Valuing the Attributes of Malaysian Recreational Parks:
A Choice Experiment Approach

by

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Abstract

The objective of this study is to investigate public preferences and willingness to pay (WTP) for the attributes provided at the Malaysian Agricultural Park (MAP) in Shah Alam (SA), Selangor. The study also estimates individuals' WTP for the attributes of a generic recreational park and investigates the transferability of these estimates to MAP. This exercise is undertaken by asking a sample of residents in Kuala Lumpur (KL) to value a hypothetical park in KL. Qualitative and quantitative methods are applied to undertake this study. The former include focus group meetings and stakeholder interviews which are used to determine appropriate park attributes and their levels. The latter use Choice Experiments (CEs) to investigate respondents' preferences for these attributes. A face-to-face questionnaire survey is employed to collect information from respondents. The usable sample sizes achieved in KL and SA are 188 and 169, respectively. Data analysis methods employed include multinomial, random parameter logit, and latent class modelling.

The qualitative approaches suggest that visitor amenities, recreational facilities, information, and natural attractions are the most relevant park attributes for visitors. Analysis of CE data indicates that respondents in KL had the highest preference for recreational facilities, followed by visitor amenities, natural attractions and information. In SA, the order of preference is recreational facilities, visitor amenities and information. The CE results also show that the samples in KL and SA are willing to pay for improvement in the attributes. The benefit transfer study yielded mixed results with evidence to support the transferability of some estimates but not others. Finally, the study yields several recommendations on the provision and pricing of facilities and amenities to those involved in the management and development of MAP and other recreational parks in Malaysia.

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Contents

List of Tables

List of Figures

Acronyms

AIC	Akaike Information Criteria
ASC	Alternative Specific Constant
AVC	Asymtotic Variance Covariance
BIC	Bayesian Information Criteria
CA	Conjoint Analysis
CE	Choice Experiment
CHKL	City Hall of Kuala Lumpur
cnAIC	Consistent Akaike Information Criteria
CRk	Contingent Ranking
CRt	Contingent Rating
CS	Compensating Surplus
CV	Compensating Variation
CVM	Contingent Valuation Method
DCM	Discrete Choice Multiple Bounded
DCS	Discrete Choice Single Bounded
ES	Equivalent Surplus
EV	Equivalent Variation
FTZs	Free Trade Zones
IIA	Independence Irrelevant Alternatives
iid	independently identically distributed
KL	Kuala Lumpur
LCM	Latent Class models
LR	Likelihood Ratio
MAP	Malaysian Agricultural Park
ML	Maximum Likelihood
MNL	Multinomial Logit
MRS	Marginal Rate of Substitution
MU	Marginal Utility
MXL	Mixed Logit
NLD	National Landscape Department
NOAA	National Oceanic Atmospheric Administration
OE	Open Ended
OMEP	Orthogonal Main Effect Plan
OS	Open Spaces
PC	Payment Cards
PwC	Pair-wise Comparison
RF	Recreational Facilities
RM	Ringgit Malaysia
RPL	Random Parameter Logit
RUMs	Random Utility Models

RUT	Random Utility Theory
SA	Shah Alam
SAS	Statistical Analysis Software
SHS	Standard Halton Sequences
SLL	Simulated Log Likelihood
SPSS	Statistical Package for the Social Science
TCM	Travel Cost Method
TEV	Total Economic Value
WTA	Willingness To Accept
WTP	Willingness To Pay

Chapter 1 : Introduction

1.1 Introduction

In recent decades policy makers and academics have frequently debated the question of how to value society's preferences for public goods (e.g. Sagoff, 1994). This has led to the production of a large body of work both on the notion of value and about the qualitative and quantitative techniques that can be used to learn more about the nature and magnitude of such values. The classification of public and private goods was introduced by Samuelson (1954, 1955), taking forward ideas first introduced by European economists such as Lindahl, Sax, Wicksell, Bowen and Musgrave. The publication of Samuelson's papers, however, encouraged interest in the subject and the literature on public goods grew rapidly (Cornes and Sandler, 1996).

The terms used in the literature to refer to what we now know as public goods have changed over time and tend to have been used interchangeably. Public goods have at different times been called "collective consumption goods" (Samuelson, 1954), "social goods" (Bowen, 1943) or "communal ownership-consumption goods" (Buchanan, 1965). Such goods share some similarities with private goods in at least two ways: (1) they serve human needs and (2) they are produced using resources that can be depleted (Bowen, 1943). The factors that make public goods different from private goods are based on the observation that such goods are "non-rival in consumption" and "non-excludable" (Bowen, 1943). Thus, the consumption of a public good by one individual should not affect the ability of another individual to consume it (i.e. non-rivalry in consumption), and individuals cannot be prevented from such consumption (i.e. non excludability) (Garrod and Willis, 1999).

According to Bowen (1943) private goods are divisible when they can be divided into smaller units. The ownership of such goods can be given to a consumer and she will then have exclusive rights over it. By contrast, public goods are not divisible into units and can be said to offer "indivisibility of benefits". This terms is used interchangeably with non-rivalry in consumption (Cornes and Sandler, 1996). An example of this characteristic can be observed when considering scenic landscapes in informal outdoor recreation, where one individual enjoying the view does not prevent any other individual from enjoying it too.

The non-excludability of public goods refers to a situation where the benefits provided by those goods are available to everyone (Cornes and Sandler, 1996). In other words, one individual cannot exclude other individuals from enjoying the benefits provided by a public good. To exclude other individuals from such benefits would require either some physical or legal barrier to prevent consumption, in which case the good would cease to be public (Cornes and Sandler, 1996). An example of this characteristic is an area of open access land under the 2000 Countryside and Rights of Way Act in England or Wales. Once such land has been designated any individual has the right to access it for informal recreation and it an offence to restrict access (although the land can be closed for up to 28 days per year to allow for certain sensitive activities to be conducted).

Some authors (e.g. Cornes and Sandler, 1996) distinguish between two types of public good: (1) pure public goods, and (2) impure public goods. Only pure public goods are both non-rival in consumption and excludable, while impure public (or mixed) goods lack one or other of these characteristics. An example of a pure public good is an open-access recreational park, while an impure public good could be a recreational park that only permits access following the payment of an entry charge.

An important issue in public goods provision is that of market failure (Bator, 1958). One reason for such failure is the lack of a market for public goods (failure for existence (Bator, 1958)). Take the example of air quality: generally, people cannot determine the quality of air where they live and even if they could no mechanism exists that would allow them to pay for their desired level of quality. Several factors can contribute to market failure but the one that is going to be investigated in this study is failure by incentive or signal (Bator, 1958) that is the market price signals transmitted to consumers do not reflect the social costs of provision. With no information on the value that the pubic places on public goods, decisions about their provision may lead to sub-optimal provision. Similar sub-optimal provision may exist in the case of mixed goods where a price is charged, if that price does not reflect the maximum willingness to pay of consumers for the good (i.e. where there is incomplete information about demand for the good in question).

This study investigates how much a sample of the general public in Malaysia values different attributes of a recreational park with a view to informing decision making about the future provision of such attributes. The park chosen for the study is the Malaysian Agricultural Park (MAP) in Shah Alam.

1.2 Is Valuation Important to Recreational Parks?

Market-based approaches to evaluate the provision of public goods and services have become increasingly popular over the last three decades. This has been supported by a shift from socialist to market-based philosophies and by the emergence of technologies that allow the greater adoption and implementation of market mechanisms (Garrod and Willis, 1999).

Since the 1960s, economic measures of benefit have increasingly been used to inform policy evaluation and project appraisal particularly in the United States and Europe. An early example is the commitment given by the President of the United States, John F. Kennedy in 1964 where he approved the unit-day value method for measuring the benefits and costs of recreational parks (Walsh, 1986).

The use of economic valuation has been spreading to developing countries since the 1980s. Malaysia, for example, has incorporated the role of economic valuation into their National Policy on the Environment. This recognition has meant that an increasing number of studies valuing environmental goods have been undertaken. For example, studies valuing recreational parks in Malaysia have been undertaken by Jamal and Shahariah (2004), Jamal (2000), Mustapha (1993), and Mohd. Shahwawid et al. (1998).

When considering the provision of environmental goods and services such as recreational parks it is inevitable that the issue of their costs and benefits arise. Generally, the cost of provision is relatively straightforward to measure. Measuring the benefits of such provision is not so easy, especially if no entry fee is charged or if the fee is small and unlikely to reflect the benefits experienced by visitors. Indeed, both the magnitude and the nature of the benefits experienced by visitors is usually unclear to providers as is the relationship between the level of amenity provided at a park and the utility that they offer to individuals.

Even when a price is charged for access to an environmental good or service (i.e. a recreational site) it seldom reflects the full benefits being offered. Such uncertainty means that it is hard to judge whether or not the benefits that such goods provide exceed the costs of their provision.

Putting a price on environmental goods can be controversial (Clinch, 1999). One argument against this activity, particularly in the case of habitats and natural resources, is an ethical one focussing on "anthropocentrism" (Clinch, 1999). Such human-centred valuation cannot, it is argued, reflect the value of environmental goods or services to other species (Kortenkamp and Moore, 2001) and the so-called "anthropocentrism ethic" suggests that putting a price on environmental goods can only reflect human interests without taking account other forms of life. To do so would require a shift to an "ecocentric ethic" (Kortenkamp and Moore, 2001) which would reflect the notion that all life on earth has an intrinsic value (Kortenkamp and Moore, 2001).

Such a shift would be hard to implement and it is hard to deny that the vast majority of economic studies valuing environmental goods and services have been carried out on an anthropocentric basis (e.g. Garrod and Willis, 1999; Hanley and Spash, 1993).

While there may be objections to the anthropocentric valuation of environmental goods and services, such exercises may provide important evidence to inform decisions about public expenditure and natural resource use. With the ever growing demands on land and natural resources and public budgets stretched by competing priorities such decision are increasingly important. What economists can do is provide objective and robust measurements of the costs and benefits associated with resource use both at a project and a policy level (Mishan and Quah, 2007).

Using a range of economic techniques developed since the 1960s, these measurements can incorporate estimates of the associated environmental costs and benefits to society, allowing these as well as more conventional measures of financial costs and benefits to inform decision making. Thus, when a government is reviewing its expenditure on recreational parks, their deliberations can include information about the broader benefits and costs they have for society as well as information on financial costs and revenues. By providing such information it is anticipated that decisions will be made that reflect a broader range of societal values beyond the merely financial.

1.3 How to Value Recreational Parks

Broadly speaking, recreational parks can be valued using either indirect or direct approaches. The difference between these two reflects how the information used to inform valuation is obtained. For example, if people are asked directly how much they are willing to pay for an improvement in facilities or services at a recreational park then this is an example of a direct approach. By contrast, an indirect method would infer information about value indirectly from some other source such as the number of visits that individuals make to the site (Garrod and Willis, 1999).

In the early days of valuing outdoor recreation, analysts (e.g. Clawson and Knetsch, 1966) used indirect methods. Due to potential drawbacks in the implementation of these methods (i.e. insufficient variation in travel distances especially for urban parks, see Walsh (1986)), many recent applications concentrate on direct methods. One of the advantages of using direct methods, compared to indirect methods, is their ability to estimate benefits for the entire population, including those who do not currently use a recreational site (Walsh, 1986).

A range of multi-attribute approaches are available for the investigation of public preferences and values for recreational goods and services. Such approaches may often be usefully applied to the valuation goods that possess two or more attributes, like recreational parks, for which individuals may hold different values. One such technique, that is currently widely applied in the environmental valuation literature and which could be used to value recreational parks is that based on Choice Experiments (CEs) (Louviere et al., 2000).

CEs are appealing because of their consistency with theories of economic welfare (Bateman et al., 2002). Arguments in their favour often cite four reasons for their use: (1) the technique forces respondents to trade-off changes in attribute levels against the costs of making these changes; (2) the technique allows respondents to choose a *status quo* option rather than opt for change; (3) the technique uses an econometric model that is consistent with the theory of probabilistic choice; and (4) the technique permits the benefits of environmental goods be estimated through measures of both compensating and equivalent surplus (Bateman et al., 2002).

CEs have also been used in benefit transfer studies by some analysts (e.g. Morrison et al., 2002). This is because the estimated value of a good or service can be based on the value of its component attributes rather than the good itself. Therefore, in the case of recreational parks, it is interesting to investigate whether or not estimates of value for one park can be transferred to other parks which may possess similar attributes.

CEs have been used previously to value recreational parks in developed countries (e.g. Adamowicz et al., 1997; Boxall and Adamowicz, 2002; Schroeder and Louviere, 1999). The application of the technique, however, is considered rare in developing countries. For example, in Malaysia, the technique has been applied by Othman et al. (2004) in their study of a wetland park.

The application of benefit transfer in developing countries is also considered rare compared to developed countries. From a review of the literature, no single study using benefit transfer has been undertaken in Malaysia. Based on these arguments, this study uses CE technique for valuing MAP. This study also investigates the appropriateness of applying benefit transfer in Malaysia.

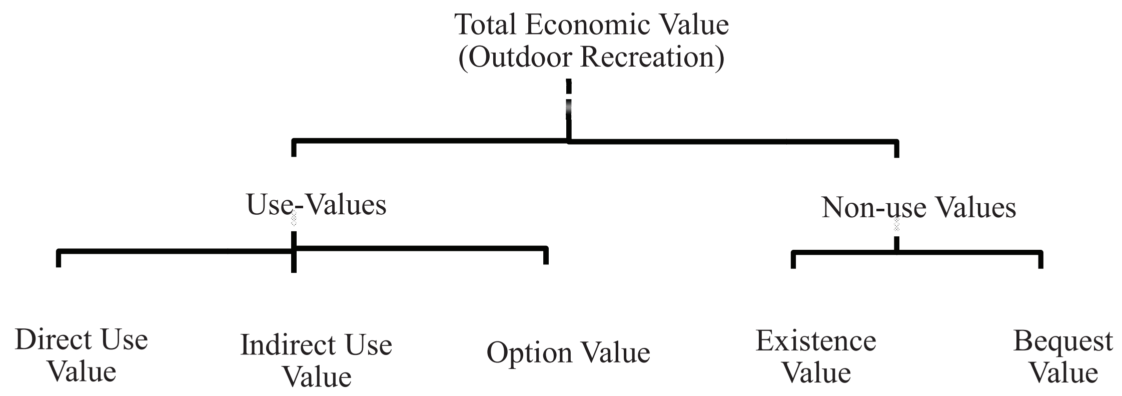
A variety of values from recreational parks can be estimated by using CEs and these are explained in the following section.

1.4 Values of Recreational Parks

Consumers may be willing to pay to gain access to a recreational park if they perceive that the benefits that they will receive from a visit are worth at least as much to them as the entry fee they would have to pay. Existing users may also be willing to accept a reduction in entry charges as compensation for any loss amenity experienced at a park as a result of environmental degradation or a reduction in the level or quality of facilities.

Environmental values, such as those associated with outdoor recreation, are generally classified into two broad categories, use values and non-use values, within a total economic value (TEV) framework (Garrod and Willis, 1999; Turner et al., 1994). These values are illustrated in Figure 1.1.

Figure 1.1: Types of Values in Outdoor Recreation



Source: Turner et al. (1994)

Use values refer to the values or benefits that consumers receive from the consumption of outdoor recreation activities (Mitchell and Carson, 1989; Turner et al., 1994). These values can be divided into three sub-groups: direct use values; indirect use values; and option values. Direct use values refers to values obtained directly from activities at recreation sites like physical activities or enjoying a view or a picnic.

Indirect use values refer to benefits that individuals receive indirectly from the outdoor recreation site such as temperature modification or soil stabilization. Option value refers to a situation where consumers are willing to pay to ensure that the outdoor recreation opportunities remain available to them in the future even if they do not currently consume them. This value was proposed by Weisbroad (1964) in his paper about uncertainty in the future provision of environmental goods.

