpower to carry out maintenance operations is quite challenging.

Maintaining an appropriate appearance is important for Kuala Lumpur's urban parks. TLG4 suggested that maintenance is required to keep the landscape beautiful. Hence, there is a need for more resources, not only to keep the ecological landscape healthy but also to make sure the appearance is aesthetically pleasing. PBG10 anticipated that the naturalistic landscape could possibly require more intensive maintenance. For example, if there is more woodland vegetation, tree management will become more important, to ensure the trees are healthy and safe for the public, as TLG4 pointed out:

> *"For the trees, we still need to do pruning to reduce the crown density and allow more light to penetrate to the ground. We also need to remove the lower branches to provide visual clearance."* (TLG4)

Similarly, about 33% of senior management personnel believed that maintenance intensity would increase, suggesting more resources would be required for upkeep of this naturalistic landscape (LD2 and NLD1). Referring to experience of applying a similar ecological treatment in the semi-woodland at *PBG* (refer to figure 6.23), LD2 indicated some weaknesses of the scheme:

> *"I think we have applied this approach [semi-woodland treatment] along the Tembusu Road [main road] of the Botanical Garden. We have planted ferns for erosion control. It was a good intention and we did reduce on mowing. But, during the dry season the area became too dry so these plants started to fade away. They require plenty of water resources, besides we have to replace the shrubs to maintain the density. We just can't afford to maintain the density of shrubs in that area.* (LD2)

Figure 6.23: Photo showing the understorey area along the Tembusu Road, *PBG* planted with *Neprolephis excaltata* (fern) which LD2 presumed could reduce mowing, yet would be water intensive, especially during the dry season
Resource: Roziya Ibrahim (2012)

It could be inferred that the stakeholders' emphasis on cleanliness and beautification in applying ecological landscape design shows a lack of understanding of this approach. Therefore, it is necessary for urban park management teams to be equipped with proper knowledge and skills, before applying ecological design and management at these parks.

6.3.4 Ecological landscape design and management will require revision of horticultural education and training, besides intensive supervision

Previous sections have discussed the potential impact of ecological design and management on urban park management in terms of changing the current landscape maintenance scope and requirements. Obviously the conventional horticultural practice would no longer be applicable for managing the naturalistic landscape style. Therefore, the majority of the stakeholders believed that revision of horticultural education and training would be significantly important for the urban park management team, in adapting to an ecological approach. Figure 6.24 shows that 67% of senior management personnel favoured revision of horticultural education and training to ensure the maintenance crew would develop and improve their skills in the new maintenance techniques. As LD5 insisted:

> *"Of course having a new approach requires training; otherwise they [the labourers] will not understand our intention. They might not do as we instruct them because they don't understand.* (LD5)

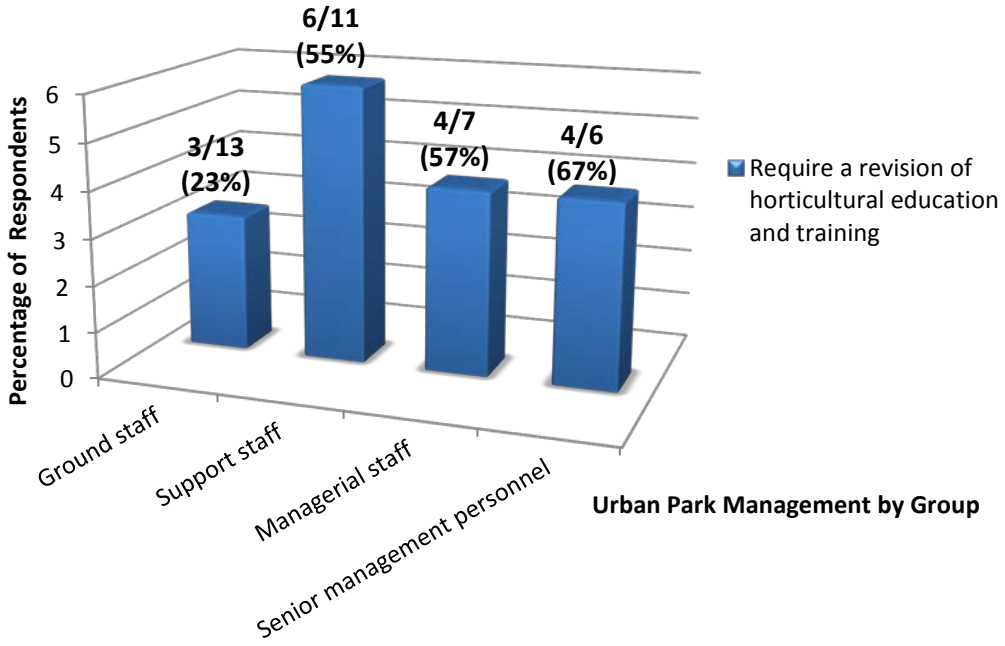


Figure 6.24: Ecological design and management would require revision of horticultural education and training

More than half (55%) of the support staff suggested the Landscape Department, KLCH should organise relevant courses and, most importantly, on-site practical training, in order to provide the urban park management team with the appropriate knowledge and skills regarding ecological design and management (TLG4, PBG10, ALG3, PLG2, PLG2, KVP4, KVP5). Similarly, 57% of the managerial staff stated that the ground staff should be exposed to ecological design and management because any changes made to the current maintenance practice might affect their performance in achieving maintenance targets which are based on

the familiar conventional horticulture maintenance practice (PBG12, TLG2). Therefore, they need appropriate training in order to become competent in delivering ecological design and management.

Besides the necessary skills and knowledge, constant monitoring is vital to ensure the ecological design is well established, healthy and clean, in line with the park management's goals and objectives (ALG3), which are considered to represent the public's expectations of urban parks. The managerial staff and the supervision staff play an important role in monitoring the ground staff in delivering ecological design and maintenance. Considering the lack of knowledge of ecological design among the ground staff, PLG1 mentioned that the managerial staff would need to closely supervise their implementation of the new maintenance tasks and techniques:

> "*I need to monitor the maintenance work more closely to ensure the concept is successfully implemented and achieves the expected quality. For example, grass cutting was previously done according to the standard height, but now we need to cut according to certain forms, and some areas need to be kept natural. So, I need to be on the ground to monitor this work".* (PLG1)

Due to the intricacy of some new aspects of ecological design, such knowledge and skills are lacking among the ground staff (TLG5). Therefore, PLG1 suggested that managerial staff and support staff should also be equipped with proper training on relevant approaches in order to be able to supervise the labourers in landscape maintenance operations.

The senior management personnel suggested that close supervision is necessary to ensure the labourers understand and comply with the specified maintenance requirement (NLD1), and the extent of maintenance to be carried out (LD5) for the new naturalistic landscape. While some aspects of ecological design might impose slight changes, such as in maintenance duration, other aspects of ecological design would involve new scope and techniques that are beyond the expertise of the supervision staff. This would impose extra demands on the managerial staff (LD5) in achieving the expected goals and objectives of ecologically sustainable landscape practice. Some scope of maintenance would also require additional specialist input, as NLD1 suggests:

> *"We should have specialists, meaning people who are experts in this type of concept*, *such as the wetland concept [referring to the ponds and water-edge treatment], otherwise it will be difficult to achieve the goal." NLD1*

Therefore, more intricate specialist input is also necessary to support the parks' managerial and support staff in their duties in maintenance operations for ecological treatments for semi-woodland, ponds and water-edges.

6.3.5 Ecological landscape design and management will have an effect on the cost of managing urban parks

Considering that the changes of maintenance scope and intensity will require different maintenance scopes and techniques, the stakeholders presumed that applying ecological landscape design will have short-term and long-term effects in terms of implementation and maintenance costs. Figure 6.25 shows that more than half (54%) of the ground staff believed that ecological design and management will have cost implications in terms of the materials and equipment required for landscape maintenance, as well as provision of weekly and monthly progress reports and, preparation of annual maintenance forecasts.

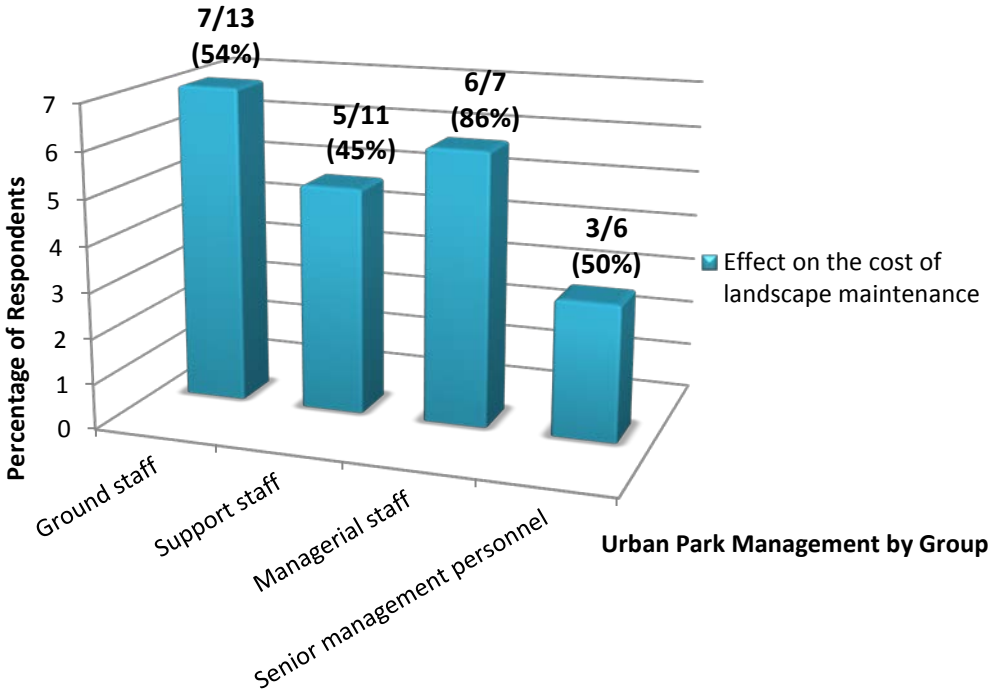


Figure 6.25: Ecological design and management will have an effect on the landscape maintenance cost

There were suggestions among the ground staff that the initial cost of delivering an ecological design could be slightly higher as it will increase the amount of vegetation in the parks; thus, additional investment in planting materials and maintenance resources will be required (TLG1, TLG2, KVP2), besides the cost of contracting out this project (TLG2). But eventually, as this landscape becomes established, the cost of maintenance will be gradually minimised (KVP1, TLG1). Although less than half (45%) of the support staff anticipated a similar initial cost effect, ALG3 predicted that the long-term maintenance cost of this landscape might increase slightly, because the landscape might become overgrown after a few years, thus more resources would need to be allocated to maintain the required physical structure.

The majority (86%) of the managerial staff shared a similar view on the higher initial cost of applying an ecological approach. There was a suggestion that introducing native species as part of a vegetation strategy for ecological design may require urban park management to outsource procurement to private nurseries, with KVP7 arguing that:

> *"To outsource the native species may be difficult because they are not commercially produced locally. Due to our limited resources, the cost could be higher".* (KVP7)

Likewise, introducing bioswale as part of SuDS in the park will incur high initial implementation costs as it introduces new landscape components and new scope of maintenance, as estimated by TLG6. But, most of the managerial staff were confident that, in the long term, maintenance costs will gradually decrease (TLG4, TLG6, PLG1, KVP7) and become less than those incurred by conventional horticulture practice (KVP6) once the naturalistic landscape becomes established.

KVP6 was more concerned about the need for more funding to educate the public about this approach. This finding implies that the financial cost of delivering ecological design and management is only a temporary issue, whilst what is most important is long-term investment to improve public attitudes and perceptions towards ecological design. However, PBG10 expressed the positive view that incorporating SuDS into urban parks would enable the park management to acquire new funding sources for landscape maintenance, from other departments or agencies. For example, previously KLCH has provided significant funding for water quality treatment at the Sydney Lake at *PBG.* PBG10 argued that:

> *"We don't have to spend unnecessarily on maintenance. We have spent so much on water treatment for the lake…We have spent RM1.7 million on the lake water treatment [through engineering solution]. For me that is too costly. I think, with this approach [using SuDS for storing and treating water naturally], we won't require so much maintenance. So, we can use the allocated budget [for water treatment] to buy tools and machinery for park maintenance* (PBG10).

Using SuDS to perform a similar function would improve the water quality naturally, but also more economically (PBG7, PBG9, KVP4). Thus, the remaining funds could be invested in improving other important aspects of landscape maintenance, as well as organising public awareness programmes and activities.

Half of the senior management personnel were also agreed that applying ecological design would have an effect on costs, with NLD1 considering that this approach would require a larger budget:

> *"The cost might increase because we need to hire specialists to train our workforce in maintenance of ecological landscape in order to achieve our goal.* (NLD1)

However, LD3 expressed a contrasting view that implementing this approach would mean a reduction of landscape maintenance costs, as less time, energy and resources would be needed to deliver the landscape operations. As the person responsible for steering landscape maintenance for Kuala Lumpur, LD5 was more cautious in response to the cost of landscape maintenance for ecological design:

"I am not able to estimate the future maintenance cost. Let's say if we omit the grass cutting it might reduce the cost. But, we cannot simply estimate the cost, it needs a specific calculation. It could be more or less than the current cost." (LD5)

It could be inferred that the cost of ecological design and management should not be solely based on simple estimation; in addition, it requires comprehensive input considering all maintenance scope and intensity implications for each park. This could vary at different sites according to their future plans and adaptation to environmental challenges in Kuala Lumpur. Apart from that, an analysis of the cost of delivering such an approach compared to its potential benefits would also be necessary, in order to justify the economic value of this sustainable landscape in the long term.

6.4 Benefits and challenges of delivering ecological design and management

In general, the respondents highlighted both benefits and challenges to adopting ecological design and management in Kuala Lumpur's urban parks. The interview findings regarding the environmental benefits of this sustainable approach were consistent with those identified in the precedent studies.

The interview findings imply that most respondents, across different levels of management, recognised the environmental benefits of ecological design and management. Ground staff personnel TLG2 and KVP2 agreed that incorporating SuDS is beneficial for improving the quality of water sources in the park. Meanwhile, two senior management personnel, LD3 and NLD1, expressed a similar view. For the same reason, one of the support staff, KVP5, stated that he would strongly recommend this idea to the park manager.

Other environmental benefits of ecological design highlighted by respondents include conservation of natural vegetation and enhancement of the natural character of the parks. Almost half of the support staff of *KVP* and *PLG* suggested that ecological design is suitable for these parks as it will enhance their natural characteristics, including the waterways and woodlands (KVP5), and undulating forms and valleys (PLG2). Some of the senior management personnel recognised this approach as beneficial for landscape regeneration and environmental improvement (LD3), besides offering beautiful naturalistic views (LD3, LD4, LD5, NLD1). Similarly, one of the managerial staff, PLG1, would support increasing the amount of natural vegetation in the park as it would enhance the existing natural character of the park; KVP7 indeed suggesting that native and forest species would expedite regeneration of forest areas.

We can use natives and forest species because this ties in with our concept to bring forest back to this Federal Park." (KVP7)

KVP7's suggestion reflects an understanding and appreciation that ecological landscape can mostly be delivered by using native plants, besides forest vegetation. However, they could learn from the experience of the precedent studies, which have started to consider mixing both native and non-native species that are appropriate for the site conditions.

The majority of the respondents at different levels of management agreed that an ecological approach is appropriate for urban parks with an existing natural setting as it could increase biodiversity. ALG3 suggested that introducing natural vegetation near the water bodies would help to improve its ecosystem. Consequently, having an ecological treatment at pond and water-edge areas will also encourage wildlife into the park by creating habitat diversity (KVP6; KVP2; LD2, LD4, NLD1). Having this quality resource within the ecological landscape will attract more wildlife (KVP2) and having more natural vegetation will increase thermal comfort in the park surroundings (TLG3, TLG4, KVP1) because increasing the amount of tree cover in the park will contribute to amelioration of the park's micro-climate (TLG5, PBG11).