The second category of value is non-use value. These may include existence and bequest values (Garrod and Willis, 1999). Krutilla (1967) explained that non-use values are values that consumers have for a good or service even if they have no intention of consuming it either now or in the future. If consumers value the continued existence of a good, these values are known as existence values. Bequest value applies to a situation where consumers are willing to pay for the preservation of a good or service (i.e. a recreational site) for the sake of future generations. In this sense, present-day consumers might be willing to pay to ensure that future consumers will have the same opportunity to enjoy an outdoor recreation facility as they have had. This value is considered as a non-use value for the current generation but could be converted into a use value for future generations (Turner et al., 1994). The sum of use values and non-use values yields the TEV (Turner et al., 1994).

1.5 Research Objectives

In general, the aim of this study is to investigate public preferences and values for MAP and to investigate whether or not a benefit transfer study based public preferences for a generic recreational park could yield similar value estimates (and thus, suggesting that a bespoke study of MAP would not have been required). For the benefit transfer study, a generic recreational parks in the Kuala Lumpur (KL) area is used as a study site. Specifically, this study will look into:

a) the potential for CEs to be used to value recreational parks and their attributes;

b) public preferences for the attributes of MAP and for a hypothetical generic recreational park in the KL area;

c) the estimated public benefits associated with visiting MAP and the generic recreational park;

d) the effect of heterogeneity of public preferences for park attributes;

e) the transferability of the demand function estimated for the generic park to an actual park, i.e. MAP; and

f) the transferability of implicit prices for attributes between the generic park and MAP.

1.6 Organization of the Thesis

The organization of the thesis is as follows. Chapter 2 sets the scene for the research by providing information about Malaysia and relates them to outdoor recreation activities. This is followed by some discussion of outdoor recreation. The chapter explains briefly the relationship between outdoor recreation, recreational parks, and open space. Other subjects covered in the chapter include the history and role of recreational parks in Malaysia, current practice and the case study site, MAP. The last section of the chapter discusses the future planning of recreational parks in Malaysia.

Chapter 3 discusses a theoretical framework for valuing outdoor recreation and methods that can be used to value outdoor recreation. The first section begins with an explanation of the underpinning theories that are relevant to valuing outdoor recreation. This is followed by a review of potential methodologies for valuing recreational parks. This discussion is structured according to the elicitation approach that could be used for this purpose. Three elicitation approaches are reviewed: (1) indirect, (2) direct and (3) a combination of direct and qualitative analysis. The strengths and limitations of each approach are discussed along with its suitability for valuing recreational parks.

Chapter 4 reviews the literature on CEs. The review begins with issues in CE design. Issues include selecting attributes and their levels, experimental design, questionnaire design, sampling, data collection and coding. The next issue reviewed in this chapter is estimation beginning with the Multinomial Logit (MNL) model. The Random Parameter Logit (RPL) model and the Latent Class models (LCM), two models that consider heterogeneity in preferences, are then discussed before a more general discussion of welfare measurement. Finally, the chapter reviews the potential application of CEs for benefit transfer. Subjects in the chapter include criteria for selecting a site for a benefit transfer study and the choice of benefit transfer tests.

Chapter 5 describes the research methodology that was applied in this study. Methods to determine the attributes to be used in the study are discussed along with issues of experimental and questionnaire design, the pilot survey, and finally sampling and implementation.

Chapter 6 presents empirical results and their interpretation. The chapter begins with a discussion of respondent characteristics, which is followed by the results of the CEs. The final section of the chapter presents the results of the benefit transfer exercise.

Chapter 7 concludes the thesis by summarising the results and discussing any implications that they have for the future development and management of recreational parks in Malaysia. Finally, some suggestions for future research are considered.

Chapter 2 : Malaysia and Outdoor Recreation

2.1 Introduction

This chapter begins with some key information about Malaysia. Details such as the location of the country, its weather, and its natural resources are presented in Section 2.2. Section 2.3 contains an explanation of the topic of outdoor recreation, including definitions of recreational parks, and their classification systems.

Section 2.4 addresses the roles of recreational parks. It outlines activities that are commonly undertaken in parks, and the possible amenities and facilities necessary for such activities. Section 2.5 presents the history of parks in Malaysia. Using the colonial period as a timeline, this history is divided into three phases: covering before; during; and after the colonial period; as well as the present day.

Section 2.6 discusses the current state of Malaysia's recreational parks. It includes details about their administration; and other current issues relevant to recreational parks. Section 2.7 describes the study site, the Malaysian Agricultural Park (MAP), and explains the concepts of good design and community involvement in park planning. The chapter ends with some general conclusions.

2.2 An Overview of Malaysia

Malaysia is located in the South East of Asia, and consists of Peninsular Malaysia and Sabah and Sarawak in North-western Borneo. Peninsular Malaysia is separated from Sabah and Sarawak by the South China Sea. There are twelve states in Peninsular Malaysia.[2.1]

The country exhibits a climate that ranges from equatorial weather to tropical monsoons. The monsoon winds come from the northeast and the southwest. The northeast monsoons occur

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[2.1] The twelve states in Peninsular Malaysia are Perlis, Kedah, Pulau Pinang, Kelantan, Terengganu, Pahang, Perak, Selangor, Kuala Lumpur, Melaka, Negeri Sembilan, and Johor. Kuala Lumpur is the capital of Malaysia.

between November and April, while the southwest monsoons usually occur between May and October. On average, Malaysia records 2500 to 3000 mm of rainfall per year. The total land area of Malaysia is 330,433 square kilometres (km^2), where 73,620 km^2 and 123,985 km^2 are the land areas of Sabah and Sarawak, respectively.

Figure 2.1: Map of Malaysia

Source:http://images.nationmaster.com/nm/motw/middle_east_and_asia/malaysia_adm98.jpg

Malaysia is a country rich in natural resources; it is known for its mineral resources, forestry, and agriculture. The area of its forested land is 193,000 km^2, covering 58% of the total land area (Noor Azlin, 2003), while its agricultural activities have been identified as one of the country's engines of economic growth in the 9th Malaysia Plan (Malaysia, 2006).[2.2] These facts confirm why so many tourist destinations in Malaysia attract people through their natural resources.

[2.2] The Malaysian Plan covers a five-year planning period, and presently is under the 9th Malaysian Plan (2006-2010).

Local and overseas tourists alike enjoy a variety of fascinating destinations in Malaysia, such as islands, beaches, highlands, lakes, rivers, wetlands, caves, and recreation sites. In other words, they like Malaysia's offerings for outdoor recreation. This fact is evident in the total number of overseas visitors that visit places of outdoor recreation, such as national parks, highlands, etc. The total number of overseas tourists in Malaysia increased from 7.1 million in 1996 to 30 million in 2007; 1.04 million of these tourists have visited the National Park of Malaysia (Tourism Malaysia, 2008).

Other nature-based destinations, such as Forest Recreation Areas, also record high numbers of visitors. Bukit Nanas Forest Recreational Park, which is the original tropical forest in the city centre of Kuala Lumpur, recorded 24,403 visitors between November and December in 1999, with 15% coming from the United Kingdom (Forestry Department of Peninsular Malaysia, 2000).

Therefore, it is not surprising that the Malaysian government is willing to take various actions to give a face-lift to the country's natural resources, as they are the country's main assets. In the 2008 budget, the government allocated RM120 million for a nature-based programme called the "river rehabilitation plan".[2.3] This plan included cleaning and beautifying all of Malaysia's rivers for outdoor recreational purposes.

2.3 Outdoor Recreation

"Outdoor recreation" may refer to activities in forests, nature preserves, monuments, historical areas, wildlife refuges, parks, and many other locations (Clawson and Knetsch, 1966). According to Clawson and Knetsch (1966), places could be labelled as such because of their physical characteristics, their main uses, their history, and their administering agencies. In this study, the term "outdoor recreation" is used in reference to parks.

[2.3] RM is an acronym of Ringgit Malaysia, which is the currency used currently in Malaysia.

Parks are most often associated with open spaces. Open spaces, by definition, are areas of land that are put aside for multiple reasons (Abu Bakar, 2002), including recreational purposes (Gibberd, 1982; Elliot, 1988).

In 1928, the United States of America defined a park as any area of land or water set aside for outdoor recreational purposes. These include active and passive activities, and at least part of this recreation is expected to come from the park's appearance. Gibberd (1982) defines a park as an enclosed piece of ground, within or near a city or town, ornamentally laid out and devoted to public recreation. Elliot (1988) describes parks as lands intended and appropriated for people's recreation by means of their rural, sylvan, and natural scenery and character. In Malaysia, parks refer to areas of open space where recreational activities are held (Town and Country Planning Department Peninsular Malaysia, 2002).

According to the National Recreation and Park Association in the United States of America, parks may be classified into four types: mini parks; neighbourhood parks; community parks; and special use parks. Details about these parks, such as their target visitors; sizes; and facilities provided are presented in Table 2.1.

Table 2.1: Classification Systems of Parks

Types of Parks	Target Visitors	Size Area	Facilities
Mini (Pocket) Parks	To serve people who live or work within 0.4 km radius.	0.13 to 0.30 hectare.	Small scales facilities for children.
Neighbourhood Parks	To serve people who live or work within 0.8 km radius.	0.61 to 2 hectares	Picnic areas, open grass, outdoor sports courts and sports fields.
Community Parks	To serve two or more neighbourhoods within a radius up to 5 km.	8.1-40.5 hectares (the land needed depends on the actual needs).	Facilities are provided in large scale capacity.
Special Use Parks	It consists of broad ranges of parks and activities. However it must be used for a single-purpose use. The size area and facilities provided depends on the demand of parks.		

Source: National Recreation and Park Association, United States of America

Another type of park is a Natural Resources Area. In such parks, land is set aside for purposes of preservation or for the conversation of natural resources. Examples of this kind of park are national parks, wetland parks, and wildlife parks.

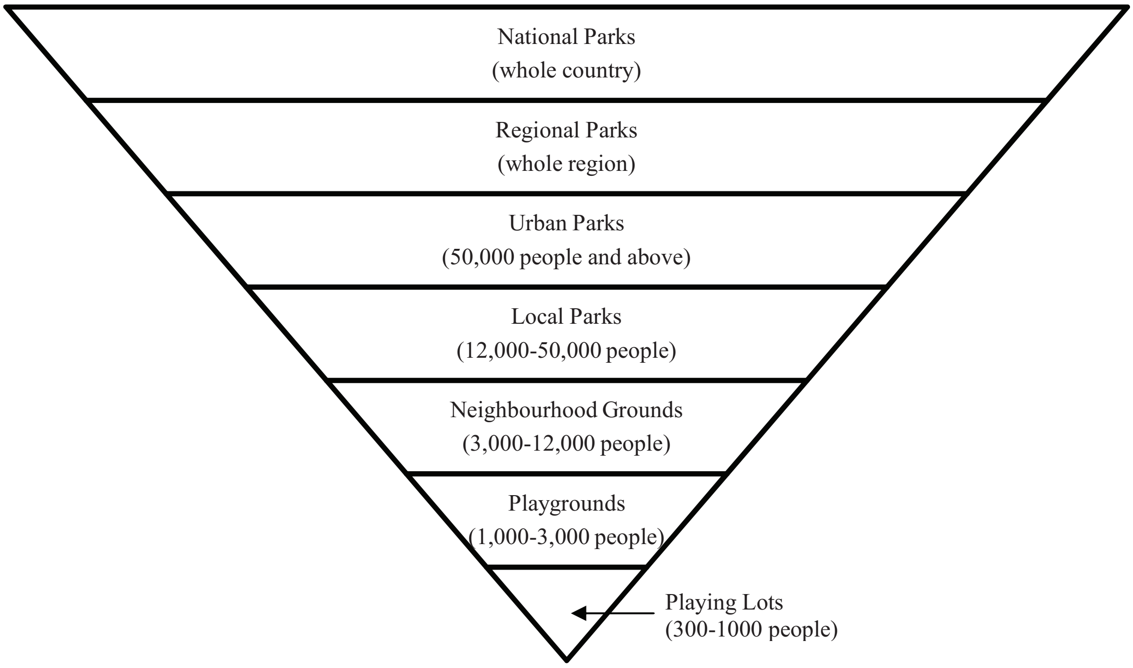
Clawson and Knetsch (1966), however, have divided parks into three categories, including user-oriented areas, resource-based areas, and intermediate areas. Each category possesses unique characteristics. For instance, the main characteristic of the user-oriented category is accessibility to users. Examples of parks in this class are playgrounds and city parks.

A dominant characteristic of the resource-based category is outstanding physical resources. Recreational parks in this category may be national forests, public wildlife refuges, or national parks. The intermediate category falls between the user-oriented and resource-based categories. Usually close to residential areas (i.e. an hour or two by car), parks in this category are typically used for all-day outings or on weekends. State parks and federal reservoirs belong to this category.

A hierarchy of parks in Malaysia is presented in Figure 2.2. From top to bottom, it begins with national parks, regional parks, urban parks, local parks, neighbourhood grounds, playgrounds, and playing lots. Each type of park has different characteristics, such as total land area and population catchment size.

As shown in Figure 2.2, there is no limit to the total land area of a national park, whilst for regional, urban, and local parks the areas are limited to 100, 40, and eight hectares, respectively. A small land area is allocated for neighbourhood grounds (two hectares), playgrounds (0.6 hectare), and playing lots (0.2 hectare). In terms of catchment population size, the number varies from 300 to 1000 for playing lots to the whole country for national parks. Details are presented in Figure 2.2.

Figure 2.2: The Hierarchy of Open Spaces and Recreational Parks and Population Catchment Sizes in Malaysia



Source: Town and Country Planning Department Peninsular Malaysia (2002)

Outdoor recreational activities provide benefits for all age groups. Manning (1989) has noted that recreational activities are undertaken for a variety of reasons, including the enjoyment of nature, physical fitness, the reduction of stress, escaping from noise or crowds, outdoor learning, independence, introspection, and personal achievement. These objectives can be achieved through active or passive recreation. Active recreation includes jogging, brisk walking, playing football, bicycling, and many other activities. Passive recreation includes walking, enjoying nature, picnics, and other such activities. Details about active and passive recreation are explained in the following section.

2.4 Recreational Parks: Functions, Activities, and Facilities

Abu Bakar (2002) has classified outdoor recreational activities into three broad functions. The first function is for relaxation purposes, where the public can enjoy activities such as viewing scenery, picnicking, bird watching, taking pictures, reading, listening to music, etc.

The public can also enhance social bonding with families and friends. To some extent, these activities permit the less fortunate people in society to establish better peer and social relationships (Orsmond et al., 2004). Facilities required for these activities include grass fields, shelters, and ornamental gardens.

The second function is for educational and learning purposes. This function, supported by Ali and Maskill (2004), indicates that visitors who go to recreational parks may also engage in activities that could enhance their knowledge. This may be achieved through activities such as watching cultural shows, creative acts, or painting demonstrations. Visitors may additionally participate in hands-on programmes, such as planting, or feeding animals. Examples of facilities necessary for such activities are park centres, special gardens, and special courtyards.

The last function addresses playing purposes. In this function, activities such as playing on swings and slides, jogging, boating, exercising, and fishing are commonly undertaken by the public. Facilities for such functions include children's playgrounds, jogging trails, boat stations, exercise stations, and fishing ponds. This function provides opportunities for healthy lifestyles through physical activities such as cycling, hiking, and walking.

Several studies have investigated the function of recreational parks in relation to healthy lifestyles (e.g. Rizal, 2001; Coulton and Frost, 1982). A study by Coulton and Frost (1982) examined the factors affecting the use of medical, mental health, personal care, and recreational services in a non-institutional sample of the elderly.

Rizal (2001) investigated the correlation between lifestyle practices and hypertension diseases. Lifestyle was measured in terms of food intake, frequency of exercise, and smoking habits. In Rizal's study at *Kampung Batu 5,* Semenyih, Selangor, the results showed that 36% of people aged 18 and above had hypertension problems. Those with hypertension were not adopting healthy lifestyles.