6.4.1 Management benefits of ecological design and management

Apart from these environmental benefits, this sustainable practice offers other significant advantages to the current management of Kuala Lumpur's urban parks, which are presented in the following sections.

MB1: Enabling urban park management to address site issues while sustainably managing its natural resources for multifunctional use

The majority of the respondents commented that adopting ecologically sustainable landscape practice would have the advantage of enabling the park management to address relevant site issues while sustainably managing the park's natural resources for multiple use and benefits. For example, adopting SuDS would enable the park management to expand the role of the parks through improvement of stormwater quality by treating rainwater before it entered the waterbody (PBG10). Expressing a similar view, one of the support staff (KVP4) and more managerial staff (PBG11, PBG12, PLG1) acknowledged that replacing the conventional drainage to SuDS would allow more sustainable management of stormwater on-site, and provide cleaner water storage for cleaning and outdoor use (PBG11).

PBG10 added that replacing the concrete drainage with soft-scape elements through a SuDS scheme could reduce the amount of water management infrastructure in the park, thereby restoring the natural state of the park while conserving its ecological resources for the benefit of future generations. Likewise, the combination of naturalistic and regenerated landscape would help the park management to create more habitats for urban wildlife (PBG10, PLG2) that could potentially become an attraction of the parks by offering a different outdoor experience for visitors. TLG4 suggested that people like to visit parks that offer variety of activities and experiences. Nevertheless, public health and safety should not be compromised. By performing this multifunctional role the parks could generate maximum ecosystem services for the city of Kuala Lumpur.

MB2: Opportunity to learn sustainable approaches and improve current urban park management practice

Introducing ecological design would give urban park management the opportunity to improve their current practice and to provide their staff with prior knowledge and skills regarding delivery of this sustainable approach. PBG10, for example, affirmed that he is looking forward to learning about ecological design and management. TLG4 further claimed that as long as maintenance staffs are well informed regarding the aims and objectives of ecological design, and provided with the appropriate knowledge and skills, they will be able to deliver this approach.

6.4.2 Management challenges

While recognising the management benefits of ecological design, the interview respondents also pointed out some challenges to delivering ecologically sustainable landscape practice in Kuala Lumpur's urban parks, as discussed in the section below.

MC1: Changes in management personnel will affect the delivery of ecologically sustainable landscape

Changes to the urban park management structure are normal practice for urban parks in Kuala Lumpur. Taking the work experience of KLCH support staff as an example, most have been assigned to different urban park management or landscape units through job rotation for a minimum average of 3-5 years' as part of skills development, prior to a management reshuffle or as requested by the staff. It was also noticed that during the period between the researcher's preliminary study, conducted in 2012, and the case study interviews in 2013, *PBG* had undergone a change of park manager and other personnel due to its transformation from a recreational park to a botanical garden.

Among all the respondents, ground staff and support staff raised their concern that change in management personnel would affect the delivery of ecological design. Some of the labourers highlighted that change in management personnel normally leads to changes in management approach. Consequently, this could affect ecologically sustainable practice in urban parks. This was demonstrated by past experience in some of the studied parks of applying ecological shrubland and semi-woodland (*PBG*) designs and pond and water-edge treatments (*ALG*). Despite this move, due to the appointment of a new city Mayor, the landscapes were returned to the original design. According to ALG2:

> *"We did plant this species [Alt 2 treatment for shrubland] during the former Mayor's management. When the new Mayor took charge, he instructed us to change the landscape back, so we just followed his instruction."(ALG2)*

In addition, ALG2 and TLG1 commented that top management personnel might not necessarily prefer the ecological landscape. Hence, decisions regarding delivery of ecological design are dependent on the view of the Mayor and top management (PBG3). Meanwhile, most of the ground level staff must comply with whatever instructions are handed down by senior management.

Likewise, one of the support staff of KLCH suggested that while changes in support staff might cause less effect, a change of park manager could have considerable effect on the adoption of ecological design in the urban park. Although moving management personnel around is good for staff development (i.e. job promotion, learning different work skills), discontinuity in urban park management could affect the delivery of ecological design if the new personnel have different interests or less understanding of ecological design and management. According to PBG10:

> *"The challenge will be if I am no longer in charge here. The person who replaces me might not have the same passion as I do, and maybe no preference for this landscape type. We have faced a similar challenge of different ways of thinking and maintenance every time the park manager has changed. In 7 years, the park manager has changed 4 times. Among them, only one manager was interested in the ecological approach. He is a certified Arborist so he is more interested in nature [in the park].* (PBG10)

Taking into account the above statement by PBG10, there is more likelihood that the successor would oppose rather than promote an ecological approach. Therefore, the urban park management ought to provide proper ecological knowledge dissemination to their workforce in order to ensure continuous adoption of such an approach at Kuala Lumpur's urban parks.

MC2: Retrofitting ecological design to existing parks is challenging due to site constraints

Another challenge expressed by the respondents is retrofitting ecological design into an existing urban park compared to designing a new park. For example, among the current case studies, *ALG* is part of the integrated stormwater management system for Kuala Lumpur. Even so, the park is still facing a critical water pollution problem, to which SuDS might be a potential solution. However, one of the support staff argued that applying this system might fix only 20-30% of this problem, specifically by filtering the surface water runoff before it enters the lake. According to ALG3:

> *"I think it's a good approach, but [unlike new developments such as the wetland park] we will have a problem to implement it at an existing park like the ALG because there are drainage inlets coming from many sources surrounding it [housing, shops, and industrial area]. So, we need to identify the main problem and only then can we propose an appropriate action. (ALG3)*

The remaining 70-80% of the pollution comes from multiple inlets through the concealed drains that discharge waste water from the surrounding area into the pond (refer to figure 6.26).

Figure 6.26: Photo showing drainage inlet sources at *ALG* (left) that contribute to water pollution in the park (right).
Resource: Roziya Ibrahim (2013)

This suggests that while incorporating ecological design could treat and prevent the water pollution at this park, specific site constraints may require more study and more complex solutions compared to new developments. As a direct consequence implementation costs would increase because the park management would need to invest in more resources and expertise. There is a strong suggestion that full commitment from all stakeholders is key to achieving ecologically sustainable practice in this type of project.

MC3: Lack of appropriate knowledge and skills among the park management team and other stakeholders could hinder the implementation of ecological design and management practice

One of the keys to success in delivering ecologically sustainable landscape practice is equipping the park management team with the appropriate knowledge and skills in ecological design. The interview findings demonstrated that lack of knowledge and understanding of the ecological approach could pose another challenge to urban park management in Kuala Lumpur. The managerial staff and senior management personnel expressed most concerned about this issue.

Among the managerial staff, PBG11 stated that despite the park management's intention to apply a similar treatment for semi-woodland in *PBG*, it is yet to be carried out because of lack of labour, which might not necessarily be a problem if the current team had the appropriate knowledge and skills for delivering such an approach. PLG1 admitted, moreover, that he needs to learn more about this approach and the new techniques for some aspects of maintenance before he can lead his team towards achieving the expected quality of ecological design and management.

Besides being aware of their own need for appropriate knowledge of ecological design, the managerial staff were also concerned about the poor understanding of ecological design among other stakeholders, such as senior management personnel. According to TLG6, they might have different perceptions of ecological design due to their lack of exposure to sustainable landscape practice. Expressing a similar view, PBG11 stated:

"Some of them cannot accept it [sustainable practice]. Not just visitors, there are also top management such as directors, with no agricultural background. For us, it is fine, but for them if we leave the dry leaves, or the grass grows tall, it is like we aren't maintaining the landscape. That's why it [ecological landscape design] is not successfully implemented in this park. Our people's mentality is still not up to that level [to accept sustainable practice]. Not just the public, but also management personnel who don't understand. (PBG11)

Similarly, the majority of the senior management personnel interviewed admitted that there is a lack of in-depth knowledge and expertise in ecological design and management among stakeholders at all levels of urban park management. According to LD4:

"I believe our weaknesses are that we don't have the expertise in terms of planting details [naturalistic plant selection] appropriate for inclusion in our parks. Even the landscape architects that we have are not experts on this aspect. We always performed the plantings by trial and error. We don't have an expert that focuses on researching the appropriate species for this ecological concept." (LD4)

This suggests that because they have only basic knowledge of ecological design, landscape architects would have to manage ecological design mainly by learning through practice. There is indeed a lack of proper study of existing research on appropriate plant palettes or planting strategy to support the implementation of ecological design in the local context and climate conditions. LD3 admits that:

"I think we [the top management] always prefer shortcuts, without any supporting research to back up our decision… At the moment we don't have the exact solution or decisions on the appropriate plants for the city [Kuala Lumpur]. We just propose the species, if it is not appropriate then we will replace it with others." (LD3)

This clearly suggests that without this prior knowledge, the landscape architects will not be able to inform and advise other stakeholders of top management in making their decisions on the appropriate direction for achieving more sustainable parks; as a result they will continue making decisions based on their general knowledge and assumptions.

LD5 further suggested that at the park level, without proper explanation and guidance by the supervision team, particularly on maintenance scope and techniques, the ground staff will indeed face difficulties in delivering ecological design, which obviously contrasts with their standard practice:

"I think we will have problems with those who do the landscape maintenance, they need to have proper understanding; that is most important. To what extent do you want to allow them to maintain the park?" (LD5)

Lack of appropriate knowledge and expertise in this approach would result in unexpected outcomes of ecological design that may lead to negative perceptions towards this approach. This would explain the failure in delivery of previous ecological design schemes proposed at some of the studied parks (*PBG, PLG*), as reported by most of the respondents across the levels of urban park management. The interview findings imply that the negative outcomes from previous ecological experimentation may have caused the urban park management to stick to a more conventional horticulture approach. This might hamper KLCH's sustainable objective of

transforming Kuala Lumpur into a “tropical garden city”, as well as realisation of the NLD’s vision of becoming the “most beautiful garden nation” by 2020.

The findings also implied that lack of experience of ecological design is one of the reasons for most stakeholders disagreeing with transforming the landscape of Kuala Lumpur’s urban parks into a more ecologically sustainable landscape, as its appearance obviously contrasts with their common understanding of a clean and aesthetically beautiful landscape. Therefore, acquiring proper ecological knowledge is a necessity for park management, to enable them to transfer relevant information to those involved in the urban park management of Kuala Lumpur, as well as the public.

MC4: Conflict and disagreement with other stakeholders on ecologically sustainable landscape practice

Among the respondents, there was an understanding that ecological design will require collaborative effort between the park management and other departments, and will involve other disciplines. Top management personnel are mostly concerned that urban park management would face conflict and disagreement in managing multidisciplinary collaboration to deliver this ecologically sustainable landscape practice, which will now be discussed.

The distinct backgrounds of the various stakeholders have considerable influence on their attitudes and responses towards ecological design, which could cause disagreements in delivering an ecological approach. PBG10 expressed concern that there would be difficulty in reaching mutual consensus regarding an ecological approach:

> *“It will be very difficult to apply this approach in this park, because it not only involves our department but also the Drainage Department…We can say we want to treat the water-edge like this [water-edge treatment], but they will have a different opinion, for example, ‘this structure is not strong and will collapse’. There will be a lot of conflict.”* (PBG10)

The majority of senior management personnel strongly believe they will face difficulties in convincing other stakeholders to accept and change towards ecologically sustainable landscape practice. Referring to his experience in dealing with attitudes of other stakeholders with different professional backgrounds, LD1 reports:

> *“We [landscape practitioners] are facing problems in managing our green space because we have to deal with the civil engineer, electrical engineer and others. There are too many champions. For example, we have a well-established Angsana tree [pterocarpus indicus] that we planted in the 80s; with big canopies that provide proper shading along the roadside…Now, the Engineering Department are proposing a covered pedestrian network, which is also a government policy. But because the road reserve has limited space, the engineer has proposed cutting down all the trees.”* (LD1)

The lack of tolerance and compromise among the stakeholders in dealing with integration of the landscape with other public amenities reflects the poor multidisciplinary collaboration within local government. LD2 referred to this problem as a conflict of priorities in delivering policies for

green spaces provision and an integrated pedestrian network, with different stakeholders having different approaches to delivering various government policies. LD3 further suggested that this conflict occurred through the unwillingness of some professions to compromise over the environmental approach proposed by the landscape architects as it is opposed to their normal practice. Besides, as this is quite a new approach that is unfamiliar to other stakeholders, acceptance of the change of practice to ecological design and management becomes even more critical.

MC5: Difficulties in dealing with public attitudes towards ecological landscape design

Besides having to deal with difficulties arising from multidisciplinary collaboration, urban park management faced a similar challenge in terms of public attitudes towards ecological landscape design. According to one of the labourers:

> *"If we have this type of landscape, people will say that we are not doing our work"*. (PBG3)

Similarly, KVP2 argued that *"the challenge will be to attract people to come and appreciate this type of park"*. Failure to communicate to the public the value of ecologically sustainable practice would lead to disapproval of such approaches. As discussed above, previous experience indicates that this approach was not successfully implemented at some of the parks, where, due to complaints by the public, the park management gave instructions to the ground level staff to take immediate action to return the landscape to the previous, conventional design.

For the same reason, some of the support staff opposed the idea of implementing ecological design at their respective parks. PBG6 strongly criticised the adoption of ecological pond treatment (refer to figure 6.27) at *PBG* because:

> *"I don't think we can apply this concept for the whole of the Botanical Garden. We need to do it at an appropriate site [park with existing natural setting]. We have tried the wetland concept [pond treatment] but people don't like it because it is not appealing to them although it is natural. They preferred a clean landscape with themes…from what I see, this concept is new in Malaysia. People are used to open lawn, with flowery plants. If we change to overgrown grass, they will start to complain." (PBG6)*

Figure 6.27: Photos showing the wetland plants at the pond area in 2008 (left), which had been cleared by the time of the site visit in 2013 (right).
Resource: Gloria Seow (2008) and Roziya Ibrahim (2013)

According to PBG6, if ecological design were introduced at PBG, they would not only receive complaints but it would also affect the number of visitors to the park. This would damage the reputation of the KLCH because they have made huge investment in transforming the park into a botanical garden, as one of Kuala Lumpur's tourism attractions. Therefore, a few of the support staff would prefer to keep the existing landscape (PBG6, PBG9). The interview findings indicate that based on the following reasons the public may disapprove of ecological design:

a. Differences in public preference regarding urban park landscape's appearance

As perceived by the majority of the management stakeholders, park visitors have different preferences regarding urban park landscape's appearance. The senior management regarded varying public attitudes towards ecological design as the most critical task to handle (LD5, NLD1). Consequently, KVP6 would expect negative responses from some members of the public during the early development phase of ecological design, and stressed that:

> *"Our main challenge will be to get the public to understand this approach. The implementation stage will be the most critical stage…There will be a tendency for the public to complain".* (KVP6)

For example, KVP7 mentioned that at *KVP* some users were so particular about the cleanliness of the park that they could not tolerate even 2-3 days delay in mowing. But, to the contrary, the park management would also receive complaints from other park users if they cut the grass too often. A similar issue was also faced by the park management of *PLG.*

Negative attitudes among the public resulted in conflict between them and park management of all the studied parks. *KVP* had encountered such problems since they took over the park management in 2011. Reflecting on the experience of dealing with public complaints, KVP6 commented:

"It's difficult to deal with the public. For example, we proposed an extension of the parking area, but we received objections from the local residents." (KVP6)

Having an urban park in close proximity to their home can make some regular park users so attached to that park that they are unwilling to compromise over any developments in the park (refer to figure 6.28). In this regard, KVP7 added:

"This neighbourhood is so called elite. For instance, when we used blowers to expedite the cleaning of dry leaves, they complained it was not environmentally friendly because the smoke polluted the air and the sound caused noise pollution. When we stopped using blowers, it took time to clear the dry leaves as the leaves continued to fall. Then, people started to complain that we didn't keep the park clean." (KVP7)

Figure 6.28: Photo showing the latest feedback session, organised by the National Landscape Department on 6 December 2014, on the landscape proposal for *KVP* upgrading, which has continued to receive objections from park users
Resource: Yap Chee Hong, the Star (2014)

This view suggests that dealing with public attitudes and perceptions is more critical at urban parks surrounded by high income residential areas, such as *KVP.* High educational background would perhaps lead to residents having higher expectations of their local park and a tendency to be more vocal in raising their opinions, especially those that conflict with park management decisions.

b. Lack of public understanding of ecological design

Poor understanding of ecological design could further aggravate public perceptions towards this naturalistic approach. According to some of the support staff, gaining the public's approval could be problematic for the urban park management, especially when introducing ecological design elements that are not familiar to them (ALG3, PBG6, PBG9, PLG2).