The Malaysian government also emphasises the importance of recreational activities for healthy lifestyles. In 2003, the Ministry of Health Malaysia launched a campaign called the "Healthy Lifestyle Campaign" to advocate healthy lifestyles among Malaysians (Ministry of Health Malaysia, 2005). The campaign highlighted four major elements, including healthy eating, no smoking, stress management, and exercise and physical activities. Various physical activities included in this campaign including cycling expeditions, skipping, etc.

Following the campaign, the government established the National Fitness Council. With the objective of supporting sports culture, the council was established to enable the implementation of more integrated and coordinated sports development programmes. Various government agencies were involved in the council, such as the Ministry of Youth and Sports, the Ministry of Health, the Ministry of Housing and Local Government, and the Department of National Unity and Integration.

Even though many programmes related to outdoor recreation have been launched recently, the commitment from the government in promoting recreational activities is not considered to be new. This can be seen from the number of parks built and maintained after independence from the United Kingdom in 1957.

2.5 History of Recreational Parks in Malaysia

The history of recreational parks in Malaysia can be divided into three phases in relation to the colonial period. The first phase, which occurred before the 15th century, refers to pre-colonial times. During that period, elements of garden parks, such as tropical landscape plantations, were planted in the compounds of royal palaces.

Before the 15th century, the royal palaces were the most important and dominant landscapes in traditional settlements (Abu Bakar, 2002). This was based on the roles played by such places, including the largest residential unit. Knowledge of this period, however, is restricted to 500 years from the 15th century because of two factors: all timber constructions have since perished, and there is an absence of written reports (Abu Bakar, 2002).

The second phase occurred during the colonial period. Malaysia (or, more precisely, Malacca) was placed under colonial occupation when the Portuguese conquered it in 1511. Malaysia was subsequently occupied by the Dutch, and finally by the British in 1824 before gaining independence in 1957. Though gardens existed during the colonial occupations by the Portuguese and the Dutch, they did not last because of many factors, including conquests, and changes in land use (Abu Bakar, 2002).

The formal development of recreational parks in Malaysia began only during the British occupation. The first public park in Malaysia, Lake Garden, in Kuala Lumpur, was built in the 1890s. This park was built for the recreational activities of British officers and their families. The same motive applied to the establishment of Taiping Lake Garden in 1910. Other types of parks built by the British were botanical gardens; the first Botanical Gardens was built in Penang in 1884. This park was built because of a higher demand for herbs and exotic plants from around the world at that time.

The last phase covers the period after Malaysia gained its independence, and extends until the present day. The development of new recreational parks in Malaysia was halted for at least two decades after independence. Many factors contributed to this scenario, including government needs to develop major infrastructures, and public utilities. The government was then primarily concerned with policies that could enhance Malaysia’s economy. Many policies were introduced, with the manufacturing sector one of the most successful ones (Malaysia, 1996).

The government introduced several strategies to improve the manufacturing sector. One of these strategies was the establishment of Free Trade Zones (FTZs) in several locations of Peninsular Malaysia. These locations were concentrated around the western corridor of Peninsular Malaysia, in places such as Selangor, and Kuala Lumpur (KL).

As a consequence of the FTZs, the western corridor of Peninsular Malaysia exhibited a scenario of in-migration into the states. The total population noticeably increased in these states. Selangor, for instance, recorded a population rise from 1.3 million in 1980 to 3.3

million in 2000, an increase of more than 100%. A similar scenario occurred in KL, where the population increased from 980,000 in 1980 to 1.4 million in 2000 (Malaysia, 1996).

The introduction of the manufacturing sector also triggered several changes in socio-demographic characteristics. The first and most significant change was an increase in income levels. For example, the mean monthly household income level for Selangor and KL increased nearly 50% in 1995, as compared to 1990 (Malaysia, 1996). With the increase of income levels, the lifestyle of Malaysians also changed, with rising levels of education and health concerned have increased. People began to think about healthy lifestyles, demonstrating this through exercising regularly at recreational parks and sports complexes.

The second effect of the manufacturing sector was connected to changes in the composition of age-groups. This occurred in most cities in the western corridor of Peninsular Malaysia, such as Petaling Jaya and KL. For instance, the number of people between the ages of 15 and 39 in KL increased from 460,000 in 1980 to 655,000 in 2000, an increase of 42% (City Hall of Kuala Lumpur, 2003). This increase indicates that there is a greater demand for recreational activities suitable to the active age group (i.e. 15 to 39 years old).

Based on the changes in socio-demographic characteristics, more leisure activities such as cinema, health club and outdoor recreation were demanded. However, the one that is related in the study and be discussed further in this thesis is the effect on the recreational activities demand. Having said these changes, it can be deduced that the government needed to build more parks to meet people's demand. In 1970, the City Hall of Kuala Lumpur (CHKL) built a new park, with the first phase opening to the public in 1980. The park was known as Titiwangsa Lake Park. Following the success of this park, many other parks were built by different councils. These included Shah Alam Lake Park (built by the Shah Alam Municipal Council), and Subang Jaya Park, built by the Subang Jaya Municipal Council. To ensure that the development of parks (or more generally, open space recreational areas) was well planned, the government established agencies to monitor these projects.

2.6 Current State of Recreational Parks

Various governmental agencies have been involved with parks in Malaysia. One significant agency that plays an active role is the National Landscape Department (NLD). The NLD is one of the departments in the Ministry of Housing and Local Government. This department was established on January 1, 1996, with the mission to ensure quality landscape development planning for good living environments. Several objectives were established to achieve these missions, in order to ensure that the landscape development of public parks, open spaces, and recreational facilities were high quality, viable, and cost-effective. Several programmes were formulated to achieve these objectives. The programs relevant to this study include (Ismail, 2005):

- the development of new public parks in every town and city throughout the country, with the aim of providing one hectare of green space per 1000 people;
- the upgrading of public parks, with renovations, the development of additional facilities, and tree planting carried out in existing parks; and
- the provision of advisory services and technical assistance to all government agencies, particularly the local government, in the fields of landscape and park development.

The achievements of the NLD are considered remarkable, as they managed to develop 30 landscape master plans, build 17 new public parks, and upgrade 256 existing parks between 2001 and 2005 (Malaysia, 2006).

In general, the functions of the NLD include planning, coordinating, executing, and monitoring national landscape developments, open spaces requirements, green areas, and recreational facilities. Specifically, the main functions of the NLD include (Ismail, 2005):

- to advise all related government agencies on the planning, development and management of landscapes and parks;

- to plan, coordinate, implement, and supervise landscape and park development throughout the country;
- to research, formulate, and implement policies, standards, regulations, and guidelines on landscaping, parks, and other related activities;
- to conduct research and development (R&D) and training programs for government agencies and private sectors;
- to establish information dissemination system and act as a reference centre for landscape and park development; and
- to act as the lead agency in all landscape and park development throughout the country.

The role of the NLD, however, is limited to areas where local authorities have financial difficulties in developing and maintaining recreational parks. Large local authorities such as the CHKL have their own authority to develop and maintain recreational parks.

Other departments or ministries that provide parks under their ministry include the Ministry of Agriculture and Agro-based Industry (MAP, Shah Alam); the Ministry of Natural Resources And Environment (Paya Indah Wetlands Park); and the State Government (State Park). Forest recreational parks and waterfall picnic areas are managed and controlled by the Forest Department of Peninsular Malaysia.

One of the issues in park development relates to budgetary concerns, as the budgets come from the federal government. In practice, the government distributes the budgets directly to the ministry related to each park. For example, if a park is managed by the Ministry of Agriculture and Agro-based Industry, such as the MAP, the budget will go directly to the ministry. The ministry will then allocate the budget to the park's management.

The budget, however, is often not sufficient to cover a park's operation costs. Ishahak (1983) reveals that only 10% of the budget received by the Petaling Jaya Municipal Council was used for recreational development. It is even less for small councils, where the councils usually allocate only 5% of the received budget for recreational purposes.

With smaller budgets, parks are not able to do maintenance work properly, and eventually this impacts on the quality of their amenities and facilities. This fact was supported by one of the participants in a focus group meeting for this study, who explained that in general, the amenities and facilities provided at parks during the first few years after their inception are sufficient and in good condition. But after some time, these conveniences deteriorate because of low maintenance. The focus group meeting will be explained further in Chapter 5.

Several recommendations have been suggested to solve the problem of insufficient budgets. One of them was involved a public-private partnership, especially for tasks difficult for the government to undertake due to a lack of expertise. This recommendation was implemented by the CHKL, where ten projects were operated as privatised or joint ventures in 1990. The cost of these projects was RM54 million (City Hall of Kuala Lumpur, 1990).

Another recommendation was to charge the public entrance fees, coupled with charges for using facilities provided at parks such as boating, canoeing, horse riding, etc. The intentions to charge the public were suggested for at least two reasons: (1) to bear part of the costs of maintenance work and (2) to instil responsibility and awareness about recreational parks amongst visitors (Jalil, 1983).

An implementation of entrance charge for parks in Malaysia, however, is difficult to apply because parks are currently free of charge, and at the same time no physical fences are built around the parks. The situation, however, may change in the future because park management officials tend to have inclinations to erect fences around parks. The reason for this is because of vandalism. The Deputy Director of the KL Landscape Department, for instance, indicated several steps to curb threats of vandalism, including erecting fences around parks (Siti Zakiah, 2009). The barriers, however, will be made of trees (i.e. hedge plants) rather than being physical fences.

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Another issue relates to finding open spaces suitable for recreational purposes. This occurs particularly in highly developed areas such as city centres. Land in a city centre usually concentrates on the residential and infrastructure uses, as opposed to recreational purposes. For example, the land in KL was used for residential areas (23%) and infrastructure (21%), as compared to open spaces and recreational purposes (7%) (City Hall of Kuala Lumpur, 2003).

Technically, the amount of land required for an open space is determined by the open space ratio. In this ratio, the total population is divided into the area of open space. The ratio of open space per 1000 in KL increased from 0.6 hectare in 1984 to 1.11 hectares in 2000. This ratio, however, is considered low in comparison to other western cities, ranging between two to three hectares per 1000 (City Hall of Kuala Lumpur, 2003).

The amount of land required for parks depends upon the attributes available in them. Parks with recreational facilities, such as jogging trails or bicycle tracks, may require large spaces, as compared to parks that provide basic amenities (such as park benches). The choice of attributes provided at parks not only affects the amount of land, but it is also one of the most important factors in attracting the public. Some people do not go to parks if their attributes do not match their needs. Such mismatches usually occur at older parks.

According to Siti Zakiah (2009), public preferences for recreational parks during the 1980s were different from public preferences in 2010. As she explains, nowadays it is quite common for visitors to visit parks at night (i.e. after working hours), which was not the case in the 1980s. Children are also not excluded from these changes, as they currently expect playgrounds to include challenging activities such as climbing, or walking on spider-web nets; in addition to typical playground equipment such as swings, slides, or see-saws.

Based on this argument, it can be concluded that the demand for recreational parks is subject to public preference. Therefore, to establish and explore the influence of public preferences on the demand for recreational parks, this study employs a case study approach. The park chosen for this study is the MAP.

2.7 Malaysian Agricultural Park

The idea of the MAP was initiated by the Ministry of Agriculture in 1985. The park, however, was not opened to the public until 1989. The park is located in the permanent reserve forest in Bukit Cerakah, Shah Alam (SA). The park's objectives included (1) to attract visitors through agricultural activities; (2) to establish a centre for research and/or educational activities; (3) to provide a sanctuary for plants and animals threatened by extinction; and (4) to provide a sizeable green area for the population of SA.

The MAP provides various types of activities for its visitors, and it is suitable for all age-groups. For those who enjoy physical activities such as cycling, camping and fishing, these are available. Visitors may also be entertained by scenic views, winter season in the climate house, and a variety of gardens, such as paddy, mushroom, ornamental, cactus, bamboo, coconut, and spices.

For those who are interested in animal husbandry, the park provides a fishing lake, an aviary, and an animal park. Furthermore, the tranquil atmosphere of the Idyllic Village and the water dams (i.e. the Yellow Water River and the New River) allows visitors to experience the appeal of village life within an urban location. A list of facilities at the MAP and their prices is presented in Table 2.2.

Table 2.2: Facilities and Their Prices at the Malaysian Agricultural Park

Items	Price (in RM*)		
Admission charge	Adult	Children	Senior Citizens
	3.00	1.00	1.00
Car Park	1.00 per entry		
Four Season Temperature House	Adult	Children	
	3.00	1.00	
Chalet/Camp site	Weekday	Weekend/Public Holiday	
Idyllic Village (10 persons)	80.00	100.00	
Dining Hall	100.00	100.00	
'A' Frame	20.00	20.00	
Camp Site (4 persons)	5.00	5.00	
Family day site	100.00		
License for one unit video	10.00		
Shooting fees	1000.00		
License for fishing (per rod)	2.00		
Bicycle rental	3.00 for first one hour and 1.00 for per subsequent hour		

*The exchange rate in 2010 figures was RM5.00=£1.00
Source: MAP

It can be concluded that the establishment of this park was an effort by the government to bring nature to the public, and to serve as one of the main attractions for supporting the tourist industry. With their role in promoting the agricultural sector (i.e. a centre for research activities) the park also serves as a one-stop centre for tourists to experience hands-on training in agricultural activities within a short period of time.

Though the number of visitors was high during the first few years after its inception, the numbers began to decline over a period of time. This was apparent for the period between 1999 and 2005, where the total number of visitors diminished from 545,575 in 1992 to 91,945 in 2003. The total number of visitors to the MAP is presented in Figure 2.3. The revenues received by the park also do not cover its expenses except from 2006. Figure 2.4 presents the park's total revenues and expenses between 1989 and 2009.