There was a suggestion among the senior management personnel that Malaysians have a lower opinion of naturalistic landscape compared to people from developed countries, due to their lack of knowledge and exposure regarding such ecological designs (NLD1). Expressing a similar opinion, LD3 further suggested that:

> *"This difference is reflected in different attitudes between us and developed countries. They are more appreciative of this type of landscape; whereas our public still have negative attitudes of damaging the landscape or even polluting the environment. That is the mentality of our people."* (LD3)

This finding also suggests that a developing world mentality still prevails among some Malaysians, which is reflected in a lack of appreciation of ecological design. . Furthermore, as they are so used to a manicured landscape style, it is difficult to change their attitude to naturalistic appearance. According to LD5:

> *"We will have a problem with public perceptions. If they don't understand about this landscape they will develop negative perceptions. "What is KLCH doing? Everything is a mess", because they were so used to seeing a well grown and well maintained landscape, and suddenly we changed the landscape. They will react as if KLCH have no more budget [for landscape maintenance]." (LD5).*

This finding infers that level of understanding of the ecological approach has a significant influence on stakeholders' attitudes towards ecologically sustainable landscape practice in Kuala Lumpur's urban parks, as suggested by one of the managerial staff, PBG11:

> *"With detailed information about the benefits of this landscape, people may accept this idea. But for some people who just don't understand, it will still be an issue. They will complain direct to the mayor."* (PBG11)

Similarly, a member of senior management, LD5, insisted that the public should be instilled with appropriate knowledge and understanding about ecological design and its environmental contribution; otherwise they will disapprove of this landscape, leading to reduction in urban parks' visitor numbers. Similarly, NLD1stated:

> *"We need to provide knowledge among the public. If you have been to the Cyberjaya Lake Garden, you will notice there are very few visitors because the landscape is more natural and people are not interested in coming."* (NLD1)

Providing inputs on ecological design is particularly critical in the cases of community groups that are strongly attached to their parks (*KVP, ALG*), as they may refuse to accept the change towards a new landscape style. KVP4 expressed this concern as follows:

> *"It will be a conflict because there is a community group called Friends of Bukit Kiara. They are quite sensitive about the word 'development'. For them [landscape] development means building structures. Previously, we organised a public meeting and invited them to view our landscape development proposal. Although some of them are doctors and engineers, they can't accept the new ideas or technology that we introduce, such as water treatment for the septic tank at the toilet."* (KVP4)

However, one managerial staff member, PLG1, thought that such misconceptions are normal during the early stage of implementation, but this negative attitude could gradually change to one of acceptance over time, once the public experience the naturalistic landscape and appreciate its environmental benefits (KVP6).

The above findings suggest that urban park management should be aware that there are broad differences in public attitudes and perceptions and that there will always be a few people who will disagree with this approach or take a longer time to accept it. Thus, any effort to gain public

approval of ecological design will require strategies for dealing with these differences. In addition, the public should be able to have input into developing design and management features appropriate for their park. There is also an implication that the higher the visitors' educational level, the more they tend to require information and clarification to convince them about this sustainable approach, possibly with supporting facts and figures or results of official studies (KVP4, PBG9). Such efforts will help them to understand and be willing to change towards a more ecologically sustainable landscape.

MC6: Challenge to convince politicians to accept ecologically sustainable landscape practice

Despite the government's aspirations and its support regarding sustainable urban landscape development, including urban parks, political influence could threaten the efforts by urban park management in NLD and KLCH to change over to ecologically sustainable practice. LD5 suggests that:

> *"All new things indeed will have their own challenges. But, most importantly, those who are going to implement it must give their commitment; about how to realise this approach [ecological design and management] on the ground. (LD5)*

LD3 admits that it is difficult to convince politicians and government officials to change their perceptions towards an ecological approach:

> *"In response to ecological sustainable landscape… the Minister and other VIPs will start to express their opinions to us [KLCH]. Besides them, the VVIP and also laymen, who will give negative comments on this type of landscape as they prefer conventional landscape design [manicured garden] and the beautification concept"* (LD3)

Expressing a similar view, LD2 and LD3 demanded that top management personnel be more determined in convincing the government officials (i.e. VVIP) of the value of naturalistic style landscape in order to gain their approval and full support of such design:

> *"The local enforcement is still very low. We might say yes today, but it can change by tomorrow because of political power. Power can do anything [may affect delivery of ecological approach]."* (NLD1)

Otherwise, there is no assurance that ecological design and management could survive such political interference, especially when a Minister or Mayor is replaced by someone with less interest in ecological design.

This finding suggests that political influence will have a significant influence on determining the success or failure of ecologically sustainable landscape practice in Kuala Lumpur's urban parks as politicians usually act as the local government's policy makers. Besides representing the public voice, politicians could use their power and influence to steer ecological design and management at Kuala Lumpur's urban parks, and subsequently influence the public to accept such an approach. This was proven successful in the development of Tampines Eco-green Park, Singapore. Thus, urban park management ought to play a more pro-active role in

channelling information about ecological design and management inputs to the respective politicians to gain their full support during implementation of this ecologically sustainable landscape practice.

6.5 Summary

The analysis of the case study semi-structured interviews provides a range of findings regarding stakeholders' attitudes to changing to a more ecologically sustainable landscape practice through integration of sustainable water management in Kuala Lumpur's urban parks. First, the interview findings clearly show that delivery of the government's beautification policy, as interpreted in the landscape development objectives and strategies, has obligated the park management to adhere to conventional horticulture practice. The interview findings also highlighted key themes that are common across case studies. Whilst there were constructive responses to aspects of ecological design and management, regarding its appearance as well as the impact of such an approach, ecological landscape would need to correspond to the current management's requirements as well as public preference and expectation, particularly on cleanliness, beautification and safety. Based on the interviews with stakeholders, Chapter 7 will present a comparative discussion of the across-case analysis of the benefits and challenges entailed in adapting ecological design and management to the local context and setting.

CHAPTER 7

Adaptation of Kuala Lumpur's urban park management towards delivering ecologically sustainable practice: Comparative discussion of case study interviews

7.0 Introduction

This chapter presents a comparative discussion of the findings from the semi-structured interviews across the case studies, in order to identify means of adaptation of Kuala Lumpur's urban park management towards delivering ecologically sustainable landscape practice. This chapter first discusses the potential for Kuala Lumpur's urban parks to change to more ecologically sustainable design and management practice, as highlighted by the urban park management. This is followed by discussion of the key benefits of introducing ecological design and management into the current landscape practice and the challenges involved in achieving this goal. These outcomes will help to identify strategies that are appropriate to the local context and environment.

7.1 Potential for Kuala Lumpur's urban parks to change to a more ecologically sustainable style of landscape design and management

Overall, responses by urban park management across the case studies identify potential for delivering ecologically sustainable landscape in Kuala Lumpur's parks, although this would require certain changes to current design and management practices. Despite their uncompromising responses to certain aspects of ecological design and management, stakeholders from different levels of management would consider such an approach, provided certain modifications were made to adapt the proposed ecological design framework to the local context, as well as the preferences and expectations of the public.

The stakeholders' responses confirm the finding by previous studies that the appropriate ecological approach for Kuala Lumpur's urban parks is very much dependent on the park's setting and its function within the city (Wu, 2013). For example, each park in Kuala Lumpur was designated for specific functions by typology. Those parks that are in natural settings, such as *PBG, KVP* and *PLG,* can potentially benefit from linkage with these existing resources and perhaps exposing park visitors to different landscape expression and intensity. This may contrast to the approach appropriate for those sites that are contained within built environments (*ALG, TLG*).

It addition, adaptation to ecological landscape design is influenced by the park's age, location, scale (Forman, 1995), and the extent of existing ecological resources in the park (Lovell & Johnston, 2009). These important criteria for adaptability are discussed as follows:

a. Age of the park

Age of the park is an important criterion for assessing the suitability of adopting ecological design because older parks in the city, such as *PBG, KVP* and *PLG,* contain established vegetation cover including significant amounts of semi-woodland, which means these parks are considered best suited to this approach

b. Location of the park

Location is an equally important criterion for determining the appropriateness of applying ecological design to Kuala Lumpur's parks. The findings from the interviews suggest that ecological design is most appropriate for parks located at the city's periphery, such as *KVP* and *PLG*, whereas city parks like *PBG* and *TLG* are less suitable due to their significant social functions. For instance, whilst in terms of age and setting *PBG* might suit an ecological approach, the park is located close to the city centre and is well known for its botanical and visual attractions that attract many local and foreign visitors. Therefore, the park management believe that intense ecological treatment may not be appropriate for this type of park. For similar reasons, *TLG* is also considered inappropriate for such an approach.

Besides reflecting its physical setting, the park's location represents the different demographic backgrounds of visitors, particularly regarding social class and educational attainment, which may influence their demands and attitudes. The park management have faced the challenge of dealing with differences in public preferences and expectations of urban parks, as well as their various attitudes towards naturalistic landscape appearance. The findings imply that *KVP* and *ALG* present the most critical challenges to the park management compared to the other parks in this study.

c. Size of the park

The interviewees identified size of the park as another significant criterion, with ecological design being considered most effective in larger parks, such as *PBG*, *TLG* and *PLG,* where the park management would have more flexibility to plan the best areas and strategies for implementation of ecological design. However, in smaller scale parks, such as *ALG* and *KVP,* where space is restricted, the naturalistic landscape would conflict with the recreational space, which most of the stakeholders regarded as unacceptable.

d. Current extent of natural resources within the parks

The existence of natural resources, such as existing woodlands and waterways within the park, as well as undulating topography, is an added value for adopting ecologically sustainable landscape practice. The park management could integrate these natural resources into their ecological designs, with relatively modest input of resources and design intervention required (*KVP, PLG, PBG*) compared to parks that lack these natural elements, such as *TLG* and *ALG*.

In addition to identifying the above criteria, respondents highlighted the importance of the unique setting of Kuala Lumpur's urban parks compared to those of their western counterparts. The particular climate and cultural background would be significant factors influencing adaptation of an ecological approach to the local context. For instance, because of this tropical city's abundant rainfall, the integration of SuDS for stormwater management could be highly beneficial. In addition, tropical and temperate climates have different impacts on ecological design and management practices, and the landscape's appearance also varies. Furthermore, stakeholders' attitudes are strongly influenced by the particular cultural background of this developing city and by public preferences and expectations of how the landscape of urban parks should look. The following sections discuss the responses of management stakeholders in relation to adopting the ecological design and management practices proposed for the case study sites.

7.1.1 Overall response to aspects of ecological design and management

Generally, the responses of stakeholders across the different levels of urban park management reflect a mixture of positive and negative attitudes towards ecological design and management across the case studies. Figure 7.1 presents a summary of stakeholders' responses regarding changes to landscape design and management for increasing ecological sustainability of Kuala Lumpur's urban parks. The positive responses include acknowledgement that ecological design is appropriate to park settings, produces instant impact on the environment and, most importantly, creates a multifunctional landscape.

Consistent with the previous studies, all levels of urban park management were agreed that sustainability could be enhanced through expanding the multifunctional potential of ecological design (Nigel Dunnett & Clayden, 2007; Lovell & Johnston, 2008; McGuckin & Brown, 1995) by water management based on integration of SuDS into the parks (*PBG, TLG, ALG, PLG, KVP*); by creating habitat diversity (*PBG, PLG, KVP*); expediting the re-generation of the park's vegetation (*PBG, PLG*); and ameliorating the micro-climate (*PBG, TLG, KVP*).

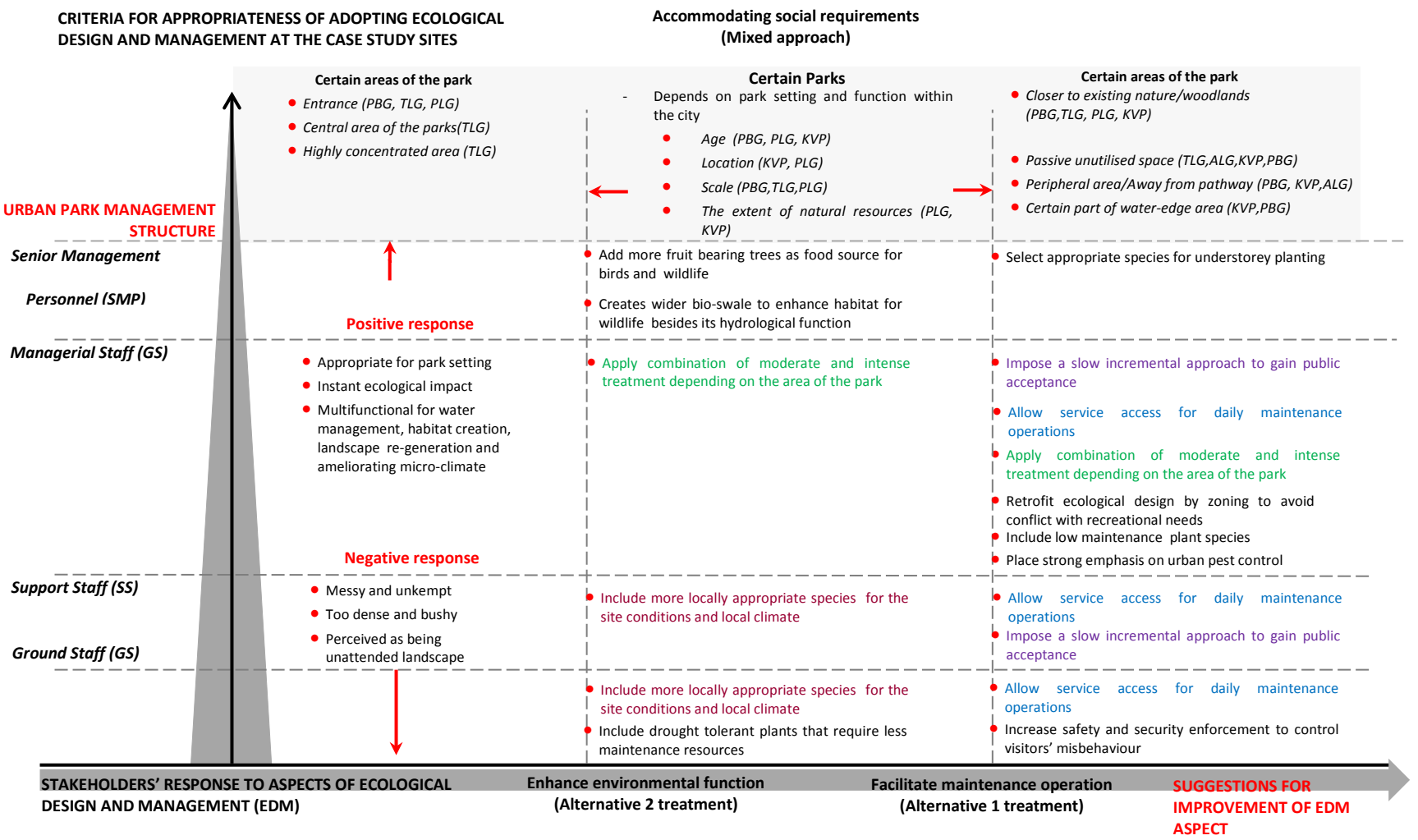


Figure 7.1: A summary of stakeholders' responses to ecological design and management aspects proposed to increase sustainability of Kuala Lumpur's urban parks

However, across the case studies, responses indicated a lack of willingness to move towards a more ecological and sustainable approach to landscape practice in Kuala Lumpur's urban parks. This was reflected through interviewees' negative response to naturalistic landscape as being messy and unkempt, too dense and bushy, and presenting a neglected landscape, which they claimed would conflict with the park management's goals and objectives, as well as causing them to be blamed for not performing their duty in maintaining the parks. The following are the key recommendations for modifications to ecological design, management and maintenance as suggested by the respondents.

- **Recommendations for modifications of design aspects to enhance the environmental function of naturalistic landscape**

Using appropriate plant species for the local site conditions and climate was recommended, as these are believed to be more resilient to site modification. This response supports the finding of previous studies that this practice could help conserve the existing vegetation while expediting the landscape regeneration process in urban parks (Echols, 2008). It was also argued that the ecological functions of the park could be enhanced by appropriate selection of species; for example, adding more fruit bearing trees as a food source for birds and other wildlife could increase the level of biodiversity in the park (Adams, 1994). In addition, as drought tolerant plants would be more resilient during the dry season (Hunter, 2011), less maintenance would be required. In support of the inclusion of SuDS in the parks for storm water management, it was suggested that creating a wider bio-swale would achieve better hydrological function, besides enhancing habitats for wildlife, as suggested by Kennedy et al. (2007). These suggestions bear similarities to certain ecological design aspects applied in temperate countries, which could potentially be further tested and adapted to the local context.

- **Recommendations for design and management modifications that would balance environmental function and social needs**

There was awareness among the management stakeholders of the need to achieve a balance between environmental function and social needs through a combination of moderate and intense treatment, which is consistent with the previous literature (Makhzoumi, 2000). As suggested by the managerial staff, the park's setting or the area around the park are important considerations in achieving optimum environmental functioning of an ecological design, while at the same time accommodating social requirements (Nassauer, 1995a). This strategy is believed to be the best option for applying ecological design and management in Kuala Lumpur's urban parks.

A minority of the stakeholders would choose to showcase this naturalistic landscape at focal points in the urban park, such as entrances (*TLG, PLG, PBG*), as a public education and

awareness strategy. For the same reason, some stakeholders from *TLG's* park management would apply this approach in central areas of the park where it would be visually apparent and could promote close interaction between visitors and the ecological environment (Forman & Godron, 1986; Steiner, 2011). However, the majority of stakeholders across the case studies were clearly unwilling to introduce ecological design near to utilised public and recreational spaces and suggested that it should be used only at certain areas of urban parks. Among the spaces they believed to be applicable for naturalistic landscape in Kuala Lumpur's urban parks are those closer to existing nature (*PBG, PLG, KVP, TLG*); passive and unutilised areas (*PBG, KVP, ALG, TLG);* peripheral areas and away from pathways *(PBG, KVP, ALG);* and certain parts of water-edge areas *(KVP, PBG, TLG).* Such strategy would contradict those applied in parks reviewed through the precedent studies, where most of the SuDS components were located near public spaces, such as children's play areas (*LOP*, *MP, TP and BP*). Moreover, this could limit the potential for the park's ecological enhancement and for addressing site issues sustainably.

Attending to public safety and health is another critical aspect to consider in delivering ecological design in Kuala Lumpur's urban parks, as a common theme across the case studies. Having direct contact with park visitors and constantly dealing with their complaints, the respondents' main concern is public safety around the naturalistic landscape, especially in relation to crime and harmful wildlife. They believe that such threats could deter the public from visiting the parks, as suggested by Jorgensen et al.'s (2002) finding that intense naturalistic landscape composition and structure may result in visitors feeling unsafe in these environments. This issue is more significant in tropical urban parks because of the high density of vegetation when compared to temperate climates. Thus, a moderate treatment would offer a better solution. Similarly, pest borne diseases, such as dengue fever and leptospirosis (bacterial infections), are major public health issues in Kuala Lumpur. Although there is no empirical evidence linking naturalistic landscape to this health threat, there is a perception that naturalistic landscapes could possibly become mosquito breeding grounds if not regularly maintained, especially during the wet season. Therefore, the park management needs to take preventive measures in order to avoid health risk to park visitors.

These recommendations are consistent with measures applied in parks in the precedent studies, confirming previous research findings that alteration to ecological design is necessary in order to satisfy park visitors' perceptions of safety (Schroeder and Anderson, 1984), with treatments needing to vary according to local context and setting (Nassauer, 1995a). It was also suggested that the park management should guarantee strong security enforcement, which confirms that, eventually, managing this landscape would require additional resources for ensuring the public's actual safety as well as their perceived safety while in the parks.

- **Recommendations for improvements to management aspects to facilitate maintenance operations**

There was mutual agreement among stakeholders of different levels of urban park management that they would consider implementing ecological design provided it did not affect their daily landscape operations. Adequate provision of service access is an important aspect to be considered in applying naturalistic style landscape, in order to allow clear entry for the maintenance staff to perform their daily maintenance operations, such as crown trimming and thinning and clearing of the trimming debris, which are more critical for semi-woodland and water-edge treatments. This shows that some of the stakeholders had misconceptions of what an ecological approach would entail, confirming the suggestion by Nassauer (1992) that "we assume that healthy ecological systems are beautiful. But this syllogism misleads" (p. 240). This misunderstanding has perhaps led to their unwillingness to accept a wilder and messy landscape.

However, managerial staff and ground staff suggested that this lack of understanding of ecological design and management could be addressed by adopting a slow incremental approach to delivery that would gradually allow the maintenance workforce to develop comprehension of this naturalistic landscape style and its maintenance flexibility. They would also come to understand, as indicated earlier by Cranz & Boland (2004), that ecological approaches are more responsive to dynamic changes of the naturalistic landscape, thereby reducing maintenance intensity and resource input (Nassauer, 1995a). Another design aspect that requires consideration is selection of appropriate species for the understorey planting, which, as suggested by senior management personnel, could expedite restoration of the woodland floor, while using low-maintenance plants in these areas would reduce the level of care needed to ensure their survival (Seabrook et al., 2011). Through this approach, the urban park management staff could develop their skills and knowledge of ecological design and management, which would be beneficial for communicating these sustainable ideas to park users.

7.1.2 Overall response on the appearance of ecologically sustainable landscape appropriate for Kuala Lumpur's urban parks.

Overall, the interview findings reveal that park management's commitment to satisfying social requirements is not restricted to fulfilling the recreational needs of park visitors, but also includes their preferences and expectations, which confirms the suggestion by previous studies that appropriate landscape appearance is significantly important for gaining public approval of naturalistic landscape styles in urban parks (Nassauer, 1995a). It is necessary for urban parks to be clean and tidy as well as aesthetically pleasing (Kaplan, 1985), which relates to the need to have more open and clear space and less obstructive and low density landscape, to improve public perceptions of safety (Jorgensen et al., 2002). These requirements are consistent with

the park management's goals and objectives as indicated by the stakeholders, the review of the current maintenance specification of these parks, and also evidence from the current landscape maintenance of the case study parks as observed by the author.

Consistent with previous literature (Özgüner, Kendle, & Bisgrove, 2007), the interview findings imply that the stakeholders' judgements on naturalistic landscape appearance are similar across the case studies, strongly determined by perceived public expectations and preferences of what urban parks in Kuala Lumpur should be like and established through their experience of dealing with park visitors' attitudes to naturalistic landscape appearance. Figure 7.2 presents a summary of stakeholders' responses on the appropriate landscape appearance for ecologically sustainable design for Kuala Lumpur's urban parks. It is observed that the responses towards naturalistic appearance vary overall across different levels of park management and across case studies, with a mix of positive and negative responses (Seabrook et al., 2011).

The interview findings show that some stakeholders were positive about naturalistic landscape's appearance due to their understanding of its environmental function and instant visual impact of wilderness, which is consistent with Hume's (1957) theory of taste. However, as they were putting public preferences before their personal preference, some stakeholders perceived that the wild appearance of naturalistic landscape would tend to create unsafe feelings among park visitors (Jorgensen, Hitchmough, & Calvert, 2002; Schroeder & Anderson, 1984) regarding crime, wildlife and health threats. It is noticed that among the different levels of urban park management across case studies, ground staff who had closer contact with the public were most disapproving of naturalistic landscape appearance, which they considered as bushy, overcrowded and creating a messy and unpleasant look.

For the above reasons, some stakeholders would rather keep the existing landscape. Nevertheless, the majority of the stakeholders, at different levels of management, are willing to consider a moderate treatment with appropriate landscape appearance for satisfying park visitors' preferences. The stakeholders' suggestions for modifications of ecological design and management that would achieve appropriate naturalistic appearance in Kuala Lumpur's urban parks depended on the park's setting and its function within the city and have been divided into four categories for discussion, as follows:

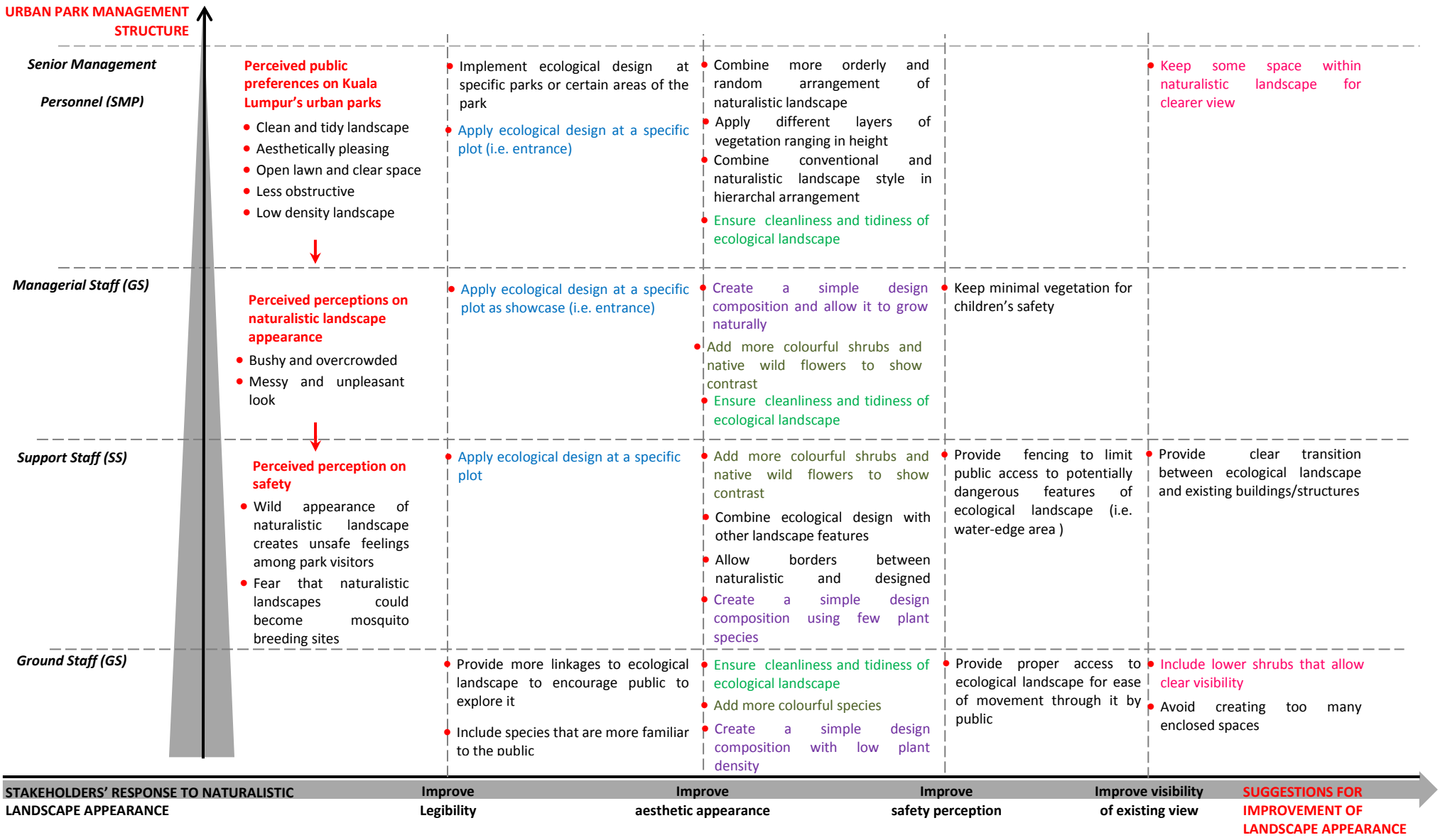


Figure 7.2: Summary of stakeholders' responses on the appropriate landscape appearance for ecologically sustainable landscape for Kuala Lumpur's urban parks

a. Improve legibility of ecological design

A common suggestion for gaining appropriate appearance of ecological design is to improve its legibility. This could be done by allocating naturalistic landscape to a specific plot within the park that would be easily accessed visually by park visitors. Besides serving as an educational model or experimental plot for instilling environmental knowledge among the public, it could also provide a platform for the public to give their feedback and suggestions for improvement. It is also believed that provision of more linkages to naturalistic landscape could encourage the public to explore ecological design and its environmental functions (*e.g.* SuDS) through life experience. Likewise, including species that are familiar to the public will help gain their acceptance of this landscape. Despite the suggestion to implement ecological design at certain areas of all parks, some stakeholders would prefer to implement it only in parks that have the appropriate setting for this natural theme.

b. Improve aesthetic appearance

Aiming for beautification, the park's aesthetic appearance has been the main priority of park management when considering the adoption of ecological design at Kuala Lumpur's urban parks. This is consistent with the literature (Gobster et al., 2007), with the most common suggestion from the stakeholders being to add colourful shrubs in combination with native wildflowers to show contrast in the designed landscape (Hitchmough, 2008b; Seabrook et al., 2011). Cleanliness and tidiness are other important aspects in enhancing the visual aspects of urban park landscape, and are considered to be consistent with beautification as the key objective. Therefore, it is important to display a distinct appearance of naturalistic landscape by creating a clear border and recognisable constant presence of human care, such as architectural mowing. In terms of plant composition, although applying a simple design with low density planting is mostly preferred to control the dynamic form of tropical vegetation, different layers of planting have considerable capacity to enhance the aesthetic look of naturalistic landscape. However, this should be achieved through a combination of the orderly and random, through hierarchical arrangements to help frame the view towards the ecological landscape. This method, it is believed, could further enhance the naturalistic landscape's appearance, which complies with the cues to care theory by Nassauer (1995a). Whilst literature evidence indicates that aesthetic appearance is in general relevant to urban parks, it is more critical in the context of Kuala Lumpur due to the Malaysian government's vision, as embodied in recent policies, that emphasises "beautification" as a main aspect of the sustainable development agenda for Malaysia to become a "Beautiful Garden Nation" by the year 2020.

c. Improve visibility and maintain the existing view

Maintaining existing views within and beyond the boundaries of Kuala Lumpur's urban parks is significantly important to the park management across case studies. Having inherited the "picturesque style" of colonial landscape, maintaining a scenic view is significantly important for all case study sites, either towards natural surroundings or city scenery. Therefore, the stakeholders suggested keeping some open space within the naturalistic landscape to allow for a clearer view, besides using lower shrubs to avoid visual obstruction of scenic views. Similarly, a clear transition between ecological landscape and existing buildings (*e.g.* toilets) or structures is also necessary to provide a sense of direction. Likewise, the stakeholders disapproved of having too many enclosed spaces near to public areas as this could block the view and evoke negative responses.

d. Improve perceptions on safety

The perception of safety is also vital to Kuala Lumpur's urban parks because this influences the rates of visitation to these parks. The majority of stakeholders across the case studies were agreed that ecological design could cause negative perceptions of safety among park visitors. Therefore, to improve their feeling of safety, it was suggested to have minimal vegetation, especially near semi-woodland, ponds and the water-edge, to maintain public safety, particularly that of children. Similarly, another suggestion was to limit public access to potentially dangerous features of the ecological landscape (e.g. vegetation along steep water-edges). In addition, it was considered important to allow proper access for ease of public movement through this ecological landscape.