Figure 2.3: Total Number of Visitors to the Malaysian Agricultural Park (1989-2009)

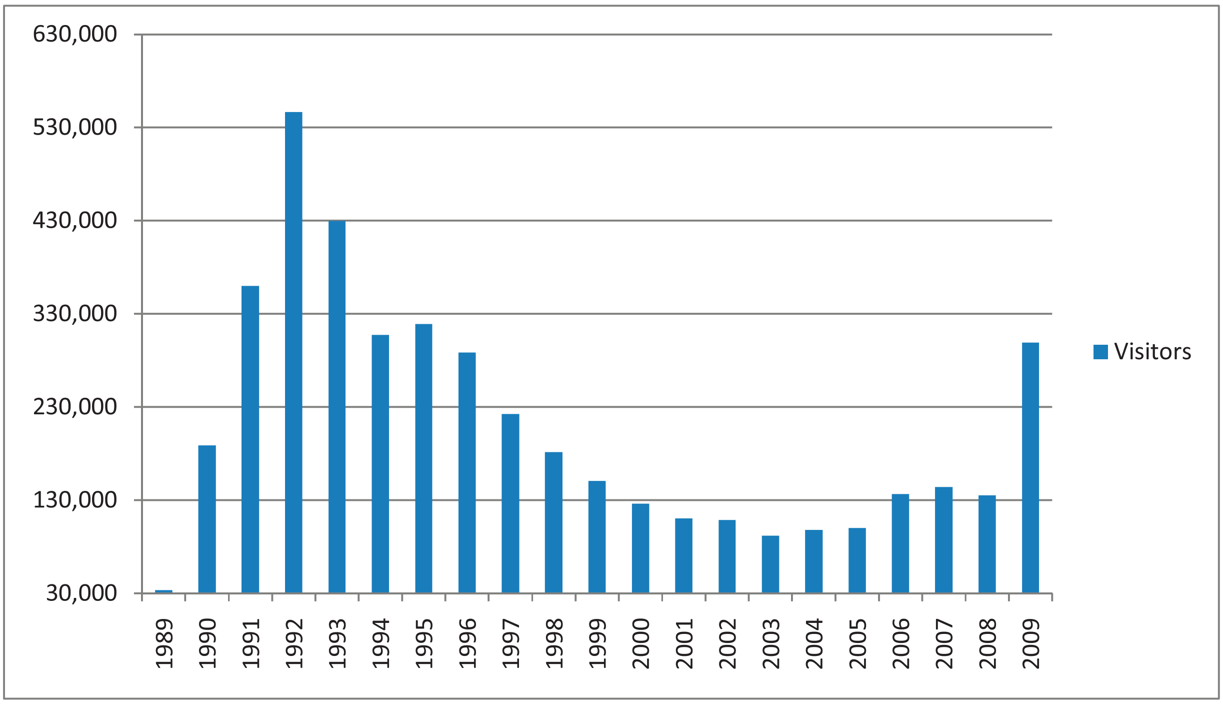
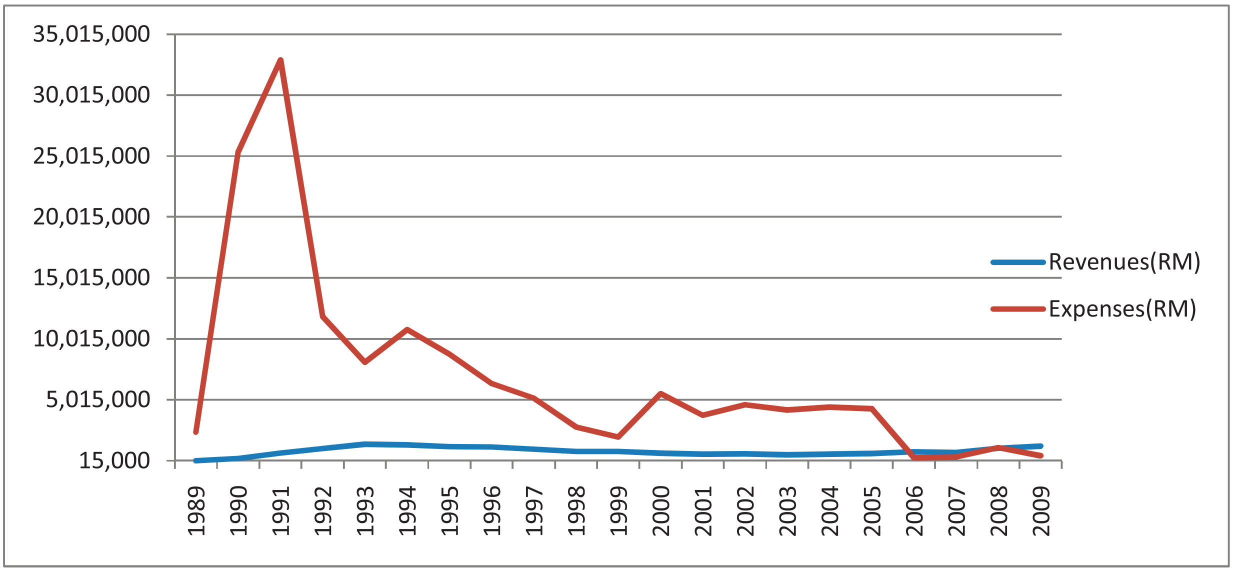


Figure 2.4: Total Revenues and Expenses at the Malaysian Agricultural Park (1989-2009)



Such a situation has encouraged the park management to think of strategies that could be used to attract more visitors to the park. One of these strategies was to have a joint venture programme with the private sector. This materialised in 2007, when they decided to form a joint venture with the Skytrex Adventure Ltd.

Activities provided in this joint venture were based on challenging games. Games such as "flying squirrel", "crazy zig-zag", and "hanging bridge" were available for visitors, letting them test their adrenaline levels. The charges for these activities were based on package prices. Three packages were available for these extreme games. Details of the package prices and their descriptions are shown in Table 2.3. The package prices, however, do not include the prices of admission.

The park also introduced new activities, such as paintball, where visitors could experience "battle war games" with the charge of RM80.00. Several strategies have been devised for attracting people to the park in the years to come. These strategies involve plans to include activities such as horse riding, and the introduction of botanical gardens into the park.

Table 2.3: Package of Extreme Games Provided at the Malaysian Agricultural Park

Type of package	Description	Price (in RM)
Little Adventure (LA)	Fifteen adventure activities are provided in the package ranging from easy to difficult.	30.00
Big Thrill (BT)	This package provides twenty-three thrilling challenges with the difficulty levels vary from easy to difficult. The highest height is 17m.	40.00
Extreme Challenge (X)	This is the latest games available at MAP. There are twenty-one extreme challenges where some of the platforms reach the height of 22m.	45.00

Source: MAP

2.8 Future Planning for Recreational Parks

One of the most important concepts in park planning is good design. Good design covers various aspects, depending on the parks. For example, elements of good design for a community park might be different from those for parks with special uses, such as a nature park. The same argument applies to the target visitors, where what constitutes a good design for mini parks for elderly people may be different to good design for mini parks for children. This concept involves several elements, including future development, as planning for park development should be determined in advance, rather than on an ad hoc basis.

In Malaysia, the standard planning for open spaces and recreational areas is monitored by the Town and Country Planning Department of Peninsular Malaysia (JPBDSM).[2.4] The department has listed fifteen principles for the development of open spaces and recreational parks. These principles and their explanations are presented in Table 2.4.

Table 2.4: Planning Principles for Open Spaces (OS) and Recreational Facilities (RF)

Principle	Explanation
1) Accurate and Equitable	-provide balanced and equitable distribution of OS and RF commensurate with the needs of the people. -ensure that OS and RF are accessible for all age group.
2) Accessibility	-provide OS and RF which are accessible and within easy reach.
3) Art and Beauty	-the planning of OS and RF that highlight the art and beauty of nature.
4) Compatibility	-the planning and provision of this facility should be comprehensive as an integral component of development and not an afterthought.
5) Systematic	-the establishment of OS and RF should be systematic and based on the actual requirements of users as well as environmental needs.

[2.4] The Town and Country Planning Department of Peninsular Malaysia (JPBDSM) is one of the departments in the Ministry of Housing and Local Government in Malaysia.

Continuation of Table 2.4: Planning Principles for Open Spaces (OS) and Recreational Facilities (RF)

6) Visionary	-establish open and recreational spaces with goals in the provision of OS and RF. Its clear provision should be foster unity among the community users.
7) Civil	-establish various OS and RF complete with knowledge, science and technological characteristics to generate a creative, protective and civil society.
8) Safety , Privacy and Comfort	-the planning of OS and RF should incorporate safety features, create various degree of privacy and peace as well as taking into consideration the needs of people from all walks of life with their respective perceptions of the concepts of safety, comfort, peace, harmony, beauty and privacy.
9) Well-being	-the concept of peace, which stresses the well being and peace of mind of users should be emphasised in the planning and design of OS and RF. An approach towards crime prevention through environmental design will help towards this direction.
10) Interaction, Culture and Image	-representations of the cultural arts and image of unity should be created in the provision of OS and RF as places for interaction as well as places which will be frequented by people from all walks of life.
11) Symbiotic, Balanced and Harmonious	-the planning concept to create orderly OS and RF which pose no danger and guarantee the needs and rights of various groups of users.
12) Quality and Caring	-the planning should emphasize quality to ensure the continuity of use and the concept of caring society.
13) Aesthetic and Cheerful	-cleanliness for health sake is an important concept that should be incorporated in the design of open and recreational spaces. Designs which obstruct any forms of threats and pollution are capable of creating a cheerful and quality environment with constant aesthetic values.
14) Greenery and Water bodies	-the emphasis on greenery and the use of the various forms of water bodies as well as other design elements to highlight the beauty of the natural and built environments, should be stressed in efforts to create a comprehensive environment.
15) Flora and Fauna	-the use of the natural flora and fauna in planning and design is important in towards manifestating the creation of a beautiful park and gratitude towards God's creation.

Source: Town and Country Planning Department Peninsular Malaysia (2002)

These principles support that the government has clear guidelines about the establishment of parks, and these guidelines can be used to determine the direction of a park's development in future. One of the guidelines relevant to this study is Principle 5: Systematic. In this principle, the establishment of open spaces and recreational facilities are based on the actual requirements of users and environmental needs.

The participation of users, referred to as "community involvement," was not considered a new idea for planning in recreational parks. This concept emerged in the 1980s, when the era of park management with "keep off the grass" mentalities was challenged by groups of people involved in sports (Small, 2005). Since then, participation of the public has become a common practice in the planning of recreational parks. The practise has been supported by the public wanting to be engaged in what park management do and wanting their opinions and needs to be met by open spaces and recreational park planning projects (Small, 2005).

This idea was applied to the MAP recently. With efforts to meet visitor requirements by providing activities that they liked doing (i.e. challenging games), the number of visitors coming to the park gradually increased. This statistic is shown in Figure 2.3, where the total number of visitors increased from 91,900 in 2003 to 299,000 in 2009, an increase of 225%.

2.9 Conclusion

Parks play many roles in people's lives, serving as settings for active and passive activities. There are many benefits generated by open spaces and by recreational activities undertaken at parks. Therefore, it is hard to deny that most people value parks. Public appreciation of parks, however, is not always congruent with other issues pertaining to parks. For example, some people prefer to engage in certain activities at parks, while others prefer different activities. Members of the public may also have different views about which areas should be preserved for recreational parks. The different views could be about the park's location or the total land required. This creates arguments amongst the public, around how to determine the best provision of parks, because different people have different preferences.

This study attempts to investigate public preferences, using the MAP as a case study site. The MAP has been chosen because of its uniqueness. The park is considered unique because it was one of the first agro-forestry parks in the world. In Malaysia, only the MAP has this concept. The second factor for choosing the MAP was because of its location. The MAP is located in the city centre of Shah Alam, Selangor. Selangor is one of the most developed states in Malaysia. Because of its location, the demands for its land are high. Efforts to use the land for other purposes are likely to succeed if the existing projects do not seem practical. Usually, such land is used by the government for developing new housing estates or for road expansion.

This has happened to the MAP, whose area was reduced from 1285ha in 1996 to 817ha in 2010. Some of its land was converted for road expansion, and some was used for new housing projects. One of the reasons for these changes was the lower number of visitors to the park, as explained in Section 2.7. These two factors motivated this study of public preferences about recreational parks to be undertaken at the MAP.

Having said that, this study is important in terms of several aspects, *inter alia*, (1) the need to investigate demand on the park; (2) the need to understand pressure on the park from competing land uses such as housing projects; and (3) the need to explore public preferences on attributes available at the park. At least two types of preferences will be explored in this study: (1) the ranking of attributes preferred by the public and (2) the public willingness to pay for attributes. Preferences will be explored through a non-market valuation technique. Further discussion about theories underpinning this technique is presented in the following chapter.

Chapter 3 :A Theoretical Framework and Techniques for Valuing Outdoor Recreation

3.1 Introduction

This chapter discusses a theoretical framework and techniques for valuing outdoor recreation. It begins with Section 3.2 where the section explains underpinning theories that are relevant for valuing outdoor recreation. Included in this section are discussions of: (1) the theory of utility; (2) axioms of choice; (3) utility function; (4) theory of value; (5) theory of random utility; and (6) the theory of welfare economics.

Section 3.3 discusses techniques for valuing outdoor recreation. The techniques are discussed in three categories: indirect methods; direct methods; and mixed methods. Section 3.4 compares some of the direct methods that are available. Finally Section 3.5 identifies a method that is suitable to be applied in this study.

3.2 Theoretical Framework for Valuing Outdoor Recreation

The economic valuation of outdoor recreation has been discussed by many environmental economists (e.g. Walsh, 1986; Garrod and Willis, 1999). Several approaches have been applied to such valuation exercises and these approaches will be explained in the following sections. The study of the economics of outdoor recreation, or more broadly speaking environmental economics was introduced by Pigou in 1920 (Verhoef, 1999). His research on negative externality and market failure uses a neoclassical economic framework as a theoretical basis to investigate research questions. The research by Pigou encouraged other economists to follow in his footsteps and use a neoclassical framework. This continues to be applied in many studies (for a list see Venkatachalam, 2007).

According to Venkatachalam (2007), the neoclassical approach has its own strengths as a theoretical framework for environmental economics, among them are (1) its analytical rigour, and (2) its ability to provide concrete and first-hand solutions to environmental issues. The author also explains that the motivation for environmental economists to use a neoclassical approach is because they believe environmental issues are economics issues. Therefore, environmental economists believe these issues should be investigated by extending the existing neoclassical tools and principles without altering the fundamental structure of them.

The neoclassical approach encompasses many theories. One which should be highlighted in the context of valuing outdoor recreation is utility theory. This will be explained in Section 3.2.1. Section 3.2.2 discusses the axioms of choice and utility in terms of the utility function. Section 3.2.3 explains about the utility function where the function is explained in terms of its properties and maximization conditions.

Section 3.2.4 introduces a theory that utility also can be received from the attributes or characteristics of goods. Section 3.2.5 clarifies a process how consumers make an economic decision when faced with a choice of goods. Finally, section 3.2.6 discusses the effect of utility on consumer welfare.

3.2.1 Theory of Utility

The word utilitarian was coined in the literature by Jeremy Bentham (1748-1832), an English philosopher in the early eighteenth century (Warnock, 2003). Bentham published the *Introduction to the Principles of Morals and Legislation*. In this publication, the author defined utility as a property in an object whereby it tends to produce benefit, advantage, pleasure, good and happiness (pg.7, Warnock, 2003).

Following Bentham, the concept of utility been discussed by many, for instance by eminent philosophers like John Stuart Mill (Warnock, 2003). The concept survives and continues to be used to explain phenomena in the real world, at least in consumer economics; statistics; management science; and psychology (Fishburn, 1968). Practically, utility deals with individual choice; preferences; judgement; decisions; and other similar concepts (Fishburn, 1968). However, the interpretation of utility theory is subject to two pillars: prediction and prescription.

"Prediction" refers to the need to predict actual individual choice behaviour whilst "prescription" explains how consumers ought to make a decision (Fishburn, 1968). Based on the definition of utility given by Bentham and its practicability from Fishburn (1968), utility theory can be seen as a tool to explain how a consumer ought to make a decision and eventually to predict the actual behaviour of the consumer in the real world. One of the phenomena that can be interpreted using utility theory is economy activity.

In reality, in economy activity, consumers face a set of choices. Choices can be about commodities, for example goods to be consumed, activities to be undertaken, time to be spent, money to be invested, etc. Outdoor recreation is also subject to such choices. Consumers have to make choices from those available and will usually have to forgo some alternatives. This is due to the scarcity problem, where the resources available to consumers are limited. For instance, the set of recreational parks that consumers can visit at a particular time are constrained by the income consumers can earn, or spare time that they have. Therefore, consumers will make a choice that will generate the maximum utility to them. In order to determine what that choice might be, some axioms of choice have first to be discussed.

3.2.2 Axioms of Choice

There are six axioms to be discussed: (1) reflexivity; (2) completeness; (3) transitivity; (4) continuity; (5) non-satiation; and (6) convexity (Deaton and Muellbauer, 1980). For this purpose, the symbol $\geq$ is used to mean 'at least as good as'; and the symbol $\sim$ as 'indifferent to'. While subscripts on a vector such q_1 refers to a vector of commodity 1. Any good can be characterised as a bundle of its attributes (Lancaster, 1966). This will be explained later in the following section, theory of value.

- *Axiom 1*– Reflexivity.

Each bundle is as good as itself. For instance, for any good q, $q \geq q$. This axiom is less important if a choice is properly defined (Deaton and Muellbauer, 1980).

- *Axiom 2*- Completeness.

This axiom explains that consumers can compare any two bundles in the economy, $q_i \geq q_j$ or $q_j \geq q_i$. To reiterate, when facing a set of choices consumers can decide which bundles they prefer or which bundles they are indifferent to (Johansson, 1991).

- *Axiom 3*- Transitivity.