Overall, it can be concluded that the stakeholders' responses towards naturalistic appearance were determined by perceived public preferences and perceptions towards this landscape. Careful consideration of the issues raised above could guide Kuala Lumpur's urban park management to achieve appropriate appearance of naturalistic landscape for Kuala Lumpur's urban parks. Improving the legibility aspect could develop park visitors' understanding of ecological design in a more systematic manner, which is consistent with the cues to care theory by Nassauer (1995a), suggesting proper presentation of ecological landscape is necessary for public familiarity and recognition. Meanwhile, aesthetics, visibility, and perceptions of safety are very much interrelated and combination of these three aspects could help to achieve an ecological landscape that would create positive perceptions towards the appearance of naturalistic landscape among park visitors. This finding supports Schroeder and Anderson's (1984) claim that aesthetics are a priority for park management, while allowing visibility throughout the parks is equally important for preserving the existing scenery and improving perceptions of safety among park visitors.

7.1.3 Overall response to the impact of ecological design and management on current landscape maintenance

Adaptation to a more ecologically sustainable approach will significantly affect current landscape maintenance practice in Kuala Lumpur's urban parks. Table 7.1 summarises the aspects of maintenance that are most affected by adopting ecological design and management.

Table 7.1: Summary of the aspects of design and management impacted by ecologically sustainable landscape practice

Maintenance Aspect		Scope of Maintenance
1.	Maintenance intensity	Watering
		Mowing
		Tree pruning
		Shrub trimming
		Fertilizing
		Clearing dry leaves and trimming debris
2.	Amount of Resource input	Energy and time
		Labour workload
		Water
		Plant materials
3.	Intricacy of maintenance work	SuDS maintenance
		Lawn Mowing
		Understorey vegetation
		Water-edge maintenance
		Tree management
4.	Implementation and Maintenance cost	Initial cost of implementation
		Long term maintenance cost
5.	Additional scope of maintenance	SuDS maintenance
		Pest and Disease Control
		Automatic irrigation system

a. Maintenance intensity

Overall, the interview findings show that the majority of stakeholders across different levels of management believe ecologically sustainable landscape practice would reduce the intensity of watering; grass mowing; tree pruning; shrub trimming and fertilizing because naturalistic landscape allows plants to grow naturally to a considerable size and height. Even so, most stakeholders suggested cleaning work would be increased. The increase in vegetation in the park would require more clearing of dry leaves and trimming of debris. This suggests that despite increased flexibility on some maintenance aspects, considering the fast growing tropical vegetation, maintaining cleanliness and tidiness of the parks would demand more resources. Thus, changing towards ecologically sustainable landscape practice would require management to first adjust their goals and objectives and then rationalise their maintenance operations accordingly.

b. Amount of resource input

The level of maintenance intensity would determine the amount of resource input required for maintaining the ecological landscape. It was anticipated that over time aspects of maintenance would become less intense, saving energy and time spent on maintenance operations. Nevertheless, the majority of the stakeholders believed more resources would be needed during the initial stage of implementation, alongside an increase in labourers' workloads to cope with a new maintenance scope and requirements.

Given the priority placed on ensuring the landscape is of proper appearance at all times, introducing understorey planting and local species to enhance the naturalistic landscape would require more sourcing and replacement of plant materials. In addition, some stakeholders suggested that despite a reduction in watering, more water resources would be needed to sustain these naturalistic landscapes during dry seasons. These views partly reflect misunderstanding of the transition from current horticultural practice to ecological design. As current practice places emphasis on constant maintenance of the appearance of any landscape scheme introduced to Kuala Lumpur's urban parks, the management presumed ecological design would require a similar level of maintenance. In fact, the ecological approach is a slow incremental approach that would allow native species to spread naturally and perhaps would reduce dependency on water supply through the inclusion of SuDS. Thus, in the context of Kuala Lumpur, a transition period would be appropriate to enable park management to adapt to delivering this sustainable landscape.

c. Intricacy of maintenance work

Another potential effect of ecological design and management on maintenance would be an increase in intricacy of maintenance operations due to inclusion of ecological design components, such as SuDS and naturalistic landscape, which require a different scope of maintenance and, in the case of SuDS, specialist input. In addition, different levels of frequency would be required for lawn mowing; tree management, such as pruning and trimming within the understorey vegetation; and water-edge maintenance, including collecting rubbish.

It was indicated that the complexity of ecological design and maintenance would affect the quality of maintenance work performed by ground staff. All levels of park management were agreed that the introduction of ecological design and management will require new maintenance scope and techniques. Unless the ground staff are properly informed and closely supervised in their daily maintenance operations, the ecological approach may not be delivered to the expected quality. Therefore, the park management

should be equipped with the necessary skills and knowledge regarding this ecological approach in order to guide the ground staff in delivering their maintenance work.

d. Cost of implementation and maintenance operations

Responses towards the cost of delivering ecological design and management were mixed, with the top levels of management, as the people directly involved in financial decisions on urban park management, being the most vocal on this topic. While the majority of the stakeholders were agreed that the initial cost of implementation of ecological design would be on the high side, there was disagreement over long-term maintenance of this sustainable approach. Their estimations of future operating cost varied according to their responses to different aspects of ecological design.

The research finding would suggest that applying ecological design at Kuala Lumpur's urban parks could have different financial implications compared to costs incurred in developed countries, and might not necessarily reduce expenditure, which is consistent with a previous study of a similar approach to urban parks in the United Kingdom (Özgüner et al, 2007). However, in contrast, Cranz & Boland's (2004) study conducted in the USA indicated that this approach is cost-effective. Comparison between precedent studies in the UK, Singapore and Putrajaya, Malaysia also highlighted differences in the cost of ecological design and management. These contradictions confirm that the cost of delivering ecological design is subjective according to the park or management context, suggesting more comprehensive calculations and even a particular study is necessary to determine the actual cost of implementation and maintenance.

e. Additional scope of maintenance

Delivering ecological design and management introduces additional scope of maintenance; for example, SuDS includes landscape components (*e.g.* vegetated bio-swale) and water management components (*e.g.* filtration strips). In addition, some stakeholders were insistent on pest and disease control to avoid risk to public health (e.g. rats, mosquitos). There were also suggestions for installing automatic irrigation systems to help park management ensure the naturalistic landscape always has an adequate water supply.

To cope with the additional scope and requirements, the park management believe that it is most important to give staff sufficient training to ensure they are well-informed on the ecological approach and acquire the knowledge and skills required for delivering ecological design and management efficiently, at least at support staff level and above. Meanwhile, they highlighted the need to develop new specifications for ecological design, confirming an earlier study by Cranz & Boland (2004), indicating the importance of guiding grounds staff on the implementation and maintenance of this sustainable

landscape. Specialist input would be necessary to support urban park management in delivering complex ecological design aspects such as SuDS or a naturalistic planting strategy, a finding that is again consistent with the literature (Kendle & Forbes, 1997).

7.1.4 Overall response on the benefits of ecologically sustainable landscape practice

Overall, stakeholders' attitudes on adopting ecologically sustainable landscape practice highlight both management and environmental benefits. Retrofitting ecological design and management into urban parks could offer the park management more sustainable solutions in addressing site issues and problems, such as improving stability of slopes around water-edges or hillside areas of urban parks while performing stormwater management and filtration functions, which could potentially be applied at *ALG* and *PLG* to address their water pollution issues. At the same time, the inclusion of SuDS would enable the park management to sustainably manage the natural resources of the urban park and its ecological components. These environmental functions would provide the best possible ecosystem services for the city. Parks best endowed with natural settings and abundant natural resources, such as *PLG, KVP* and *PBG,* would potentially offer and gain much more from this sustainable practice.

Applying ecological design and management to Kuala Lumpur's urban parks is an opportunity for the park management to develop more sustainable landscape practice. It would create an opportunity for the park management staff to develop their knowledge and skills regarding sustainable approaches and thereby to become more competent in delivering ecologically sustainable practice in Kuala Lumpur's urban parks, which is a finding consistent with the literature (Makhzoumi, 2000; Özgüner et al., 2007).

The above findings inferred that ecologically sustainable landscape practice could potentially be applied to Kuala Lumpur's urban parks provided adjustments are made to the many aspects of current landscape design and management affected by this change, in order to facilitate maintenance operations and satisfy park visitors. Likewise, the level of adaptation would vary between parks and this would determine the actual cost of implementation. However, adoption of a more sustainable approach by Kuala Lumpur's urban park management would eventually offer multiple environmental and social benefits, as has been widely confirmed by previous literature (Lovell & Johnston, 2008; J. I. Nassauer, 2011).

7.2 Major challenges of delivering ecological design and management at Kuala Lumpur's urban parks

The previous sections have identified the benefits for Kuala Lumpur's urban park management of adopting ecological design. However, stakeholders across the different levels of urban park management also indicated some major challenges that could impede implementation of such an approach on the ground, which will require attention from the park management. These challenges will be discussed in the following sections.

Management challenge 1 (MC1): Lack of compromise in managing collaborative efforts due to unwillingness of management stakeholders to change their mind-set

A major challenge to delivering ecological design and management at Kuala Lumpur's urban parks is changing the mind-set of management stakeholders regarding accepting an ecological approach. This research found that there is a culture at the top level of management, based on these stakeholders' professional backgrounds, which would influence their attitudes towards ecological design, as they would view it as incompatible with their standards of practice. This challenge would be compounded by their lack of knowledge and ability to deliver such an approach. Although input of different expertise could enhance collaborative efforts as a key driver for ecological design and management, as suggested by Clark et al. (1997), managing such multidisciplinary collaboration would be difficult as these management stakeholders were unwilling to change. This confirms previous findings by Calkins (2005) that stakeholders' mind-sets were confined with the current management culture.

Inability of park management to manage any lack of tolerance or uncompromising attitudes on the part of other stakeholders would lead to conflict and disagreement, which would make it more difficult to integrate ecological design into the current management practice.

MC2: Lack of understanding creates different interpretations and misconceptions about ecological design

The fact that ecological design introduces techniques which differ from their standard practices could create another challenge for urban park management in Kuala Lumpur, as emerged from Sandström et al.'s (2006) research findings. Although the Wetland Park, Putrajaya could become the closest reference point for KLCH and NLD in applying an ecological approach to park management, to retrofit such an approach to already established parks in Kuala Lumpur with predetermined goals and objectives might require a different strategy. For example, in-depth study based on relevant research will be necessary to identify the key differences between conventional and ecological design and management, especially in terms of plant palettes and planting strategy appropriate for these parks, again as indicated by previous studies (Calkins, 2005; J. Nassauer & Opdam, 2008). This prior knowledge is not only important to ensure smooth implementation of ecological design and management, but also as a

reference point for the park management to demonstrate the practicality and adaptability of their proposal in order to convince other stakeholders, particularly in the case of influential decision makers (i.e. top government officials).

MC3: Lack of motivation to deliver ecological design deriving from the need to comply with current management policy and goals that are opposed to an ecological approach

Delivery of ecological design and management requires strong motivation and support from the government, as well as at the local municipality level, as translated in various landscape policies. Politically influenced policies and strategies for landscape development may be incompatible with ecological design. Some stakeholders may prioritise delivering government policy for city development to the extent that they would be unwilling to compromise on ecological design, resulting in conflict and disagreement that eventually would affect its implementation. For example, the need for the park management to deliver a beautiful, clean and tidy landscape in compliance with the "beautification" policy developed by the National Landscape Department has limited their interest in applying an ecological approach. Unless the top management is resolute in convincing high government officials of the value of ecologically sustainable landscape, adoption of this approach may not be successful.

Discontinuity in urban park management personnel could also significantly affect the delivery of ecological design. For example, replacement of key management personnel (*i.e*. mayor/park manager) with people who do not value ecological design would affect the course of management decisions, which could lead to delay in delivery of ecologically sustainable landscape or even abandonment of established naturalistic landscape practice.

MC4: Difficulties in dealing with public attitudes towards ecological design and management result in conflict and disagreement

As perceived by the urban park management, dealing with public preferences and expectations of the landscape of urban parks are other critical factors that could delay delivery of ecological design and management in Kuala Lumpur's urban parks. Difficulty in dealing with the different attitudes towards ecological design and management among park visitors was a common theme across the case studies. As stated by the park management, satisfying the preferences of one could lead to criticism from others. The reason for these uncompromising attitudes is the public's unfamiliarity with ecological design and its naturalistic landscapes, besides their very close attachment to these parks. Failure to communicate this sustainable approach to park visitors would lead to the latter's misinterpretation of management's ecological aspirations and result in their disapproval and consequent rejection of such an initiative as unacceptable practice, confirming the finding by Nassauer's (1995a) study. It was also suggested that convincing members of the public with higher incomes and academic levels is more critical as they have higher expectations and would seek more fact based information and clarification of the ecological approach.

Findings from the interviews indicate that the public of Kuala Lumpur have a strong influence on the park management's decisions regarding adopting ecologically sustainable practice at their parks, which is reflected through public complaints either to the park management staff or directly to the Mayor's office. As KLCH and NLD place priority on responding to public needs and requirements, the park management is required to take immediate action on any public query or complaint and respond within fourteen working days, otherwise this could affect the key performance indicators (KPI) for meeting the park management's goals and objectives, which are mostly set by politicians. The findings clearly show that even a single complaint could have a significant effect on the park management's reputation, as shown in the case of *PBG*, where strong community groups have emerged that have considerable power to delay or prevent introduction of ecological design and management, as has been demonstrated by the prolonged redevelopment of *KVP*.

MC5: Retrofitting ecological design to existing parks is challenging due to site constraints

The research acknowledges that introducing ecological design and management at more established parks in Kuala Lumpur requires a different approach from those adopted at new developments in precedent sites such as *MP* and *LOP* in the United Kingdom, *TP* in Singapore, and *WP* in Putrajaya, Malaysia, and should be carried out through retrofitting, similar to the method applied at Bishan Park Kallang River, Singapore. Introducing ecological design to landscape at existing sites (*PBG, TLG, PLG, ALG, and KVP*) would require more in-depth study as it would involve complex design solutions. Furthermore, addressing site constraints on adoption of ecological design and management would require more investment in physical resources and design expertise to find appropriate technical solutions. There is also a need to instil environmental awareness and knowledge among park users through these techniques, as described in precedent studies (*e.g.* cleansing biotopes, soil bio-engineering techniques).

7.3 Summary

Overall, analysis of the responses of stakeholders at different levels of urban park management across the case studies selected within Kuala Lumpur, Malaysia indicates strong potential for delivering ecologically sustainable landscape practice, with recommendations given for modification of design and management aspects, including the ecological landscape's appearance. Suggestions include applying different ecological treatments and levels of intensity to fit in with different park settings and public recreational requirements. Likewise, some maintenance aspects are likely to be affected by applying ecological design, and the current maintenance practice will require adjustment. It is also important to satisfy public preferences and expectations regarding the appropriate appearance of the park. In this regard, improving the legibility and aesthetic of naturalistic landscape, retention of visibility of existing views and

improving perceptions of safety among park visitors were recommended. In addition, the research found that the park management should be willing to compromise over their current practice in adaptation to ecological design and management. As well as identifying potential, this chapter highlighted major challenges for park management in delivering such an approach. Strong motivation and willingness would be needed to change the mind-sets of stakeholders across different levels of urban park management, alongside government support in steering a course towards effective implementation of ecologically sustainable landscape practice.