The third axiom is that preferences on bundles are transitive. If $q_1 > q_2$ and $q_2 > q_3$, then $q_1 > q_3$ (Russell and Wilkinson, 1979). This axiom is also known as the consistency axiom because it tests whether or not consumers behave in a consistent manner.

- *Axiom 4*- Continuity.

The following axiom explains that two bundles of goods in the economy are close to each other. For example, if $A(q_1) = \{q|q \geq q_1\}$ and $B(q_1) = \{q_1|q_1 \geq q\}$; it explains that one bundle shares its boundaries with another bundle (Deaton and Muellbauer, 1980).

- *Axiom 5*- Non-satiation.

This axiom explains that the utility received by consumers from a commodity increases if the commodity increases. This happens because the more consumers perceive that they have of those goods, the more satisfied they are (Johansson, 1991).

- *Axiom 6*- Convexity.

Based on the neo-classical assumption, convexity explains that the choice exhibits diminishing marginal rates of substitution (MRS) (Varian, 1992). The concept of MRS will be explained in the following sections. With the explanation of these axioms utility theory can be presented in terms of the utility function.

3.2.3 Utility Function

The existence of the utility function is subject to the axioms of choice because the latter is a sufficient condition for the former (Johansson, 1987). In a utility function, consumers can express their preferences on how bundles of goods can affect their utility. Graphically, the utility function is shown through an indifference curve, U. In the two goods example (i.e. x and y), the general form of the utility function can be shown by $U(x,y)$, where the utility gains by consumers are subject to the consumption of good x and good y. Before discussing the utility function in detail, it is essential to explain its properties. The properties discussion is based on Deaton and Muellbauer (1980) and Johansson (1987).

3.2.3.1 Properties of Utility Function

- *Property 1*- $U(x)$ is not unique in an ordinary world.

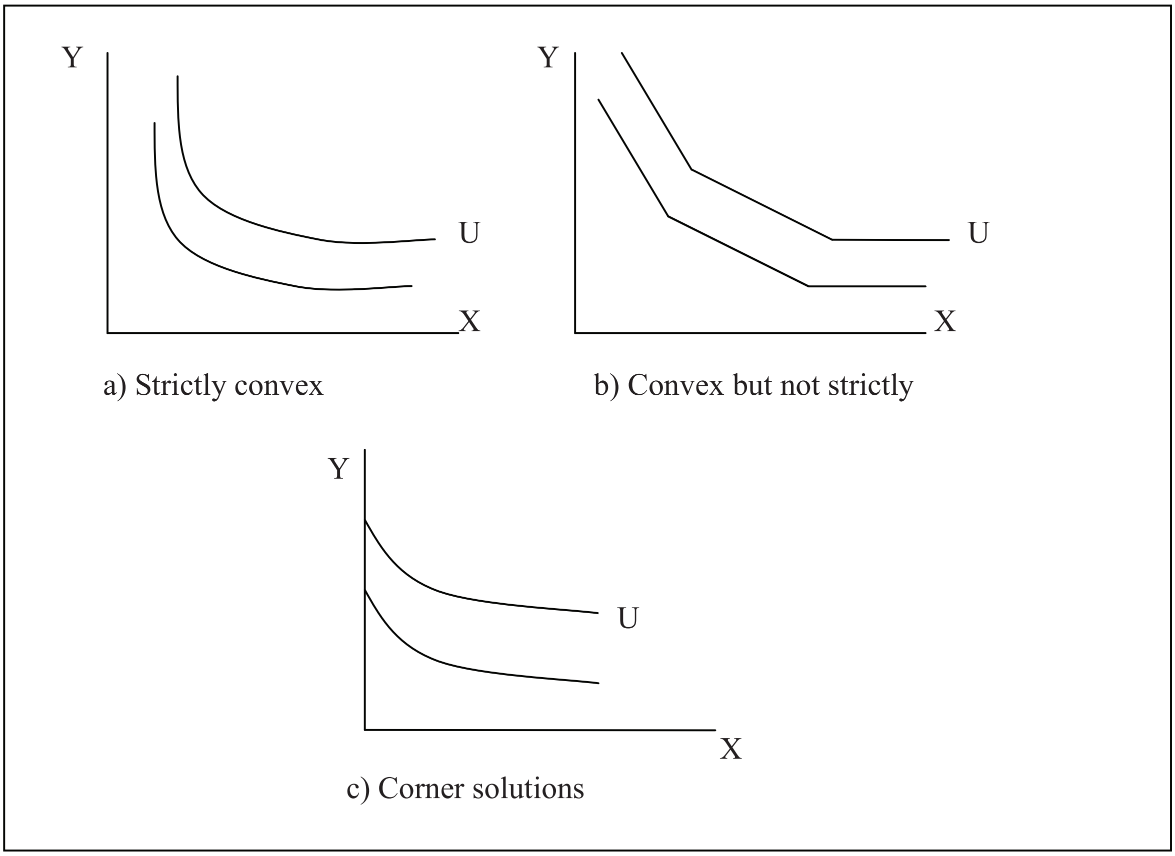
The utility function will not be unique. Any monotonic transformation of a utility function will itself be a utility function representing the same underlying preferences, i.e. if U is a utility function that represents a preference relation and f is a strictly increasing function then $V= f(U)$ is also a utility function representing the same preferences.

- *Property 2*- $U(x)$ is strictly convex

The utility function is strictly convex if the indifference curve, U, is curved towards the origin (Johansson, 1987). However there is a possibility that (1) the utility function is convex but not strictly convex, and (2) the utility function with the corner solutions. The distinction between convexity and strict convexity is explained as follows.

For strict convexity, a combination of bundles $\lambda q_1 + (1-\lambda)q_0$ for $0 < \lambda < 1$ must be strictly preferred to q_0, however, if the combination $\lambda q_1 + (1-\lambda)q_0$ is indifferent with q_0 ,convexity still holds but not strict convexity (Deaton and Muellbauer, 1980). A utility function with corner solutions reflects a situation where consumers are indifferent between one commodity and a combination of other commodities. These three utility functions are illustrated in Figure 3.1. In Figure 3.1, graph a, b, and c portray the utility function for strictly convex, not strictly convex and corner solutions, respectively.

Figure 3.1 Types of Utility Functions



Source: The Economic Theory and Measurement of Environmental Benefits (Johansson, 1987)

3.2.3.2 Utility Maximization

One of the main objectives of utility theory is to explain how consumers allocate the limited resources available to them (i.e. income, time, wealth, etc.) for achieving maximum utility. In neoclassical economics, this is called the rational-choice model where consumers act to maximize an objective function subject to constraints (Eggertsson, 1999). To illustrate this, an example is explained in the following paragraphs.

Consider the consumer utility function shown below:

$$\max_{x,y} U(x, y) \text{ s.t. } P_x.X + P_y.Y = I$$

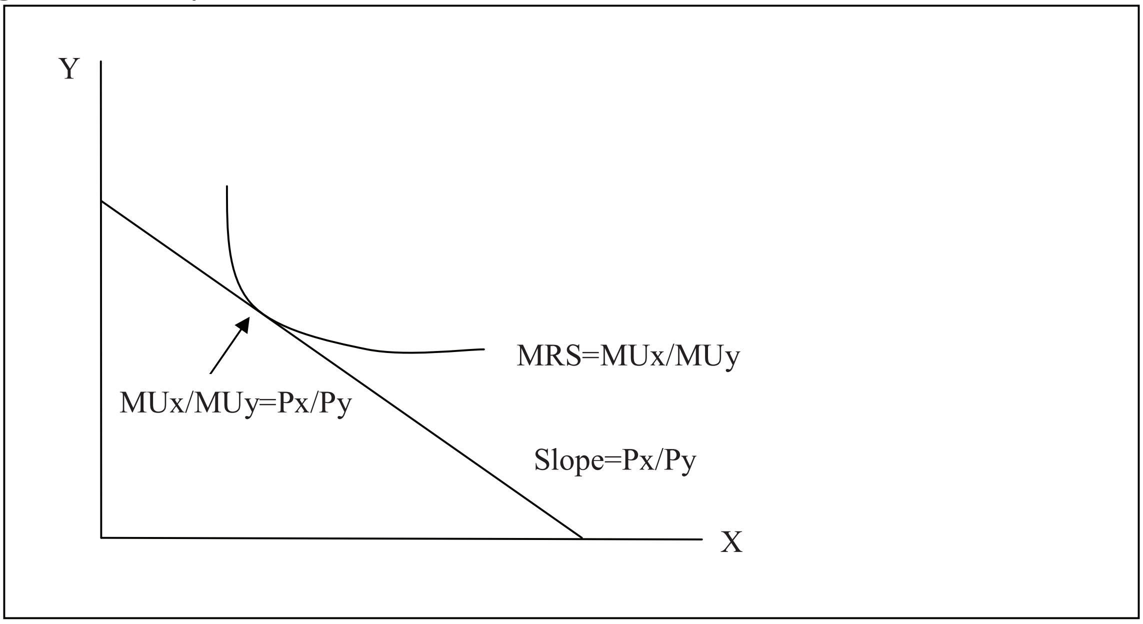
where *x* and *y* are non-negative goods to be used and *Px* and *Py* are their respective prices. It is worth noting here that the utility function is subject to (s.t.) the budget line or total available income (*I*). The budget line is the maximum amount of goods that the consumer can afford at a particular income level. Since it is a straight line, the slope of the budget line is constant and equal to the negative of the price ratio, $-P_x/P_y$ (Johansson, 1991). With the axioms of choice on consumer preferences that the consumer prefers to have more rather than less (i.e. *Axiom 5*- non-satiation), the optimum bundle must lie on, rather than inside, the budget line (Johansson, 1991).

In addition, *Axiom 4* (continuity) permits the differentiation process to be undertaken in the utility function. A result obtained from the procedure is identified as the MRS. In the two goods example, good *x* and *y*, MRS explains that the total utility received by consumers remains the same when they give up one good, say *y*, but at the same time increase consumption of another good, say *x* (Varian, 1992).

MRS exhibit diminishing patterns where the amount of good that consumers are willing to give up, for instance good *y*, will decrease as the amount of good to be substituted for it, good *x,* is increased (Varian, 1992). In mathematics, this is shown as $MRS = -MU_x/MU_y$; where MU refers to marginal utility. The concept of MU explains the changes that would happen in total utility if a good changes by small amounts. For example, differentiating the utility function on good x, $\partial U(x,y)/\partial x$, yields the MU of x, MU_x (i.e. a change in total utility if consumers change the quantity of good x).

Since the optimum bundle must lie on the budget line, utility maximization will only happen when the slope of utility function is equal to the slope of budget line, $MU_x/MU_y = P_x/P_y$. This happens when the indifference curve (utility function) is at a tangent to the budget line as illustrated in Figure 3.2.

Figure 3.2: Utility Maximization Condition



Source: Microeconomics (Pindyck and Rubenfeld, 2005)

The utility function used in this illustration [i.e. *U*(*x,y*)] is known as the direct utility function. There is another type of utility function which is identified as the indirect utility function [i.e. *V*(*p,m*)]. This function explains that consumers maximize their utility *V* subject to a price level *p* and income level *m* (Varian, 1992).

As explained above consumers receive utility from the consumption of goods. The utility, however, does not definitely arise from the consumption of goods *per se*. It could be from attributes of the goods. This is explained in Section 3.2.4.

3.2.4 Theory of Value

The idea of studying consumer utility based on the attributes of goods was initiated by Lancaster (1966). As an alternative to the good itself, the author argued that consumers' utilities are actually based on the characteristics or attributes (or a combination of the attributes) of goods. Based on this argument, the utility received from the consumption of goods is no longer subject to the goods *per se* but to the attributes possessed by the goods.

Rosen (1974) extended the idea proposed by Lancaster. In tandem with the popularity of the hedonic regression technique in the 1970s, Rosen applied the idea to examine the effect of environmental quality on the price of houses. In a seminal paper, the author assumed that the demand for and supply of houses are based on their attributes. One of the attributes is the environmental quality at the house location.

Rosen (1974) uses two functions in his analysis: bid functions for consumers and offer functions for developers. The bid functions, which represent a level of utility, are subject to the attributes belonging to a house. While the offer functions, which represent a level of profits, are subject to a profit from selling the house. The equilibrium point occurs when the bid functions are at a tangent with the offer functions. At this equilibrium point, consumers will not intend to increase their utility and developers will not intend to increase their profits.

An example by Johansson (1987) is used to illustrate the theory of value. In this illustration, let consumers face attributes of a house such as j location; k neighbourhood; and m environmental characteristics. Therefore a price of the house j is given as follows:

$$P_h = f_h(S_{h1}, \dots, S_{hj}, N_{h1}, \dots, N_{hk}, Z_{h1}, \dots, Z_{hm})$$

where *S* are location attributes, *N* are neighbourhood attributes, and Z are environmental attributes. The differentiation of P_h yields the implicit price value (Hanley and Spash, 1993). For instance, a differentiation of P_h on the attribute *Z*, $\partial P_h / \partial Z_{hm}$, yields the implicit price value for the environmental attribute. The implicit price (or part-worth) will be elaborated further in Chapter 4.

Based on the utility maximization condition, consumers maximize their utility when the MRS is equal to the implicit price for that particular attribute. If the consumer faces a utility function as follows:

$$\max_{a} U\,(x, S, N, Z) \text{ s.t. } y = px + h(S, N, Z)$$

where a=U(x,S,N,Z); and c=h(S,N,Z) explains the cost for a unit of house, consumers maximize their utility by equating the implicit price and the MRS, $\partial P_h/\partial Z_{hm} = \partial U/\partial Z_m$, respectively.

The theory of value seems an appropriate theoretical framework for valuing outdoor recreation. This is because outdoor recreation facilities such as recreational parks, consist of a variety of attributes. The utility received from recreational parks could be based on the attributes of the park rather than the park itself.

Utility theory and the theory of value suggest that consumers have to consume goods (or the attributes of goods) in order to receive utility. Goods that are available in the market, however, are varied. Therefore, consumers have to decide which goods to be consumed. The question arises here of how consumers make a choice? This is discussed in the following sections.

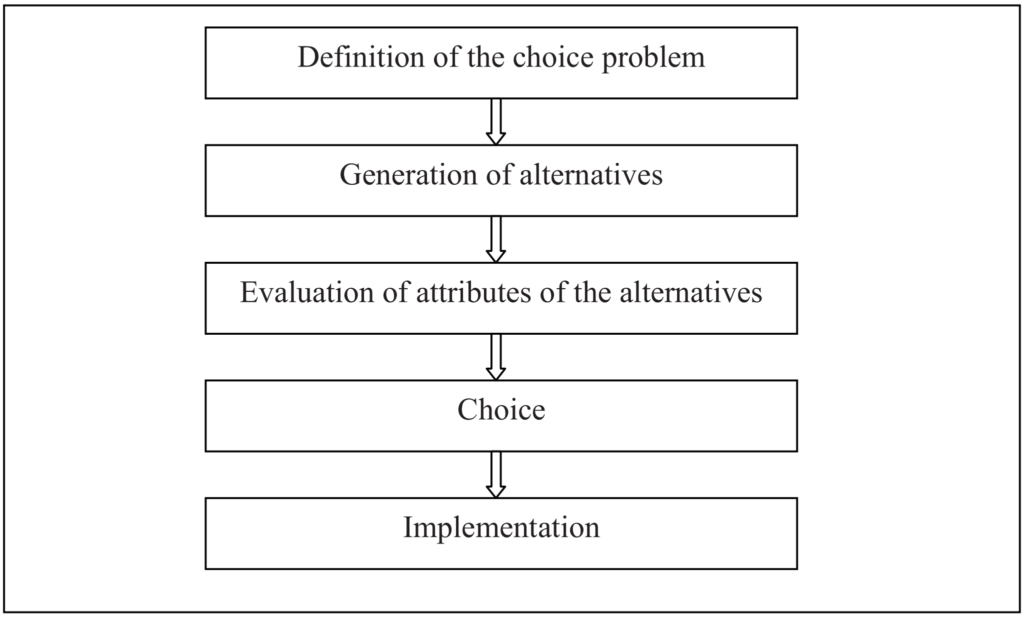
3.2.5 Theory of Random Utility

Neoclassical economists assume that when consumers make a choice between alternatives the choice is based on an assumption about the highest utility that they can receive from it (McFadden, 1981). Such consumer choices are complex. What is the process that consumers undertake when making a decision and what is the probability that they will choose a particular alternative?