CHAPTER 8

Synthesis of the main research findings, final conclusions and recommendations for future research

8.0 Introduction

This chapter presents a synthesis of the main findings regarding the primary research aim of assessing the potential of Kuala Lumpur's urban park management to meet challenges deriving from environmental problems and climate change at a time of growing demands on limited resources in the city, while creating more environmentally resilient and ecologically rich habitats. The chapter starts with a brief summary of the research structure, linking the findings to the main research question and sub-research questions. Then, this chapter goes on to consider the implications of the research findings with respect to delivery of ecologically sustainable landscape practice by Kuala Lumpur's urban park management and recommends strategies appropriate to the local context and settings. Finally, this chapter presents final conclusions, followed by brief reflection on the research process and recommendations for potential future study.

8.1 Summary of the research structure, linking the key findings to the research aim

This research initially set out to explore the potential of adaptation of Kuala Lumpur's urban parks towards delivering an ecologically sustainable landscape practice to meet the challenges of environmental problems and climate change faced by the city, while creating more environmentally resilient and ecologically rich habitats. Figure 8.1 illustrates how the research linked the key findings to the research questions, in a structure which can be summarised as follows:

- The key driver that motivated this study was the need to address issues around poor management of the urban hydrological cycle due to rapid urban development that resulted in major changes in the city's land use by placing greater emphasis on development of housing, commercial areas, institutions and other city infrastructure. These changes not only compromised the city's environment and natural resources, especially water resources (Meng, 2011), but also caused frequent flooding in Kuala Lumpur (Mohan et al., 2010; Saw, 2009). While the city is struggling with these issues, in order to maintain the city's green spaces, the urban park management continues to

apply a conventional horticultural approach that consumes large amounts of its water resources.

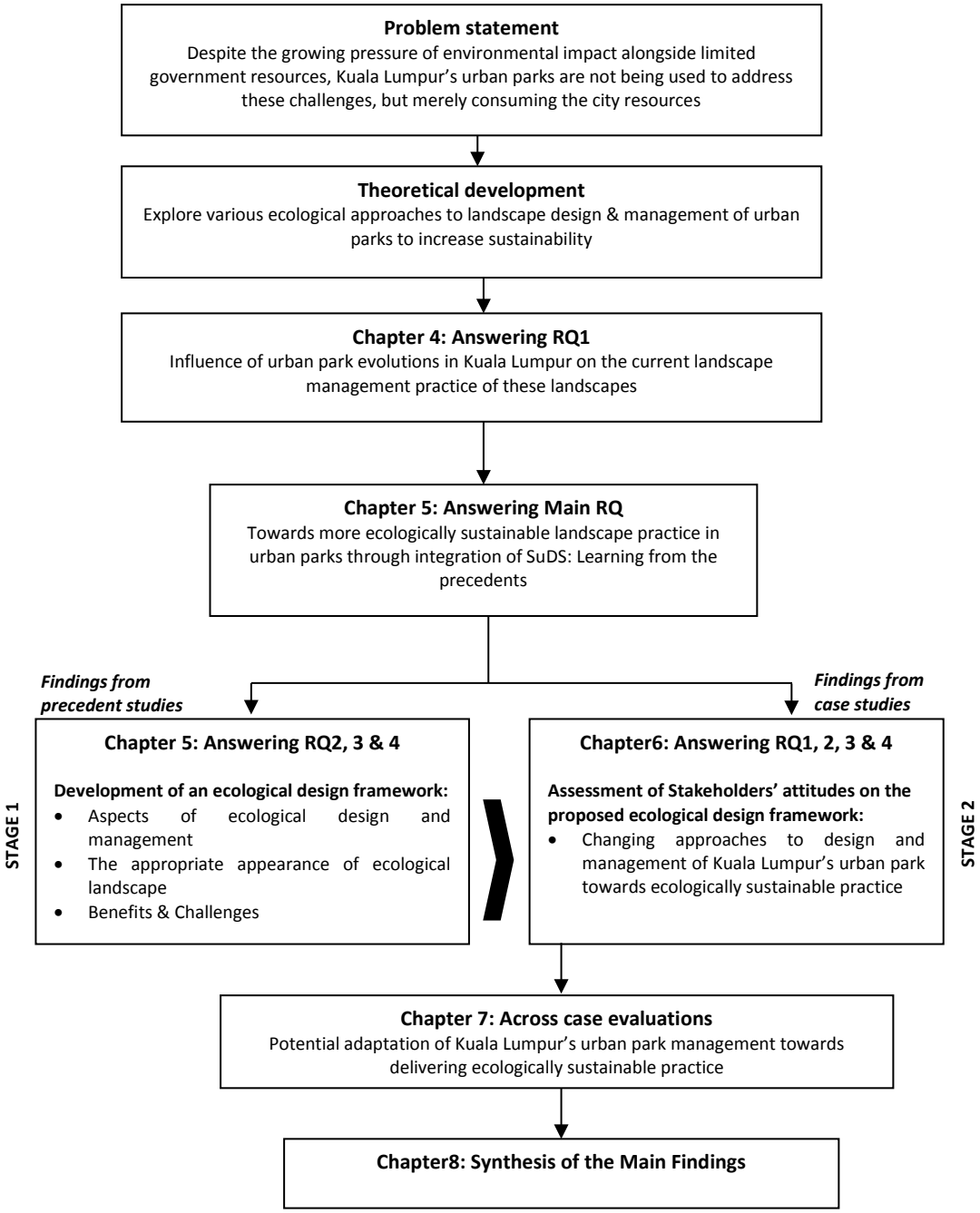


Figure 8.1: Research structure linking the findings to research questions

- Previous literature reaffirmed that urban parks can contribute to addressing these growing environmental challenges in developed countries (Chiesura, 2004; Cranz & Boland, 2004; Konijnendijk, Annerstedt, Nielsen, & Sreetheran, 2013; Thompson, 2002). However, no studies have explored this topic in the wider context of a developing city such as Kuala Lumpur, with different climatic conditions. Hence, the

significance of the current research derives from its exploration of the following research questions to identify how Kuala Lumpur's urban park management can adapt towards delivering ecologically sustainable landscape practice that is appropriate to the local context:

- **Main research question:**
  How can design and management of Kuala Lumpur's urban parks be adapted to more ecologically sustainable practice?

- **Sub-research questions:**

1. How has the evolution of urban parks in Malaysia influenced the current design and management of these landscapes?

2. What aspects of design and management of Kuala Lumpur's urban parks can be changed to increase their sustainability?

3. What is the appropriate appearance for ecologically sustainable landscape in Kuala Lumpur's urban parks?

4. What are the stakeholders' attitudes towards changing to an ecological approach to design and management at Kuala Lumpur's urban parks?

- The study adopted a case studies approach for answering the above research questions. The findings highlighted that current practice reflects a long inheritance of colonial landscape, with a strong focus on "beautification". This perspective has dominated park design and management at Kuala Lumpur's urban parks and led to continuous use of conventional horticultural practices of intensive maintenance that consume large amounts of physical and financial resources. As Kuala Lumpur's urban parks share a similar pattern of historical progression with those in developed countries (as discussed in section 2.2 and 4.2), there could be potential for park management in Kuala Lumpur to follow the latter's current trend of shifting to more ecologically sustainable landscape practice (as discussed in section 2.3).

- The findings from the precedent studies in chapter 5 confirmed the environmental functions and benefits achieved from delivery of ecologically sustainable landscape practice in developed countries. The precedent studies' findings revealed examples of ecological landscape design and management, which, through integration of SuDS, have potential for application in Kuala Lumpur's parks (as discussed in section 5.1). This finding was translated into a framework of ecological design proposals for Kuala Lumpur's urban parks (refer to appendix 5).

- Further evaluation of this framework by local urban park management stakeholders, presented in chapter 6, confirmed that delivering this sustainable approach would generate a different landscape outcome, particularly in terms of design and management and naturalistic appearance. It was found that except for the ground staff (15%), the majority of the other groups: support staff (64%); managerial staff (86%) and senior management personnel (83%), have a general understanding about ecological or sustainable design and their environmental benefits. This was mainly because of their academic background, combined with their having more experience and better opportunities to attend landscape courses and seminars to learn about this ecological approach. Despite having this general understanding, the stakeholders' responses to applying ecological design and management at Kuala Lumpur's urban parks are similar across different levels of management. The interview findings show that only 51% of management stakeholders were sympathetic to this new sustainable practice on account of its environmental benefits. However, 87% of the stakeholders were sceptical that an ecological approach could be successfully implemented at the local parks, due to other contributing factors such as conflict with the current park's management goal of keeping a clean and beautiful landscape that is safe for park users, as well as negative perceptions that the public would disapprove of the naturalistic landscape as being messy and unkempt. However, 70% of the stakeholders would be willing to compromise with this new idea provided a less intensive, safer, and more aesthetically pleasing landscape design were adopted in order to fulfil public expectations and preferences. Consistent with the previous literature (Özgüner et. al., 2007), this finding indicates potential for applying this approach to Kuala Lumpur's urban parks.

- Detailed discussion of the case study findings in section 7.1 suggested that the park management could potentially adapt towards delivering ecological design and management. The findings are comparable with those from the literature and the precedent studies in suggesting that implementation strategies should vary according to the park's age, location, size, and the extent of natural resources within the park. Climatic and cultural background were significant and unique factors influencing the management stakeholders' attitudes. They mostly expressed constructive opinions on ecologically sustainable practice that would produce a more intense form of naturalistic appearance, appropriate to the tropical climate. Most of the suggestions the respondents offered on modification of design and management aspects contrasted with their views on the ecological approach. This finding reflects that the park management's lack of an in-depth understanding of ecological design has contributed to their unwillingness to move towards ecologically sustainable landscape practice. This confirms the finding from previous literature (Steiner, 2011; Nassauer, 1995) suggesting level of education has a significant influence on people's attitudes towards naturalistic landscape.

8.2 Implications of the research findings relating to Kuala Lumpur urban park management's adaptation towards delivering ecologically sustainable landscape practice

The research findings clearly show that transferring western knowledge of ecological design and management to this developing city would pose similar challenges to those experienced in developed countries. However, the findings also identified that the different climate and cultural context make delivering this ecological approach in Kuala Lumpur more problematic. The study has identified the following as the most challenging aspects of applying ecologically sustainable landscape practice in the context of Kuala Lumpur:

a. Conflict in existing landscape policy between objectives of "beautification" and sustainability

Whilst aesthetic appearance is relevant to all urban parks, as evidenced by the literature and precedent studies, this is more critical in the case of Kuala Lumpur due to the focus of existing landscape policy on "beautification" as part of the government's vision of Kuala Lumpur becoming the "Most beautiful garden nation" by the year 2020. Previous studies suggest the importance of maintaining an appropriate landscape appearance in order to gain people's acceptance of naturalistic landscape style (Kaplan, 1985; J. I. Nassauer, 2011). However, attempts to combine the goals of beautification and sustainability goal would create conflict in terms of landscape practice because the park management has defined "beauty" as meaning manicured, clean and tidy landscape.

b. The urban park management lack confidence in delivering ecologically sustainable landscape practice

The findings indicate that implementation of ecological design and management in Kuala Lumpur's urban parks depends on the park management's commitment to applying such an approach. However, the study revealed that the park management seem to lack confidence to make or consider changes to their current landscape practice, as an ecological approach would conflict with the current landscape policy of "beautification", which is favoured by the Mayor and politicians and with which, therefore, park management have to comply. The government's landscape policy aspirations have been interpreted to deliver a strong message to the local public that displaying "beauty" is the main objective of Kuala Lumpur's urban parks. Hence, these parks have carefully designed and manicured landscapes, with strong emphasis on aesthetics, cleanliness and safety aspects, besides conservation of natural or semi-natural woodland elements. In this context, introducing ecologically sustainable landscape could severely test the park management's willingness to change their practice and their ability to convince other

management stakeholders as well as the public of the value of this approach, both of which are crucial to successful delivery of this landscape in Kuala Lumpur's urban parks.

The review of the historical development of urban parks in Kuala Lumpur, starting from the colonial period and continuing through the post-independence era, reflects the strong influence that the colonial legacy still has on the current management of urban parks in Kuala Lumpur. The culturally accepted concepts of urban greening and beautification inherited from the colonial government continue to dominate development of new landscape policies. As a developing nation, the Malaysian government are intent on creating a strong cultural identity for the country based on their vision of being the "Most beautiful garden nation". Therefore, they are not willing to risk applying ecological design concepts that could potentially produce a more messy appearance. The above reasoning explains the park management's continued use of conventional horticultural practice for the maintenance of Kuala Lumpur's urban parks and the consequent intensive resource input that is becoming increasingly less sustainable.

The research notes that the government has in the past relied on expertise from developed countries to support urban landscape development in the country. For instance, delivery of the urban forest concept and the River of Life project in Kuala Lumpur depended greatly on input from international consultants. Engaging external experts has helped the local authority to deliver western ideas and content into local landscape designs that are more plausible and acceptable to the public, a practice requiring considerable investment from the government. However, local landscape practitioners could draw on the expertise of such international experts to gain new knowledge and understanding of the latest approaches to landscape practice. This could enable them slowly to gain confidence and independence in steering the urban park management towards sustainability, thereby eliminating the need to rely on outside expertise.

c. Complex institutional structure and bureaucratic procedures will prolong development and approval of new policy

The study found that the Malaysian government have given strong support, through investment of financial and physical resources, for implementing their landscape policies and strategies both at national and local level. The research also found that recent policies have started to encourage the landscape department to expand their strategy for sustainable urban landscape beyond the current scope of practice. A case in point is the River of Life project, which adopted an integrated design approach based on multidisciplinary collaboration with other departments and institutions. This reflects potential for incorporating ecological sustainable plans and strategies into current

landscape practice. However, examination of recent landscape policy developments indicates that the complexity of the existing three-tier institutional structure and bureaucratic procedures will prolong the development, approval and implementation processes for ecological design policies. Moreover, delivering ecological design and management is likely to require full revision of current policy.

Likewise, the top-down management structure means decision-making is currently a time consuming sequential process, whereas implementing ecologically sustainable landscape practice would require a more holistic approach, based on multidisciplinary collaboration and knowledge sharing across departments. Furthermore, this cumbersome process could impede delivery of accurate instructions to lower level management, which would lead to miscommunication on landscape policy and strategies, besides limiting opportunities for ground staff and support staff to offer their opinion or comments directly to top management. From the researcher's observation, the lower level management tend mainly to follow instructions without questioning the views of their superiors. They may thus lack understanding of ecological design, which eventually will make it difficult for them to deal with the public's queries about this approach.

d. Perceived public anxiety about naturalistic landscape appearance

The research findings reveal that park management across the case studies were very concerned over the public's negative perceptions of ecological design as a poorly managed landscape that is unpleasant and unsafe for public use. This very closely relates to the pre-determined idea that urban parks should be beautiful, clean and tidy. Colonial ideas on beautiful landscape have been part of the local culture for over a century, and the public have been sold the idea of beautification as the ideal image for public parks in Kuala Lumpur. The park management recognise that dealing with public preferences and expectations towards a beautiful, clean and tidy landscape is challenging. This is because the park management constantly have to attend to public complaints, with park visitors' varied attitudes and high expectations creating major difficulties.

Safety and security is another critical aspect of design and management of Kuala Lumpur's urban parks, particularly because of the prevalence of crimes such as snatch theft and stealing landscape furniture from the park, as well as public misbehaviour, such as damage to the landscapes and littering. Additional threats to public safety derive from public proximity to harmful wildlife.

While all these issues may be similar to those faced in developed countries, they are more critical in the context of Kuala Lumpur due to the negative perceptions of safety among the public. In temperate climates, the landscape is naturally more dynamic

because of the changing seasons, and therefore the public will accept a certain degree of messiness. However, in a tropical climate, naturalistic landscape imposes a more intense and messy look. Due to the long-established preference for beautiful, clean and tidy landscape, the public would perceive such an intense and messy landscape as a serious threat to their safety, particularly as they fear being too close to urban wildlife. Consequently, they may express their disapproval by complaining to the relevant local authorities, which could then result in delays or discontinuation of this naturalistic landscape approach.