"Consumer choice" is a process where consumers make a choice between alternatives (or choice cards) that offer different levels of utility and eventually the choice that yields the highest utility will be chosen (Kolstad and Braden, 1992).

Ben-Akiva and Lerman (1985) explain that the consumer choice process consist of five different steps as shown in Figure 3.3. To illustrate this, an example of the choice of destination for a recreational day visit is used. The process is as follows. Step 1: the problem faced by consumers is to determine a recreational park for a day visit. Step 2: consumers will identify all possible recreational parks that suit their needs. The number of suitable alternative destinations available to them is subject to their knowledge and the supply of sites. Step 3: consumers will identify attributes for each park identified in Step 2 and evaluate them. The evaluation may be based on a discrete set of park attributes such as available activities, familiarity with the park, public amenities, travel time and travel cost (therefore in this example the total number of attributes to be evaluated is five). Step 4: it is assumed that consumers will make a choice based on their preferences for a single or combinations of attributes. The decision will be made subject to the expectation of utility generated from the chosen attribute(s) in Step 3. Finally, Step 5: consumers have decided which park to visit and eventually, they will go to the park.

Figure 3.3: A Consumer Choice Process



Source: Discrete Choice Analysis: Theory and Application to Travel Demand (Ben-Akiva and Lerman, 1985)

The assumption of the highest utility obtained from the chosen goods is based on Random Utility Theory (RUT). The theory explains how consumers make a choice from a set of alternatives. Technically, RUT allows consumers to consider all alternatives available to them though eventually only one alternative will be chosen (Kolstad and Braden, 1992).

RUT originated from the work of Fechner in 1859 and Thurstone in 1927 (Batley, 2008). In order to explain RUT, the former used a psychophysical model of judgment and choice, while the latter used the derivative models approach. The theory was used as a basis for the development of Random Utility Models (RUMs) by Marshack in 1960, and Block and Marshack in 1960 (Batley, 2008). However, a new approach to RUMs was developed by McFadden (1973).

RUMs are models that can be used to estimate preferences for goods (Kolstad and Braden, 1992). Originally, RUMs were used to explain variability in consumer behaviour in the analysis of repeated choices (Ben-Akiva and Lerman, 1985). McFadden, however, has extended the model to an analysis of the consumer choice process in a population (Batley, 2008).

Variables in the RUMs can be classified into two components: an observable component and an unobservable component. For example, in a simple utility function, say $U = V + e$, V is the observable component and e is identified as an unobservable component. The observable component, as the name implies, comprises variables that can be observed by analysts. The unobservable component incorporates variables that cannot be observed by analysts. This component is assumed to be random with density $f(e)$. Some analysts (e.g. Hanley et al., 2001) refer to the unobservable component in random (or stochastic) terms.

The random terms in the RUMs come from several sources. Ben-Akiva and Lerman (1985) listed five possible sources: (1) unobserved attributes; (2) unobserved taste variations; (3) measurement errors; (4) imperfect information; and (5) instrumental (or proxy) variables.

An assumption of the distribution of the random terms plays a significant role in determining the type of estimation model. For instance, if e were assumed to be independently identically distributed (iid) with a Gumbell (or Type 1 extreme-value) distribution, the logit estimation model may be applied. If e were distributed jointly normal then the probit estimation model would be used. Finally if e were distributed with a generalized extreme value (GEV) distribution, then the Generalized Extreme Value (GEV) estimation model should be used (Train, 1986).

Preferences for goods can be estimated by a using suitable estimation model. Therefore, the utility or benefit obtained from the consumption of goods can be estimated as well. But what remains unexplained is the effect of such consumption on consumer welfare in total. The following section will explain this effect.

3.2.6 Theory of Welfare Economics

A basic principle in welfare economic theory is to determine the impacts of economic policy on consumer utility. The economic policy, for instance, could be a special project to gazette an area for the purpose of establishing a recreational park. Welfare economics investigates whether or not the implementation of the economic policy will make a consumer better off compared to available alternatives or the status quo (McKenzie, 1983). The investigation can be undertaken in terms of consumer welfare (or utility) (Mainwaring, 2001).

A novel idea of consumer welfare was introduced by Dupuit in his analysis of the costs and benefits generated by a project (McKenzie, 1983). These costs and benefits were measured in money. The emergence of interest in the monetary benefits of a project in the early 19th century coincided with the Industrial Revolution.

Before Dupuit, other commentators argued that utility is derived from multiplying the price of commodity with the total quantity purchased. However, Dupuit argued this only represents a lower bound of the welfare level achieved by consumers. To him, the utility of a good is derived from the price that consumers pay for that particular good plus any surplus willingness to pay (WTP) above the price amount. The analyst also argued that changes in consumers' WTP will change their utility levels. Therefore, in his opinion the difference between the prices that consumers are willing to pay and the actual price that they have to pay is known as consumer surplus. The seminal work of Dupuit has contributed to welfare economics in two ways (McKenzie, 1983): it was a serious attempt to examine consumer surplus from a demand curve, and his work has built an interpretation of WTP or willingness to accept (WTA) compensation to the area below the demand curve.

Although the measurement of economic welfare through consumer surplus was proposed by Dupuit, Marshall's consumer surplus is more popular. The form of the demand curve used by Marshall is different to the one used by Dupuit. Instead of the divisible demand curve as proposed by Dupuit, the Marshallian curve is based on a smooth demand function. This demand function is known as an ordinary demand function. The Marshallian demand function explains that the quantity demanded for a good is a function of its price and consumers' income levels. Marshall's ideas, however, were challenged when issues of changing prices were raised. To illustrate this, refer to the situation below.

For example, there are two goods available in a market: good *x* and good *y*. If the prices of good *x* and good *y* are fixed at *Px* and *Py*, consumers will maximize their utility at *U*(*x*,*y*). However, when the price of *x* is decreased and the price of *y* remains constant, the utility maximization condition does not hold anymore. In order to achieve a new maximization bundle (i.e. because of reduced *Px*), consumers will buy more of the relatively cheaper good *x* and reduce the quantity of good *y*. To conclude, to maximize utility a new combination of goods will be determined that will eventually change the original utility level.

According to Marshall, the demand curve will be derived by connecting points for goods where consumers maximize their utility levels without considering changes in income. Hence, Marshall's demand curve does not allow income to change to compensate for changes in price. This is the reason why Marshall's demand function is known as the uncompensated demand function. This function has combined together the effect of price and income changes. In terms of consumer surplus, Marshall uses the idea proposed by Dupuit where the difference between the uncompensated Marshallian demand curve and the price line that consumers pay is identified by Marshall as the consumer surplus.

In Figure 3.4, the derivation of a Marshallian demand curve is explained. By referring to Figure 3.4a, consumers have to use a bundle that consists of q_1 units of X_1 and some units of X_2 in order to achieve a utility of U_2. In this case, units of X_2 are trivial because an assumption that only the price of X_1will change is made. When the price of X_1 is decreased from p_0 to p_1, consumers will buy more of the cheaper good X_1, causing an increase of X_1 from q_1 to q_2; and reduce the quantity of X_2. At this new bundle, consumers will attain the higher utility level, U_1.

Refer to Figure 3.4b for a derivation of Marshallian demand curve. In Figure 3.4b, the relationship between the prices of X_1 and the quantity demanded for X_1 is shown. At price p_0, the quantity demanded is q_1 while when the price is reduced to p_1, the quantity demanded is q_2. Thus, the Marshallian demand curve can be derived by connecting these two maximization points, Dm_0. In this case, the quantity demanded is not influenced by the changes in income.

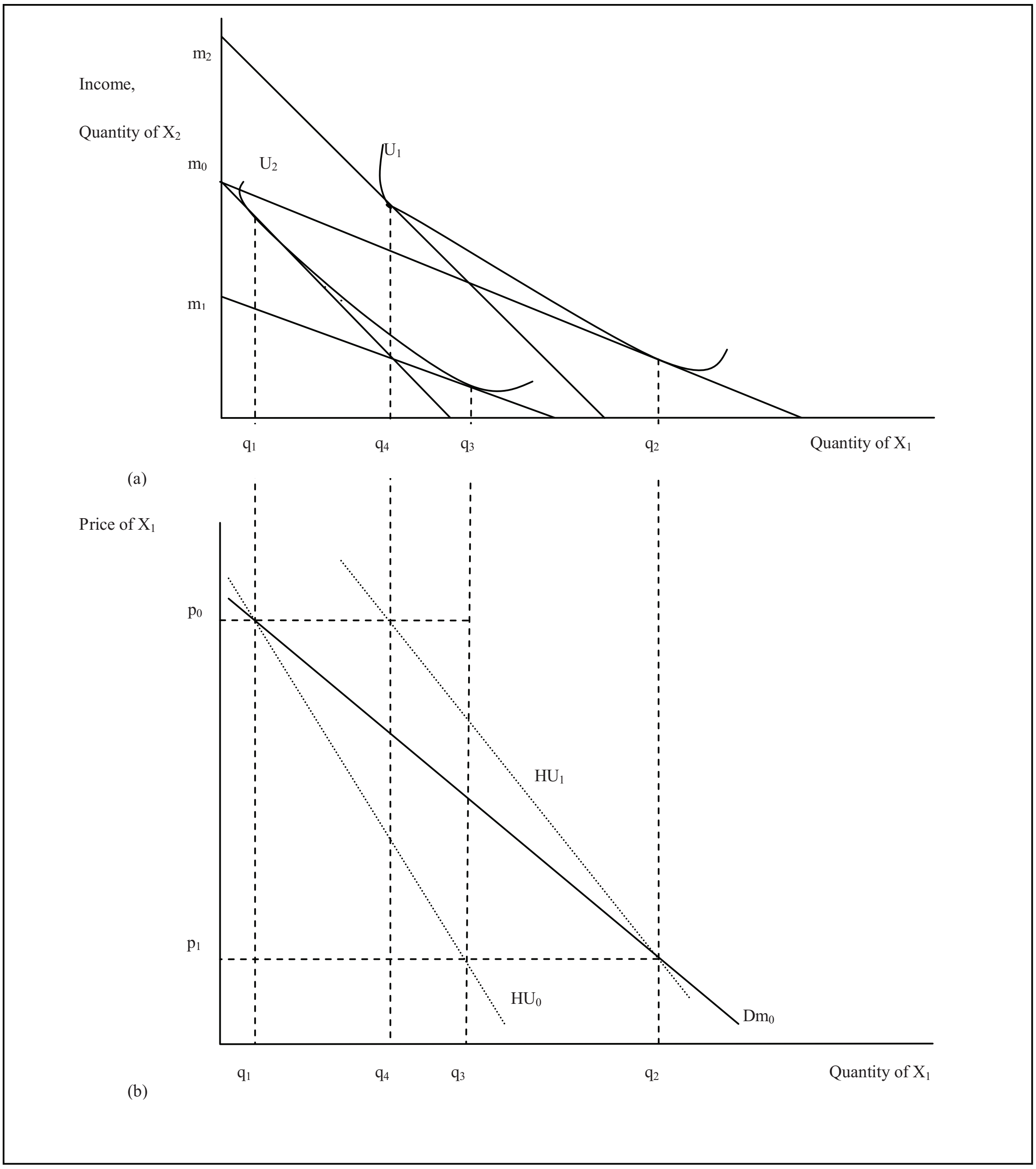
A new concept of consumer welfare began to change in 1941. This is happened when Hicks published the paper entitled "The Rehabilitation of Consumers' Surplus". Contrarily to the Marshall's approach, Hicks allowed income to change when the price changed. This is the reason why his demand function is known as the compensated demand function because the change in price has been compensated by the change in income.

Hicks suggested two types of welfare measurement when utility is constant at some specified alternative level: Equivalent Variation (EV); and Equivalent Surplus (ES). The analyst also suggested two types of measurement when utility is constant at the initial level: Compensating Variation (CV); and Compensating Surplus (CS) (Mitchell and Carson, 1989).

In Hicks' analysis, the difference between 'Variation' and 'Surplus' is due to the limitation of the quantity of goods that consumers can buy in the market. Mitchell and Carson (1989) suggested using Hicksian Variation if the consumer is free to buy any quantity of goods in the market. Otherwise, Hicksian Surplus should be used.

Since consumers are free to buy any quantity of goods, Hicksian Variation is appropriate for the analysis of any potential benefits. Benefits have the potential to increase or decrease. If consumers are willing to obtain an increase in benefits, they have to pay for it (WTP or EV). Otherwise they would rather to receive compensation (WTA or CV) if they are willing to allow a decrease in benefits (Mitchell and Carson, 1989).

Figure 3.4: Marshallian and Hicksian Demand Curves



Source: Cost-Benefit Analysis and the Environment (Hanley and Spash, 1993).

To reiterate, EV is the amount of money that must be taken away from consumers to restore their original utility after a price has been reduced (Johansson, 1987). CV refers to the an amount of money that must be given to consumers to restore their original utility after a price has been increased (Johansson, 1987).This is explained in Figure 3.4a. EV refers to the difference on the vertical distance m_2 and m_0, and CV is the difference on m_0 and m_1.

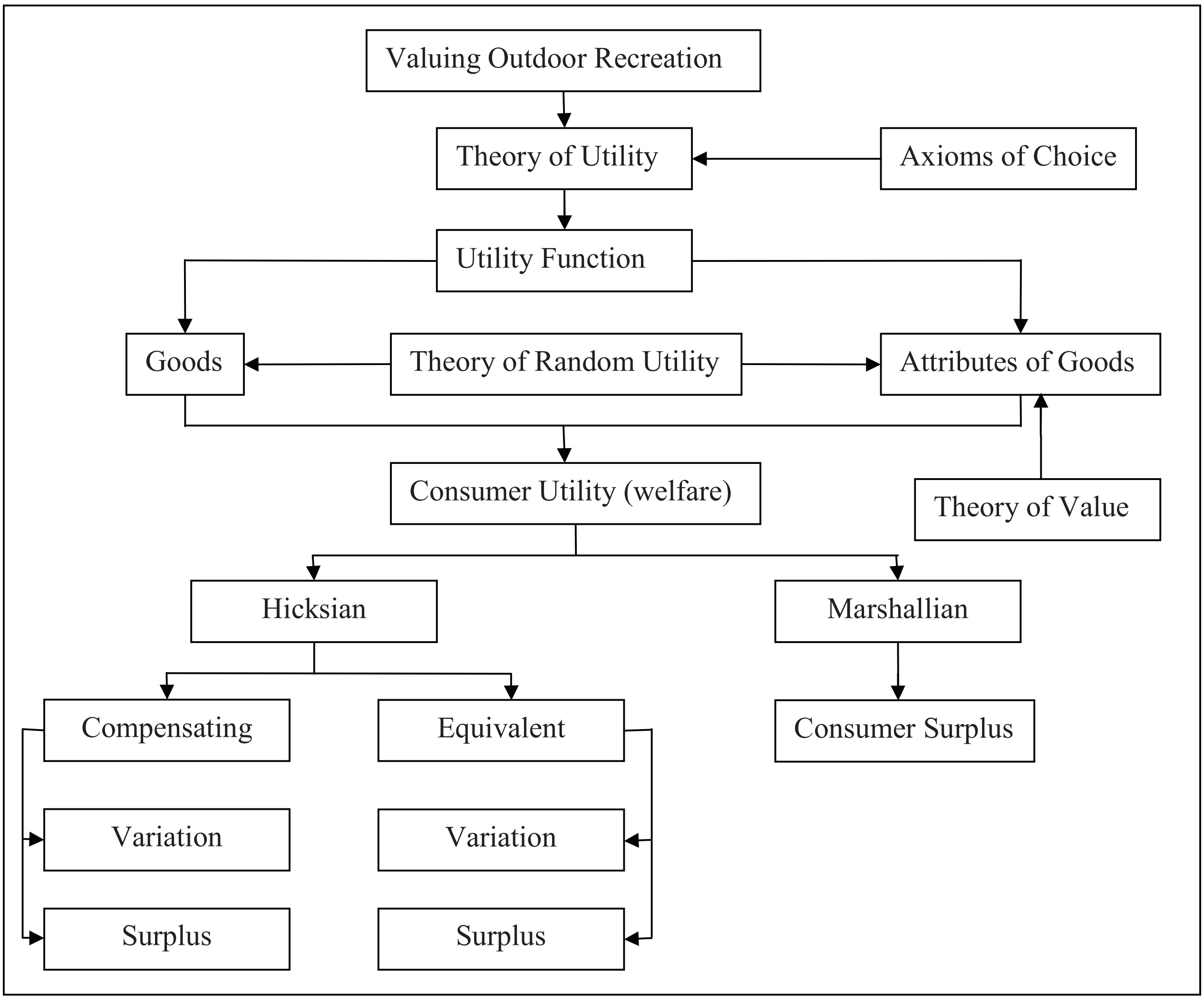
Refer to Figure 3.4b for deriving the Hicksian demand function. The function at utility 1, HU_1, can be derived by connecting the coordinate p_0q_4 and p_1q_2 and the function at utility 2, HU_0, is obtained by linking the coordinate p_0q_1 and p_1q_3.