8.3 "Take-home" message for park managers: Recommendation of short-term and long-term strategies for incorporating ecological design and management into current landscape practice at Kuala Lumpur's urban parks

Overall, the research findings confirmed that in comparison to cities in developed countries, applying ecological design and management to Kuala Lumpur's urban parks would present similar challenges but have different implications for current landscape practice. This study also found that Kuala Lumpur's climate and cultural background have a strong influence on park management's perspectives on delivering ecologically sustainable landscape practice. Therefore, the research would suggest new strategies for adapting ecological design and management approaches to accommodate these differences in both the short and long term. This will be discussed in the following sections.

8.3.1 Short-term strategies for urban park managers in Malaysia

Considering the responses and recommendations from the park management stakeholders, this research suggests certain strategies to assist urban park managers in the short term in delivering ecological design and management. The following strategies would help by reducing the impact of such an approach on the current management practice as well as park users:

- **To apply a slow incremental approach to delivery of ecological design and management**

  Learning from the experience of the precedent studies, this research would suggest that park managers apply a slow incremental approach to delivering ecological design and management at Kuala Lumpur's urban parks. This would enable the new ecological approach to be combined with conventional horticultural practice, thereby avoiding drastic changes to the current landscape of urban parks, and allowing maintenance staff to develop their knowledge and understanding of the different maintenance regimes. This

would also enable park users to become gradually familiar with the new approach by shifting slowly towards naturalistic landscape appearance.

- **To identify potential urban parks or areas within the parks for piloting ecological landscape**

  Park managers should identify potential urban parks or areas within the parks as testing grounds for assessing the practicality of ecological landscape design, and appropriate types of vegetation for addressing site issues and performing other environmental functions, such as stormwater management. It is suggested that the best place to commence this sustainable approach is at sites with natural assets, such as natural vegetation and water resources, as they could be utilised for multifunctional purposes with minimal physical and financial inputs. Results from this experimental scheme would provide effective guidance for local park managers on which western technologies and innovations are appropriate for the local environment and culture.

- **To showcase the elements of ecological design and management**

  It is significantly important to instil public knowledge and awareness of ecological design. To make naturalistic appearance legible to the public, it is essential to showcase and interpret the elements of ecological design near to public space within the urban park. Making these natural processes visible to park users will help educate them on this landscape's environmental functions and familiarise them with its naturalistic appearance. This is an important strategy for gaining park users' acknowledgement and approval of this ecological approach during the initial development of such landscapes. Public surveys could also be utilised to gauge their opinion.

- **To involve all levels of urban park management in changing towards ecological design and maintenance.**

  Delivering ecological design imposes a different design approach and technical inputs, particularly on functional and aesthetic aspects. Therefore, park managers should be more proactive in steering the change to sustainable practice and should seek direct involvement of all levels of park management in both the creation and maintenance of ecological design. This collaborative approach would allow the upper level management to share their knowledge and expertise immediately with lower levels of management. At the same time, as they are more often in direct contact with the public, the lower levels of management could pass on constructive feedback received from the public for improvement of this approach on the ground. This process of knowledge sharing would also enable support and ground staff to communicate this approach to the public in an informed manner during their daily landscape operations.

- **To engage public participation during the design and maintenance of ecological landscape**

  The support of the public, as park users, is necessary to sustain ecological landscape within urban parks. Therefore, park managers need to ensure engagement of the public throughout the initial design, implementation and maintenance of the naturalistic landscapes. This strategy will not only introduce the public to the sustainable approach and its environmental benefits, but will also instil a sense of ownership and responsibility towards this landscape among the park users. Thereby, the public will gradually become more aware and appreciative of the importance of sustainability in urban parks and the urban environment. Urban park management could encourage public involvement through organising smart partnership and volunteering programmes and other regular activities.

8.3.2 Long-term strategies for urban park managers in Malaysia

Apart from the immediate action involved in delivering ecological design and management, park management need to devise long-term strategies to ensure that urban parks play an increasing role towards encouraging green infrastructure across the wider city. These long-term strategies consist of revising landscape and related policies; developing different models of ecologically sustainable and new design vocabulary; developing expertise, skills and knowledge across all level of park management; and improving multidisciplinary collaboration with other parties involved in urban park management. The strategies are discussed as follows:

- **Revision of government policy to increase emphasis on ecological goals and objectives**

  Adoption of a more ecologically driven approach would be a major departure for the National Landscape Department (NLD) and Kuala Lumpur City Hall (KLCH), since they would need to undertake a full review of existing landscape policy and to redefine the meaning of “beautification” to embrace ecological principles as well as new types of aesthetics, which might be different from those applied in developed countries. The park management would also need to reconsider the goals and objectives of their landscape practice, as delivery of ecological design at Kuala Lumpur’s urban parks would require holistic decision-making. The case studies findings suggest that the park management would need to meet the four criteria in achieving appropriate appearance of naturalistic landscape at Kuala Lumpur’s urban parks. These include improving the legibility of ecological design, maintaining aesthetic appearance, retaining existing views, and addressing concerns regarding personal safety. While improving legibility could enhance

park visitors' understanding of ecological design, aesthetics, visibility and perceptions of safety are also important in gaining public acceptance of naturalistic landscape.

- **To develop a different model of landscape practice and a new design vocabulary for delivering ecological design and management in Kuala Lumpur through experimental study**

  This study found that retrofitting ecological design and management in Kuala Lumpur's urban parks would require a different model of ecological design and management practice, appropriate to the local context and environment in terms of climate and cultural background. Moreover, transferring knowledge of ecological design and management from developed countries would require the input of local experts who have the necessary knowledge of the native plant species and requirements, as was the case in the Bishan Park-Kallang River projects. This new model of ecological design and management for Kuala Lumpur's urban parks would need to interpret the naturalistic landscape in compliance with public expectations, as well as ensuring its manageability by the maintenance team. In addition, different vegetation strategies could be applied to different park settings, using plant compositions and structures that would make ecological design more accessible to park visitors. Health and safety measures should be established to prevent the public from coming into immediate contact with wildlife.

- **To develop expertise, skills and knowledge of ecological design and management across all levels of park management**

  This research finding reflects that all park management stakeholders need to have appropriate knowledge and understanding of ecological design in order to ensure effective implementation of such an approach to Kuala Lumpur's urban parks. The National Landscape Department (NLD) needs to place more priority on research into the various ecological approaches and latest technologies, to support the implementation of such practice in Malaysia. This could be done by working closely with universities and research institutes through public funding. The research outcomes could inform the development of new guidelines on various aspects of ecologically sustainable landscape practice that will fit in the local context and cultural background, which could then serve as reference for local authority landscape practitioners. Furthermore, local authorities should provide more opportunities for lower level management staff to attend related courses and technical training on ecological design and management. Gaining necessary skills and knowledge would not only assist them in their daily work, but help them disseminate relevant information to public. In addition, the research outcomes could be incorporated into landscape architecture programmes and other related courses to

enhance knowledge about ecological design and management among landscape students.

- **To improve multidisciplinary collaboration on delivering ecological design and management**

  Multidisplinary collaboration is one of the key drivers in delivery of ecological landscape design and management. Through such efforts, the park management could potentially explore new opportunities for expanding the role of Kuala Lumpur's urban parks in addressing the never-ending flooding issues in the city. For instance, KLCH could cooperate on joint management of urban parks and the river corridors with the Drainage and Irrigation Department. This system could offer more in the way of economic solutions when compared to the SMART Tunnel. Likewise, such collaboration could bring additional sources of funding from other departments for park maintenance, thereby reducing the local authority's reliance on government allocation. A similar strategy was proven successful in managing the Kallang River- Bishan Park project.

  However, multidisciplinary collaboration requires proper coordination if conflict is to be avoided between the various departments, which might all have different approaches and priorities in terms of integrating their standard practice into ecological design and management. The current top-down approach in urban park management decision-making process may need to become more flexible, to allow input from the various management stakeholders. At the same time, the park manager would need to retain sufficient authority to guide the stakeholders on the best way of delivering this approach to Kuala Lumpur's urban parks. This would entail relying heavily on the ability, determination and willingness of those with detailed knowledge of ecological landscape design and management: first to convince more senior decision makers and politicians lacking such knowledge of the need for change and then to inform and help shape the policies.

8.4 Conclusions

This research has highlighted the main challenges facing Kuala Lumpur's urban parks in applying ecological design and management and has presented short-term and long-term strategies for addressing these challenges. Based on the research findings, the study draws the following conclusions:

- **Consequences of not implementing more sustainable management techniques for managing Kuala Lumpur's urban parks**

  This research recognises the significant commitment made by the Malaysian government to the planning and development of Kuala Lumpur as well as their initiatives to address the environmental challenges faced by the city. Despite these innovative inputs, urban park management continue to invest considerable physical and financial resources in delivering and maintaining carefully designed and manicured landscape that may in the future become both unaffordable and environmentally unsustainable. Therefore, the current study would strongly urge that urban park management respond to the current environmental challenges by changing to a more sustainable approach; otherwise Kuala Lumpur's urban parks will face a future of decline.

  This research indicates that adopting an ecological approach would enable development of more holistic and integrated strategies for designing and managing urban landscapes for multifunctional purposes including stormwater management, habitat creation, biodiversity enhancement for carbon sequestration, etc. Failure to take advantage of this approach would limit the urban parks' potential to help mitigate environmental challenges through contributing to Kuala Lumpur's green infrastructure and providing ecosystem services for the city. Such failure would cause the city environment to become more fragile and susceptible to natural disasters such as flooding that can have devastating effects on the lives and property of the urban community.

  Multidisciplinary collaboration is one of the key drivers for successful delivery of sustainable landscape management. Unwilling to change from traditional landscape practice to ecological design and management, park managers could lose the opportunities for sharing expertise and responsibility; draw on new sources of financial support; and collaborate to develop innovative solutions, such as eco-engineering solutions for addressing site issues and managing multifunctional components of the urban parks, in a more holistic manner.

- **The impact of current landscape policy on "beautification" as part of the government's vision of Kuala Lumpur becoming the "Most beautiful garden nation" by the year 2020**

  The research identified certain limitation in the current landscape policy's emphasis on "beautification", acknowledged by local authorities and the public as one of the main aspects of the national sustainable agenda. Defining "beauty" as manicured, clean and tidy landscape totally contradicts ecological and sustainable approaches, which emphasise beauty in a more naturalistic form with less organised and more messy appearance. Compared to traditional landscape practice, ecological design would focus less on beauty and more on the landscape's environmental functions, such as flood mitigation and habitat creations. However, the views of park management suggest giving priority to a manicured interpretation of beauty had hindered implementation of ecological landscape design in Kuala Lumpur's urban parks to such an extent that some park managers had been forced to revert back to conventional horticultural management practices. It would seem that "beautification" ranks more highly than the need to safeguard the quality of human life in the city.

- **The impact of complex institutional structure and political influence on local sustainable agendas and action plans**

  Although the government has initiated landscape and environmental policies to guide sustainable development, the federal system presents a significant challenge to enforcement of such policies at the local level. The country's political system is described as semi democratic by Case (1993, cited in Hezri & Dovers, 2006). Within this system, the Malaysian Government dispenses its power and natural resource management through three levels of administration comprising federal, state, and local government. As the Constitution grants each state in the country control over matters related to land use, forest, and local government, federal government has limited power to control development within these states. Furthermore, permeation of policy through this three-tier institutional structure involves a lengthy bureaucratic process that can result in delays in policy implementation at the local level.

  Furthermore, political influence is another significant factor in delaying the development and implementation of landscape and environmental policies in Malaysia. Since the first general election in 1955, the system of government has been parliamentary democracy. However, there has never been a change of government as the Barisan National (National Front), a coalition of multi-racial parties led by the United Malays' National Organization (UMNO), has remained in power as the ruling group for 61 years (Gomez & Sundaram, 1999). While this scenario has contributed to political stability and equal distribution of socio-economic development in the country, this long-term incumbency has

also resulted in policy making and implementation being dominated by an authoritarian government. This has led to stagnation in the policy development process, characterised by lack of monitoring and assessment of policy outcomes, and slow implementation of action plans at the local level (Adnan A. Hezri & Dovers, 2006). Meanwhile, environmental policy currently pays “lip service” to the sustainability agenda, whilst the government continues to adhere to the “beautification” agenda, with consequent lack of progress towards sustainable development. Local authorities’ apparent recognition and acceptance of this management culture and their unwillingness to make or accept any reforms have simultaneously contributed to the escalation of environmental issues, especially in Kuala Lumpur.

- **A way forward for steering ecologically sustainable landscape practice in Malaysia**

In order to ensure effective execution of a sustainability agenda for Kuala Lumpur, rather than the current “lip-service” identified by this research, appropriate indicators of urban sustainability would need to be applied, as suggested by Hezri & Dover (2006). Moreover, in the case of Malaysia’s cities it would be necessary to avoid “green washing” of the city’s green infrastructure agenda. The following is a summary of a proposed way forward for future research and enhancement of ecological design and management in Kuala Lumpur as well as other cities in Malaysia:

- Review of the current landscape policy, to integrate appropriate ecological approaches and strategies and redefine the meaning of beautification in this context.
- Restructuring and streamlining of the current unwieldy institutional structure and prolonged bureaucratic processes, in order to expedite the approval of policies, structural plans and local plans and thereby speed up implementation of ecological policy at the local authority level.
- Further assessment of the organisational structure to identify the changes required to current management practice in adapting to a sustainable approach, and put in place the necessary monitoring and control mechanisms.
- Revision of landscape architecture and horticultural education to integrate ecological design and management training, in order to strengthen ecological skills and knowledge among landscape students.
- Development of a more detailed ecological design and management framework for urban parks that could potentially form part of sustainable indicators and contribute to wider assessments of urban sustainability.
- Organising regular seminars/ conferences/ workshops and/or short courses on the technical aspects of ecological design and management to keep urban park management teams, as well as other local landscape practitioners up to date with the latest trends and innovations in ecological approaches.

The above measures must be considered and applied at national, state and local levels in order to ensure that ecological design and management can be successfully implemented on the ground.

Overall, the research findings infer that in sustaining the carefully designed and manicured landscape at an aesthetically pleasing level, as well as keeping the parks clean and ensuring public safety and security, Kuala Lumpur's urban park management are currently dependent on major financial and physical inputs. Kuala Lumpur City Hall (KLCH) may no longer be able to afford the escalating landscape management costs in future, while having also to commit to other forms of urban planning and development. Considering these constraints, adopting ecological design and management will no longer be an option, but instead a matter of necessity for KLCH. However, there is huge potential for urban park management to expand their role as part of an integrated city system through delivering a more sustainable approach in these parks. Therefore, this research would strongly urge park managers to embrace this opportunity and make the necessary changes that would enable them to move towards developing sustainable landscape for urban parks in Kuala Lumpur and other cities in Malaysia.

8.5 Reflections on the research process

Carrying out this extensive research and dealing with huge amounts of data yielded by the precedent and case studies in the UK, Singapore and Malaysia has been a challenging learning experience for me as a researcher. However, I have gained much valuable knowledge through exposure to the various approaches to ecological design and management applied in different contexts and settings, including different climates and cultural backgrounds. As I progressed through the research, I gained new understanding of this process and identified areas for improving my data collection and processing techniques, which I could use as reference for my future studies.

First, the preparation of the data collection tools for the case studies was quite demanding, as it required me to extract findings from precedent studies to use as guidelines to inform the development of the ecological design framework for Kuala Lumpur's urban parks, employing photo elicitation techniques. This included developing alternative ecological treatments for five identified areas of each of the five case study sites, without considering seasonal differences. Due to the tight data collection timeframe, I was limited to developing only two alternatives, representing moderate and intense treatment, for assessment by four different levels of park management. As I observed from the respondents' feedback during the interviews, provision of other alternative ecological treatments, representing the landscapes in wet and dry seasons, would have given them greater understanding of the dynamics of this landscape type. Offering more alternatives in terms of plant composition and structure would also have provided more understanding of differences in landscape appearance.