One of the issues in the compensated demand function is whether to use WTP or WTA. According to Mitchell and Carson (1989), a solution to the issue depends on two criteria: who has the ownership of the goods in question; and do consumers have to pay if they want to use the goods. This is not an easy task because normally environmental goods like recreational parks are held collectively where every member of society has a right to access (or potential access) to those goods (Mitchell and Carson, 1989).

The paper on welfare measurement by Willig (1976) recommended a solution to the issue of WTP and WTA. In the paper, the author aims to determine the value of error bounds when the Marshallian consumer surplus is used as a proxy to WTP or WTA (Johansson, 1987). Willig found that the Marshallian consumer surplus lies between WTP and WTA (Mitchell and Carson, 1989). The author also demonstrated that the difference between WTP and WTA is not apparent.

All relevant theories in the neoclassical approach that correspond to valuing outdoor recreation were systematically discussed in this section. Figure 3.5 presents a linkage of these theories. From the discussion, it suggests that the neoclassical economics provides sensible theoretical framework for valuing outdoor recreation.

Figure 3.5: A Theoretical Framework for Valuing Outdoor Recreation



3.3 Approaches to Valuing Outdoor Recreation

In general, consumers' attitudes towards outdoor recreation may be determined by using two different approaches: by investigating their demands for outdoor recreation, or by studying their willingness to pay for outdoor recreation. The first approach may be carried out in a number of ways, either by monitoring consumers' behaviour at sites, or by asking them to report their previous behaviour at these sites. Analysts (e.g. Mitchell and Carson, 1989) may also ask consumers hypothetical questions, such as, "What alternatives will be chosen if a certain outdoor recreational site is closed?". The second approach may be carried out using two approaches, as based respectively on direct and indirect methods (Mitchell and Carson, 1989).

Direct methods (or stated preferences) involve asking consumers to respond to hypothetical scenarios related to outdoor recreation. In such an approach, consumers indicate the amount of money they would be willing to pay (or willing to accept) following the hypothetical scenarios presented to them. Indirect methods (or revealed preferences) infer these amounts of money based on consumers' behaviour and any responses to changes in site quality (Hanley and Knight, 1992). To simplify the discussion, only WTP will be used in subsequent discussions.

3.3.1 Indirect Methods

Several indirect methods are available, including the calculation of avoided costs, effects on production, hedonic pricing, and travel cost. However, this study will only focus on travel cost, because this technique seems most relevant to the valuation of outdoor recreation. For further details on other techniques, see environmental valuation textbooks (e.g. Garrod and Willis, 1999; Hanley and Spash, 1993).

3.3.1.1 Travel Cost Method

A travel cost method (TCM) uses the cost of access to an environmental good as a proxy to establish its value. This approach may be used to infer the benefits obtained from non-priced goods such as recreational parks (Garrod and Willis, 1999). Originally recommended by Harold Hotelling in 1947, as reported in Mendelsohn and Brown Jr. (1983), the TCM has been developed by many analysts (e.g. Clawson and Knetsch, 1966). In general, this method explains that the demand for environmental goods is inversely related to the cost of gaining access to them. Put simply, the demand for a site decreases when the cost of travelling to it increases. This method has been used extensively for valuing outdoor recreational spaces such as recreational parks, and it has been applied by Martínez-Espiñeira and Amoako-Tuffour (2009), Loomis (2006), and Nillesen, et al. (2005), among others.

There are several disadvantages to using this method. As highlighted by Hanley and Knight (1992), this method makes it difficult to distinguish day-visitors from 'meanderers' and 'holiday-makers.' These authors have also noted that this method ignores the benefits gained by non-users. Additionally, Willis (2003) envisaged the problem of variation in travel costs if this method were to be applied to value urban sites, because the distance most visitors travel to such sites tends not to vary that much. At the same time, the simple TCM ignores the values of attributes provided at the sites (Mendelsohn and Brown Jr., 1983).

In an attempt to include the attributes at the sites, Mendelsohn and Brown Jr. (1983) have modified the simple TCM. This modified method is known as the hedonic TCM. This method explains that the benefits of on-site recreation are related to the attributes of the site. The hedonic TCM is said to be useful for planning purposes, because its results may inform the management about attributes that are highly valued by visitors (Garrod and Willis, 1999).

This method, however, requires extensive, and high quality data (Mendelsohn and Brown Jr., 1983). In a two-step procedure, the first step requires a regression of travel costs to multiple sites with different attributes. Since sites differ at every location, a separate regression is estimated for each location. The second step is to estimate the demand for attributes at the site. This complicated procedure could be a reason why some analysts (e.g. Garrod and Willis, 1999) have identified data collection and estimation problems with this method. For further details on critiques of the hedonic TCM, see Smith and Kaoru (1987).

Based on the problems discussed earlier, the TCM seems unsuitable for this study for two reasons. The first reason is that the site chosen for this study is a recreational park in an urban context. This follows the argument made by Willis (2003), as explained earlier. The second factor relates to the study's objective, which is to investigate the values of attributes provided at parks. Though the hedonic TCM suggests a solution to this objective, its implementation seems problematic. Therefore, other methods are necessary to determine consumer preferences.

3.3.2 Direct Methods

As explained in Section 3.3, direct methods refer to approaches where consumers are asked to directly state their preferences for environmental goods. This approach has been used and discussed extensively in the literature on economic valuation of environmental goods and services (e.g. Álvarez-Farizo et al., 1999; Adamowicz et al., 1998). Two popular techniques used to value outdoor recreational goods with direct methods are contingent valuation method (CVM) and conjoint analysis (CA).

3.3.2.1 Contingent Valuation Method

CVM refers to a technique whereby respondents are required to state a value for environmental goods contingent upon changes in these goods. Respondents may state the value in terms of their WTP. For example, respondents could be asked to state their WTP if the number of trees in a particular park were to be increased by 30%. Different kinds of formats are available for analysts to elicit the WTP. Formats that have frequently been used in the CVM include open-ended (OE) formats, payment cards (PC), discrete choice single bounded (DCS) formats, and discrete choice multiple bounded (DCM) formats.

3.3.2.1.1 Open-Ended Format

Perhaps the most convenient and appropriate means of asking respondents to state their WTP for environmental changes would be to ask the maximum amount that they would be willing to pay, and record their answers (Mitchell and Carson, 1989). This approach is known in the literature as the OE format.

The OE is a straight-forward format, and it is very informative for analysts. The format, however, is considered unfriendly to respondents because it is not always easy for them to determine their own WTP (Mitchell and Carson, 1989). This is certain for goods that they have never used or purchased. Consequently, this format is susceptible to high non-response rates and protest responses (Mitchell and Carson, 1989). The difficulties respondents face in dealing with this format is known in the literature as their "cognitive burden."

Another factor that makes the OE less preferable to other formats is because it encourages respondents to employ strategic behaviours when answering the hypothetical questions. Such behaviours occur when respondents are likely to state false values, especially when they believe that their answers will influence the outcome of the survey.

The arguments of cognitive burden and strategic behaviour have made analysts question the reliability of the values stated by respondents. For example, Bishop and Heberlein (1979) have argued that respondents in this format need only a short period of time to determine their WTP values. However, this does not happen in the real world, where individuals usually take a longer time to make such decisions. Due to the fact that respondents in the OE format face a cognitive burden in stating their WTP, which consequently leads to a low-response rate, Mitchell and Carson (1989) suggest the PC format as an alternative.

3.3.2.1.2 Payment Cards Format

The PC is a format whereby respondents are shown cards outlining various payment scenarios to help them decide on their WTP for good or service in question. Respondents are then asked questions such as, "Based on the prices listed on this card, could you please circle the highest price that you would be willing to pay?" According to Mitchell and Carson (1989), analysts use this format for two reasons: to maintain a direct approach for obtaining the WTP, and to increase response rates.

Many analysts have used the PC format. For example, Blaine, et al. (2005) used this format for valuing curb-side recycling programmes, whilst Ready, et al. (2001) applied this format to studying the impacts of air pollution on people's health.

One of the drawbacks of this format is that respondents are more likely to state low WTP values (Blaine et al., 2005). This occurs because respondents are shown a series of WTP amounts, and they are free to choose whichever WTP they prefer. Because of this freedom, it is argued that some respondents will choose the lowest level available. For example, Blaine, et al. (2005) found that 57% of respondents in their study chose the lowest level. Consequently, studies using the PC may estimate a relatively lower WTP, as compared to other formats (Blaine et al., 2005). This finding was supported by Ready, et al. (2001), who found that the value of WTP produced by the PC format was lower than other formats (i.e. discrete choice). Due to this drawback, the elicitation formats have evolved to the DCS format.

3.3.2.1.3 Discrete Choice Single Bounded Format

The DCS format is also known as referendum CV. This format was introduced into the CV literature by Bishop and Heberlein (1979). In this format, respondents are asked whether or not they would be willing to pay certain amounts of money for particular changes to environmental goods. The amounts of money proposed to the respondents are known as bid values.

As reported in Portney (1994), this format received support from the National Oceanic Atmospheric Administration (NOAA) panel report as their preferred means of eliciting WTP in CVM. Following this report, studies using the CVM technique have often preferred to use the DCS format (Willis, 2002).

The DCS format is less of a burden to respondents than the OE approach, because in this case, the analysts determine the survey's bid values. Therefore, the cognitive burden faced by respondents in other formats (i.e. OE) may be reduced. This format is also similar to respondents' everyday lives, because they must make 'yes or no' decisions for the CVM questions (Garrod and Willis, 1999). Based on these advantages, use of DCS may reduce non-response rates and WTP outliers.

The WTP values obtained through this format are not likely to be the same as those obtained through the other formats (i.e. OE or PC). Empirical evidence has revealed that the WTP in

DCS is greater than the WTP of OE and PC (e.g. Kealy and Turner, 1993; Bishop et al., 1983). There are many potential reasons for these differences.

Kealy and Turner (1993) have listed two potential causes: strategic behaviour incentives, and respondents' abilities and willingness to cooperate with the CVM questions. The analysts also raised the question of the characteristics of the goods and services being valued in the CVM, and of determining whether or not they are public or private goods, because different goods have different characteristics. These authors investigated the effects of goods' characteristics on WTP in different elicitation formats. For this purpose, public goods (an aquatic system) were compared to private goods (chocolate bars). The results for the public goods showed that the WTP in the DCS was 1.4 to 2.5 higher than the WTP in the OE. This difference, however, did not appear for the private goods.

Meanwhile, Ready, et al. (2001) investigated the differences between the DCS and the PC method. Follow-up questions were used in the investigation of these differences. These questions required respondents to reveal how certain they were about paying their stated WTP. Five certainty levels were used, with 95% certainty as the highest level. Respondents choosing the highest levels in the follow-up questions would be considered certain about their stated WTP. Though the results for WTP in the DCS were higher than the PC, the respondents in the former format were considered less certain, as compared to the respondents in the latter format. The study also reported that the WTP values in the DCS and PC converged when respondents were asked follow-up questions.

Even though the DCS received high levels of support from NOAA, this elicitation method is statistically less efficient than the DCM (Hanemann et al., 1991). The DCS also needs a larger sample to increase its precision levels. Based on these arguments, the analysts (e.g. Cameron and James, 1987) proposed to use the DCM format.

3.3.2.1.4 Discrete Choice Multiple Bounded Format

The DCM format is an extension of the DCS format. This format, as its name implies, requires respondents to state their WTP for more than one bid value. The subsequent bid values in this format are subject to respondents' reactions to the initial bid value. If respondents agree to the initial bid value, the subsequent bids must be higher than the initial bid value. Otherwise, the subsequent bids must be lower than the initial bid value. The bidding process may be repeated several times, but normally only two responses are required.

A study by Cameron and James (1987) encouraged other analysts to use the DCM format and investigate various issues (i.e. statistical efficiency) in CVM. For instance, Alberini (1995) studied how to form a survey design that could maximise information about WTP, while Kanninen (1993) developed a new sequential technique called the "C-optimal sequential procedure." Both studies attempt to increase the statistical efficiency and precision of the DCM.

Cameron and Quiggin (1994), however, questioned the consumer surplus value estimates in the DCM. In their study of consumer preferences at Kakadu National Park, they raised two possible effects upon consumer surplus if this format were to be used: the first-response effect, and the starting point effect. The first-response effect refers to a situation where respondents' decisions about the subsequent value are subject to their responses to the initial value. Simply put, respondents will agree to the subsequent value if they have agreed to the initial value, or *vice versa*. The starting point effect explains the effects of the initial value on respondents' answers. The effect, however, is relevant to respondents who do not have an implicit agenda, and to those who are inclined to show a greater sense of social responsibility.

The results of the study showed that respondents were likely to agree with the subsequent value if they agreed with the initial value. Respondents were also likely to say no to the subsequent value if they said no to the initial value. The results for the starting point effect, however, were uncertain. Finally, the analysts explained that the problems existing in DCM were inherited and compounded from the DCS format. Another technique falling into the category of direct methods is Conjoint Analysis (CA).

3.3.2.2 Conjoint Analysis

In CA, goods (or services) are depicted as a set of component attributes provided at different levels (Bennett and Adamowicz, 2001). One of the main assumptions of this technique is that goods (or services) may be split into these different attributes (and levels), with each attribute (and level) giving value to those goods (Green and Srinivasan, 1978). One theory underpinning the use of the attributes of goods for explaining utilities received from them is the theory of value as explained in Section 3.2.4.

The ideas behind CA were developed in the 1920s, but its application to conjoint measurement only became known to the public through a paper by Luce and Turkey in 1964 (Green and Srinivasan, 1978). Five years later, Green and Roa discussed conjoint methodology in a working paper. Green and Carmone also discussed the methodology in a book published in 1970. In certain environmental economics books (e.g. Bateman et al., 2002), CA is known as "choice modelling."

In this technique, respondents are presented with various alternatives, where the alternatives are different in terms of their attributes and levels (Hanley et al., 2001). Analyses in CA may be undertaken through four approaches, including contingent ranking (CRk), contingent rating (CRt), pair-wise comparison (PwC), and choice experiments (CEs). Brief discussions of these techniques are given in the following sections.

3.3.2.2.1 Contingent Ranking

Respondents in a CRk approach are required to rank the alternatives presented to them, starting with the most preferred alternative, followed by the second most preferred alternative, and so on (Hanley et al., 2001; Garrod and Willis, 1999). This technique has been used by analysts such as Foster and Mourato (2000), and Garrod and Willis (1998).