The most challenging part of this research was analysing the huge amount of interview data, consisting of responses from the different levels of management stakeholders and data gathered from management documents as well as my own field observations. Understanding and categorising the data was the most intricate and complex process, as it involved comparing and contrasting responses of stakeholders from four different levels of urban park management, followed by across case comparison that demanded considerable focus and critical thinking, areas in which I am still learning and improving. Likewise, reporting the findings was also time consuming as it required restructuring of the data representation to make it more readable and coherent throughout the thesis. In gaining all this experience, I have developed both my research and my writing skills. As for the case studies selection, the research shows quite similar findings across the five case studies. Perhaps, selecting fewer sites would have given me more time to drill deeper into ecological approaches.

8.6 New research questions and recommendations for future research

The ecological design framework and detailed design and management guidelines proposed by this research could potentially serve as a foundation for urban park management in Kuala Lumpur in changing their current landscape practice towards a more ecologically sustainable approach. New research questions and future research could build on the outcomes from this study as follows:

a. RQ: How well would the proposed naturalistic style planting adapt to different space and site conditions within urban parks?

Detailed assessment of practicality and adaptability of the proposed ecological design and management practices using selected combinations of tropical plant species in experimental plots. This should be done within selected parks and certain areas of urban parks, to test the applicability of these strategies to Kuala Lumpur's urban parks.

b. RQ: What species would potentially be the best components of ecological plant palettes to serve different ecological functions in tropical urban parks?

Research on ecological design vocabulary could focus on specific local settings in order to identify ways to improve the presentation of naturalistic landscape in different seasons (wet and dry seasons) while also considering safety aspects of such design, to accommodate public expectations and preferences. In addition, future studies should focus on development of plant palettes to identify species with various hydrological and ecological functions that could support

the establishment of this naturalistic style landscape at Kuala Lumpur's urban parks.

c. **RQ: What are the park users' attitudes and preferences towards naturalistic landscape style in Kuala Lumpur's urban parks?**

Perception studies could be conducted for further investigation of public attitudes towards transition of Kuala Lumpur's urban parks to a more ecological sustainable landscape, specifically in terms of the landscape's appearance. The research findings signified that perceptions of public preferences and expectations strongly influence management stakeholders' attitudes to landscape design and management. It would therefore be useful for future research to clarify the nature and extent of differences of opinion among the public in this regard.

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Appendices

Appendix 1

The University Of Sheffield.

Participant Information Sheet

1. **Research Project Title:**

   Towards a sustainable landscape of urban parks in Kuala Lumpur, Malaysia: A study from a management perspective.

2. **Invitation paragraph**

   You are invited to take part in a PhD research project. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. You may ask for clarification or additional information if this would be helpful. Take time to decide whether or not you wish to take part. Thank you for reading this.

3. **What is the project's purpose?**

   This research aims to investigate how the design, management and maintenance of urban parks in Kuala Lumpur, Malaysia can be adapted in order to meet the challenges of creating a more environmentally sustainable landscape.

4. **Why have I been chosen?**

   The research requires feedback and comment from landscape professionals and other related personnel involved in the landscape design, management and maintenance of urban parks, which represent the managed urban landscape. You have been asked to participate because of your experience and engagement in this area.

5. **Do I have to take part?**

   Taking part in the research is entirely voluntary. If you do decide to take part, you will be given this information sheet to keep (and be asked to sign a consent form) and you can still withdraw at any time without having to give a reason.

6. **What will happen to me if I take part?**

   Upon agreement to take part in this research, I will conduct an interview with you, which will take approximately 1 hour to complete. I will ask for your permission to record the interview so that the information can be analysed later in my research. However, your identity will be kept anonymous. I would expect you to answer the question based on your experience. I may contact you sometimes after the interview, to cross-check on the accuracy of my interpretations of the interview with you.

7. **What are the possible disadvantages and risks of taking part?**

   There are no risks taking part in this research. However, some of the questions may raise sensitive issues on the current landscape management and maintenance practice of the urban park.

8. **What are the possible benefits of taking part?**

   Whilst there are no immediate benefits for those people participating in the project, it is hoped that this work will help in understanding the response towards changing approaches to design, management and maintenance of landscape of urban park into a more sustainable practice.

9. **What if something goes wrong?**
   If there is a problem with our research please contact my supervisors, Mr. Andy Clayden or Prof. James Hitchmough, at the Department of Landscape, University of Sheffield on the contact number given at the back of this information sheet. If your complaint is not handled to your satisfaction then please contact Dr. Philip Harvey the 'Registrar and Secretary' of the University of Sheffield by post (Office of the Registrar and Secretary Firth Court Western Bank Sheffield S10 2TN), telephone: 0114 222 1100, fax (0114 222 1103) or email (registrar@sheffield.ac.uk).

10. **Will my taking part in this project be kept confidential?**

    All information that you provide will be strictly confidential and no individuals will be identifiable in any reports or publications.

11. **What will happen to the results of the research project?**

    The PhD Thesis will present the research results. The results may also be presented in a conference and will be published in academic journals, during or after the completion of the research. Copies of the results can be obtained through contacting the Department of Landscape, University of Sheffield, tel: 0114 2220600, (http://www.shef.ac.uk/landscape/contact_us).

12. **Who is organising and funding the research?**

    This PhD research is funded by the Ministry of Higher Education Malaysia and the University Putra Malaysia.

13. **Who has ethically reviewed the project?**

    This project has been reviewed through the Department of Landscape's Ethics Review procedure.

14. **Will I be recorded, and how will the recorded media be used?**

    The interview will be recorded using audio recorder. The audio recordings data will be stored in an encrypted laptop which can only be accessed by the researcher and the researcher's supervisors. The back up copies of these data will be securely locked in a filing cabinet. The recorded data made during this research will be used only for this research purpose, including journal publication and conference presentations. No other use will be made of them without your written permission, and no one outside the project will be allowed access to the original recordings. At the end of the research, the file will be deleted.

15. **Contact for further information**

,

    Department of Landscape, University of Sheffield, Floor 13, the Arts Tower, Western Bank, Sheffield S10 2TN

Research supervisors:

Mr. Andy Clayden
Telephone: 0114 222 0612
Email: a.clayden@sheffield.ac.uk

Prof. James Hitchmough
Telephone: 0114 222 0610
Email: j.d.hitchmough@sheffield.ac.uk

This information sheet is for you to keep. Thank you for your time and help.

Appendix 2
Participant Consent Form

Title of Research Project: Towards a sustainable landscape of urban parks in Kuala Lumpur, Malaysia: A study from a management perspective

Name of Researcher: Roziya Ibrahim
Participant Identification Number for this project:
Please initial box

1. I confirm that I have read and understand the information sheet/letter dated 1/3/2013 explaining the above research project and I have had the opportunity to ask questions about the project. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline. *If you have any questions please contact:* ☐
   Name: Roziya Ibrahim
   Phone No: 0192345188 (hp)

3. I understand that my responses will be kept strictly anonymous. I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research. ☐

4. I agree for the data collected from me to be used in future research ☐

5. I agree to take part in the above research project. ☐

_____	_____	_____
Name of Participant (*or legal representative*)	Date	Signature
_____	_____	_____
Name of person taking consent (*if different from lead researcher*)	Date	Signature
_____	_____	_____
Lead Researcher	Date	Signature

To be signed and dated in presence of the participant

Copies:

Once this has been signed by all parties the participant should receive a copy of the signed and dated participant consent form, the letter/pre-written script/information sheet and any other written information provided to the participants. A copy of the signed and dated consent form should be placed in the project's main record (e.g. a site file), which must be kept in a secure location.

Appendix 3

Towards a sustainable landscape of urban parks in Kuala Lumpur, Malaysia: A study from a management perspective

Interview topic guide for precedent study sites

Introduction

Introduce research, provide information sheet
Ask for consent –fill out consent form (ask for permission to tape)
Give assurance relating to anonymity and can end conversation at anytime

Interviewee Backgrounds	
1.	**Experience** a. How long have you been involved in the landscape management of urban park? b. Involvement in the management of the specific park.
2.	**Background into profession** a. What is you educational/training background?
3.	**Role and responsibilities** a. How would you describe your role in the design and management of this park?
Introduction	
4.	First of all, could you describe how the project was first initiated?
5.	In the time that you have involved in the development of this park, who was responsible in introducing the ecological approach in the design, management and maintenance for the park?
6.	Why ecological design is chosen for the development of this park?
7.	Are there any other factors that motivate the project design team to choose this sustainable approach for the development of this park?
8.	How was the client convinced to accept this approach?
Focus 1: Innovations in the use of vegetation to reduce maintenance intensity and cost.	
9.	What is the vegetation strategy for this park?
10.	How does this concept enhance the sustainability of this park? (Low maintenance, minimal resources use etc.)
11.	Were there any specific site issues that the design and vegetation had to address?
12.	Is the same treatment applied throughout the park or only on selected areas
13.	What informed the choice of vegetation for the park?
14.	What are the implications for future maintenance of the park?
Focus 2: Landscape design to help contribute to the management of urban stormwater control and opportunities to increase habitat diversity.	
15.	Could you explain how the landscape is incorporated in the sustainable urban drainage system?

16.	How effective has this approach been in managing the stormwater on-site?
17.	What contribution has this approach made towards increasing habitat diversity in the park?
18.	How far do you think this concept has successfully enhanced the ecological sustainability of the park?
Focus 3: The contribution that this urban park makes towards the delivery of an integrated, city wide green infrastructure.	
19.	To what extend the design of this park considered as part of a wider infrastructure agenda for the city?
20.	Have this approach compromise the people used of this space?
21.	How the design of this park influence the development of other parks in the city?
Focus 4: The benefits and challenges of developing and managing this park through an ecological approach.	
22.	What are the key benefits of implementing the ecological approach in the design, management and maintenance of this park?
23.	What are the key challenges of implementing the ecological approach in the design, management and maintenance of this park? - Vegetation Maintenance (trees, palms, shrubs maintenance) - Resources use (water, energy, manpower) - Labour/ Manpower (required skill/ training) - Attitudes of the staff in managing and maintaining the landscape - Any other aspects

Appendix 4

Towards a sustainable landscape of urban parks in Kuala Lumpur, Malaysia: A study from a management perspective

Interview Topic Guide

Introduction

Introduce research, provide information sheet
Ask for consent –fill out consent form (ask for permission to tape)
Give assurance relating to anonymity and can end conversation at anytime

Interviewee Backgrounds
1. Background into profession b. What is you educational/training background? 2. Experience c. How long have you been involved in the landscape management of urban park? d. Involvement in the management of the specific park. 3. Role and responsibilities b. How would you describe your role in the management of this park?
Part 1: The current landscape design, management and maintenance of tropical urban park
4. How do you manage the current landscape of this park? - Management and Maintenance strategy
5. In the time that you have involved with the management of this park, what are the changes occurred? a. Changes in Design - Landscape Style - Landscape vegetation (Conservation of old species, introducing new species, addition of plant quantity, removing the existing vegetation) b. Changes in Management and Maintenance approach? - Maintenance technique (irrigation, plant management, waste management) - Labour force
6. In your opinion, what do you think influence this/these changes? - Government's policy and regulations - Decision by the top Management of this park - Others
7. Who is responsible for the decision making in the design, management and maintenance of this park? - Members of advisory board/ public representative - Top management - Mutual input
8. How do you manage the financial resources for the landscape design, management and maintenance of this park? - The main financial source - Additional allocation - Contingency budget - Is it sufficient
9. What are the issues and problems in the current design, management and maintenance of the urban park? (e.g. Resources use, labour/ manpower, equipment, other aspects)

Part 2: Moving towards ecologically sustainable practice: Potential aspects of design and management for consideration.

10. What do you understand about ecologically sustainable landscape?
    - Physical appearance/type of landscape
    - Ecological resilience: ability to withstand stressors (e.g. climate change)
    - Benefits: Multifunctional landscape (e.g. habitat diversity for wildlife enhancement/stormwater management
    - Low maintenance intensity/cost

Show series of precedent studies on this approach practiced in developed countries.

11. How would you respond towards changing the current landscape of urban park into a more ecologically sustainable landscape?

Show series of alternatives treatments suggested for urban parks in Kuala Lumpur (low maintenance/ stormwater control/ increase habitat diversity):

Existing landscape	Alternative 1: Moderate treatment	Alternative 2: Extreme treatment

12. Impact of the new landscape to the design, management and maintenance of this park. (WHAT do you think and WHY?)
    - What do you think of this landscape? Why?
      - Good/bad.
      - Safe/Not safe
    - What do you think the key differences of these landscapes?
      - Appearance
      - Cleanliness and tidiness
    - What would be the implication of this new landscape type to the maintenance work of this park?
      - Changes to the current management and maintenance
    - What aspect of management and maintenance might be changed with this type of landscape?
      - Daily maintenance work (e.g. cleaning, pruning, weeding, mowing, watering, fertilizing)
      - Resources use (e.g. water, energy)
    - What is the opportunity this type of landscape can offer?
      - Operation and Maintenance
      - Staff: training

Part 3: The appropriate types of vegetation for the ecologically sustainable landscape.

13. How can we improve this landscape?
    - To be visually engaging
    - To encourage people to experience the landscape

14. In your opinion, which part of the park is priority to apply this type of landscape?
    - Entrance
    - Central area/ active area
    - Peripheral/passive area
    - Along the street/walkway
    - Other area

Part 4: Attitudes towards changing into a more ecologically sustainable landscape practice.
15. How achievable is this landscape to be implemented in this park? - Practicality - Acceptability - Willingness to change 16. What do you think the benefits of this new type of landscape? - Wildlife Enhancement - Stormwater control; collect and store rainwater 17. What are the key issues/challenges of changing into this type of landscape? - Implementation and maintenance: Easy/difficult
Final Remark
18. How do you think this landscape might change your work in this park? (maintenance strategy)
19. How do you think this new type of landscape will affect the future management and maintenance of this park (short/long term)? - Maintenance intensity - Cost

That is all of my questions, but is there anything else you would like to add?

Thank you for your time.

Appendix 5

Ecological Design Framework proposed for Kuala Lumpur's urban parks

Series of alternative treatments suggested for Perdana Botanical Garden, Kuala Lumpur (low maintenance/ stormwater control/ increase habitat diversity)		
Existing landscape	**Alternative 1: Moderate treatment**	**Alternative 2: Extreme treatment**
Lawn		
Shrublands		
Semi-woodland		
Ponds		
Water-edge		

Series of alternative treatments suggested for Titiwangsa Lake Garden, Kuala Lumpur (low maintenance/ stormwater control/ increase habitat diversity)

Existing landscape	Alternative 1: Moderate treatment	Alternative 2: Extreme treatment
Lawn		
Shrublands		
Semi-woodland		
Water-edge		

Series of alternative treatments suggested for Ampang Hilir Lake Garden, Kuala Lumpur (low maintenance/ stormwater control/ increase habitat diversity)		
Existing landscape	**Alternative 1: Moderate treatment**	**Alternative 2: Extreme treatment**
Lawn		
Shrublands		
Semi-woodland		
Water-edge		

Series of alternative treatments suggested for Permaisuri Lake Garden, Kuala Lumpur (low maintenance/ stormwater control/ increase habitat diversity)		
Existing landscape	**Alternative 1: Moderate treatment**	**Alternative 2: Extreme treatment**
Lawn		
Shrublands		
Semi-woodland		
Water-edge		

Series of alternative treatments suggested for Kiara Valley Recreational Park (low maintenance/ stormwater control/ increase habitat diversity)		
Existing landscape	**Alternative 1: Moderate treatment**	**Alternative 2: Extreme treatment**
Lawn		
Shrublands		
Semi-woodland		
Ponds		
Water-edge		