One of the reasons why analysts (e.g. Foster and Mourato, 2000) have used this technique is because of the additional information that may be gained from it. Respondents in this technique are not only asked to indicate their most preferred alternatives, but also to report the order of their preferences amongst the remaining alternatives. Such information, however, could not be gained if respondents gave only their most preferred alternatives, were indifferent between the remaining alternatives (Hausman and Ruud, 1987). This situation occurred in a study by Foster and Mourato (2000).

In their study of the impacts of the use of pesticides in wheat production on human health and biodiversity, Foster and Mourato (2000) found that respondents' WTP for the larger changes were not significantly different from the smaller changes. These authors claimed that this could have been caused by respondents' tendencies to pay less attention to the remaining alternatives once they have chosen their most preferred alternatives.

Some analysts are concerned with the cognitive burdens of the ranking exercise. For example, Foster and Mourato (2002) applied a logical rank consistency test to investigate the effects of rank techniques on respondents' cognitive burden levels. They used three tests, including: (1) a dominance test; (2) a rank consistency test; and (3) a transitivity of rank order. They also used a lexicographic test for investigating the transitivity of rank order. The lexicographic test determines whether or not respondents solely refer to one particular attribute and ignore other attributes when ranking the alternatives. All three tests were examined with the axioms of choice in neoclassical economics (i.e. non-satiation, transitivity, and continuity).

Foster and Mourato (2002) classified the results of the test into three groups: (1) clean — referring to respondents who passed the entire test; (2) occasional failures—referring to respondents who passed some of the tests; and (3) systematic failures—referring to respondents who failed the entire test. The results showed that the percentage of respondents classified as clean was similar to the percentage of the groups of occasional and systematic failures combined, demonstrating that the consistency tests were not successful.

Foster and Mourato (2002) attributed these failures to three possible factors: (1) the fact that human psychology does not conform to economic models of rational choice; (2) the fact that the rules of thumb for respondents to make a decision may conflict with economic principles; and (3) the fact that respondents do not have the opportunity to express their indifference towards the alternatives, indicating limitations in the methodology.

3.3.2.2.2 Contingent Rating

Instead of requesting respondents to rank alternatives, they can also be asked to rate them. The latter technique is known as CRt (Hanley et al., 2001). A variety of measuring scales are used for this rating purpose, including scales from 0 to 100 (Kontogianni et al., 2001) and ones from 0 to 10 (Cuccia and Cellini, 2007; Hanley et al., 2001). Usually, the lowest level of the scale corresponds to the least preferred alternatives, and the highest level to the most preferred alternatives.

As reported in Álvarez-Farizo, et al. (2001), Múgica has suggested three factors for considering the measuring scale: (1) the ease and consistency involved in the interviewee's answers; (2) the entity being measured (i.e. utilities, preferences, or purchasing intensions); and (3) the scale's adaptability to various estimation methods. Analysts have followed these suggestions in order to determine the rating scale. For example, Cuccia and Cellini (2007), and Álvarez-Farizo (2001) used a measuring scale identical to the grading system in schools, because this scale is easy for interviewees to understand, and is perceived in consistent ways.

One of the issues related to welfare analysis in this technique is the property of cardinality in the measuring scale (Boyle et al., 2001). This occurs because some respondents may interpret the scale differently from other respondents. For example, a rating of 7 for respondent A does not necessarily have the same meaning as a rating of 7 for respondent B. To overcome this problem, Álvarez-Farizo, et al. (2001) carefully explained to respondents how to use the scale in their study, while Swallow, et al. (2001) suggested using 'quasi-cardinal' measurements, such as "slightly preferred" and "mostly preferred."

Though differences in interpretation may occur in this rating technique, some analysts (e.g. Kontogianni et al., 2001) have argued that the alternatives may be compared using a qualitative approach. For example, the order of alternatives may be determined by referring to the ratings for each alternative. The highest rating numbers correspond to the most preferred alternatives, and the second highest ratings correspond to the second most preferred alternatives, and so on. Put simply, the comparison of alternatives may be undertaken by converting the rating technique (measured cardinally) to the ranking technique (measured ordinally).

Several studies (e.g. Boyle et al., 2001; Roe et al., 1996) have investigated the differences in results (i.e. WTP, confidence intervals, etc.) when the rating technique is converted to the ranking technique. For example, Roe, et al. (1996) found that the estimated WTP in the rating converted to the rank were higher than the estimated WTP for the rating.

3.3.2.2.3 Pair-wise Comparison

PwC is a technique requiring respondents to state their preferences between two alternatives, and to indicate the strength of their preferences in numeric terms (Hanley et al., 2001). Some analysts (e.g. Bech et al., 2007) call this technique "graded pair comparisons."

One of the motivations for using this technique stems from focus group meetings. This was evident in a study by Swallow, et al. (2001). In their study on public preferences on sites to develop a new landfill in Rhode Island, some of the participants in their focus group meetings not only indicated their most preferred alternatives, but also wished to express their strength of preferences on the selected alternatives.

Swallow, et al. (2001) have outlined several advantages to using the PwC technique, noting that it provides more information than discrete choices alone. Analysts may obtain additional information by allowing respondents to indicate their strength of preferences. This additional information therefore may be used to improve statistical efficiency. This is evident in their study, which demonstrates that the estimated standard error was reduced by 20% to 40%

when the PwC was used. Bech, et al. (2007), however, challenged these findings. According to the authors, two problems could be anticipated if PcW data are collected and used in the analysis. First, the rating scale may be misinterpreted, as noted in the discussion of CRt technique, and second, respondents may face higher cognitive burdens.

To investigate whether or not including the rating scale would improve the estimated WTP, Bech, et al. (2007) used three different ordinal rating scales. The ordinal scales have different levels, including a five-level scale, a three-level scale, and a two-level scale. The results have shown that the five-level scale has a tendency to overestimate WTP, as compared to the three- and two-level scales. Therefore, the authors concluded that the more levels that are used in the scale, the more deviant are the estimated WTP values.

3.3.2.2.4 Choice Experiments

This technique was introduced by Louviere and Woodworth (1983). Here, respondents are required to choose their most preferred alternative from a series of alternatives presented to them (Bateman et al., 2002). CEs have several advantages over other techniques in conjoint analysis, including their relevancy to the economic theory of welfare measurement.

The consumer welfare calculated by CEs is argued to be consistent with Hicksian welfare analysis when this technique includes the status quo option in the list of alternatives (Hanley et al., 2001). The CRk also is consistent with this theory provided that it offers the status quo option usually lacking in the CRt and the PwC. The inclusion of the status quo option will be discussed further in Chapter 4.

Following the economic theory of Hicksian welfare analysis, only CEs and CRk are relevant for valuing outdoor recreation. This section, therefore, will concentrate on these two techniques, outlining the strengths and weaknesses of their applications. Studies comparing these techniques have been undertaken by analysts including Caparrós, et al. (2008), and Foster and Mourato (2000).

Foster and Mourato (2000) conducted model specification tests for validating the application of logit models between the CEs and CRk. The results of the specification tests favour CEs over CRk, although the latter is more efficient and only requires a small sample size compared to the former. The misspecification of the CRk model suggests that one of the most basic assumptions in the CRk, stating that all ranks derive from the same choice process, was not supported by the data in the study. Further discussion on CEs is explained in Chapter 4.

Although quantitative methods (i.e. indirect and direct methods) provide analysts with various techniques for valuing environmental goods, analysts tend to combine them with other techniques (i.e. qualitative techniques). Approaches combining quantitative methods and qualitative methods are discussed in the following section.

3.3.3 Mixed Methods

Another approach to value outdoor recreation utilises a combination of quantitative and qualitative approaches. This is known as a mixed methods approach. Most of the studies using this method involve focus group meetings for the qualitative approach, and may be combined with any quantitative approach (e.g. Brouwer et al., 1999; Clark et al., 2000; Powe et al., 2005).

Clark, et al. (2000) have noted that mixed methods are suitable for valuing complex environmental goods, such as cultural value of landscape and nature. This is supported by Powe, et al. (2005) who elaborate several advantages of this method. They argue that this method enables analysts: (1) to understand how respondents discuss and measure goods; (2) to understand respondents' decision-making processes and motivations for these decisions; (3) to investigate the adequacy of the valuation process; and (4) to explore public acceptability levels of the valuation exercises.

These advantages have been investigated by many analysts. For example, Clark, et al. (2000), Schkade and Payne (1994), and Powe, et al. (2005) have all investigated the thought process involved in answering quantitative questions.

In their analysis of the protection of migratory waterfowl (i.e. ducks and geese) from oil holding ponds, Schkade and Payne (1994) investigated the thought process faced by respondents to answer CVM questions. The results show that respondents engaged with a variety of cognitive activities while answering the CVM questions.

In their study of nature conservation policies in the U.K., Clark, et al. (2000) investigated respondents' thought processes when they were asked to respond to the CVM questions. Respondents were also given a chance to raise their understanding of levels on the stated WTP. The results demonstrated that respondents questioned the validity of their WTP, and that to some a certain extent they were unclear about the proposed policies.

In their study of water supply in the U.K., Powe, et al. (2005) used a combination of CE questions and post-questionnaire surveys in a series of focus group meetings. The results revealed that the choices were insensitive to deliberation when respondents were given a chance to reconsider their responses. However, some of the participants found it difficult to apply a trade-off amongst the attributes. This applied to those who had low cognitive abilities, particularly when valuing unfamiliar environmental goods.

3.4 Contingent Valuation Method and Choice Experiment - Superiority for Valuing Outdoor Recreation?

Hanley, et al. (2001) have discussed three advantages of CE technique, as compared to CVM, for valuing outdoor recreation. First, CEs are suitable for situations where changes in outdoor recreation are multidimensional and trade-offs between them are of particular interest. Though CVM may still be applied to multidimensional changes, by including a series of contingent scenarios in a questionnaire, or by doing a series of CVM exercises, this approach is more costly and provides cumbersome alternatives. In addition, Adamowicz, et al. (1998) claimed that it would be difficult to maintain some degree of orthogonality in the design and administration of the study if respondents were asked a series of contingent scenarios.

Second, CEs are more informative than the discrete choice CVM approach. This is because respondents in a CE have a chance to state their preferences from a number of alternatives presented to them. This is supported by Adamowicz, et al. (1998), where the analysts favoured using CEs for valuing outdoor recreation because the CEs help us to understand respondents' preferences over the attributes of the scenario, rather than specific scenarios *per se*. As opposed to the CEs, CVM focuses on the precise scenario, and the value obtained from the CVM questions are only valid for that particular scenario. The number of hypothetical situations presented to respondents in CVM is also considered to be limited.

Finally, CEs avoid asking respondents about their WTP directly, unlike CVM. In the CE technique, the amount that respondents are willing to pay comes together with other attributes in the alternative. By doing this, certain problems that appear when the WTP is asked directly (i.e. starting behaviours, yea-saying, protest bids, etc.) could be reduced.

3.5 Conclusion

This chapter has reviewed relevant methods for valuing outdoor recreation. Prior to this, it discussed the underpinning theories support these methods. To summarise, approaches to value outdoor recreation may be categorised as follows: (1) indirect methods; (2) direct methods; and (3) mixed methods. Since the main focus of this study is a single urban park, the TCM (an indirect method) is not appropriate. This is supported by Willis (2003), who has argued that the cost of travel to urban parks lacks sufficient variation to operationalise the method.

This study is designed to explore public preferences for attributes available at recreational parks. Two aspects of these preferences are explored: (1) trade-offs between attributes; and (2) WTP for attributes. As explained in Section 3.4, the CEs are believed to be more suitable for these types of preferences, as compared to the CVM.

Based on these public preferences, this study favours the CE technique, because this technique is consistent with Hicksian welfare analysis. In this study, the CE technique is combined with a qualitative approach. The qualitative approach is limited to focus group meetings. These meetings may help determine the suitability of the proposed attributes and their levels. Further information about CE technique is provided in the following chapter.

Chapter 4 : Choice Experiment Technique, Applications and Benefit Transfer

4.1 Introduction

This chapter discusses issues relevant to the Choice Experiment (CE) technique and its application for the valuation of environmental goods and services. Various issues need to be considered in the design and application of CEs. In the CE design stage, important issues include the selection of attributes, their levels, and experimental design.

Attributes and their levels are considered to be one of the most important issues in the design of CEs. This is because the hypothetical situation that will be presented to respondents depends on the selection of attributes and their levels. An inappropriate attribute or unsuitable levels could affect respondents' understanding and may lead to them giving inaccurate estimates of their willingness to pay (WTP).

The discussion of issues in this chapter covers models that have been used to analyse the CE data. The chapter begins with an explanation of choice probability theory. The main models discussed are the Multinomial Logit (MNL), Random Parameter Logit (RPL) and Latent Class models (LCM). In addition, the procedure for computing WTP is explained. Finally, the possibility of using CE parameters to estimate benefit transfer for environmental goods/services between different sites is considered.

4.2 Design Issues

Application of CEs involves respondents choosing one of several alternatives that are available on a given choice card. These alternatives refer to various hypothetical scenarios that might be used to portray an environmental good or service. These alternatives usually consist of possible combinations of various attributes and in order to portray a wide range of scenarios different levels of attributes are employed.

The total number of alternatives in the choice cards depends on the number of attributes and their levels (Garrod and Willis, 1999). For instance, a total of nine alternatives, or possible combinations, can be generated from two three level attributes. Some analysts (e.g. Lusk and Norwood, 2005) prefer to use different terms for alternatives in choice sets such as profiles or options. An increase in attributes or attributes levels will increase the number of alternatives exponentially (Bliemer and Rose, 2006).

Certain questions arise here: for example, what is the optimum number of alternatives to be presented to respondents? Since the alternatives correspond to the number of attributes and their levels, what attributes should be included to explain a scenario to respondents, and to what extent should these attributes be varied? How many alternatives should be presented to respondents and should a status quo option be included in the choice cards? These questions are discussed in the following sections.

4.2.1 Selection of Attributes and Levels

Based on the fact that CEs depend on the selected attributes and their levels, it is not surprising that issues of selection and the definition of attributes and their levels are very important in CEs (Garrod and Willis, 1999). Attributes and their levels are used to portray scenarios to respondents and three main selection criteria are suggested in the literature: demand-relevance; policy relevance; and measurability (Bennett and Adamowicz, 2001; Blamey et al., 2002).

According to the demand-relevant criterion, the attributes used must have meaning to respondents, in order to minimise the likelihood of invalid responses and low response rates (Bennett and Adamowicz, 2001). Attributes should also be amenable to policy influence. The selection of attributes based on these criteria, however, is susceptible to the so-called "causal-effect attributes" combination problem (Blamey et al., 2002).

Blamey et al. (2002) explained that the criteria tends to include some "causal" and "effect" attributes in the short-list of environmental attributes where the attributes would be used by respondents to simplify their decision process. The authors suggested three ways to reduce the influence of causal-effect attributes: further explanation of the attribute combinations used in the questionnaire; combining the affected attributes to become a single attribute; or to omit all of the affected attributes from the study.

Some analysts (e.g. Lancaster, 1991) proposed the use of attributes' relevant characteristics in the study context. Relevant characteristics refer to a situation where the exclusion of a particular attribute from the attribute list will change or distort the alternative preferences. In this approach, two types of attribute characteristics have to be considered. Attributes could be excluded from the study if the characteristics are not relevant from the perspective of analysts or decision makers. Attributes, however, could be retained if they are relevant to decision makers though not from the analysts' point of view.

In terms of attribute levels, Bennett and Adamowicz (2001) suggested that CE design should take into account the types of measurement in levels (either qualitative or quantitative), the range within which attributes can be varied, and the increments between levels.

Quantitative levels are more appealing in terms of their properties for modelling purposes compared to qualitative levels. By using quantitative measures, analysts have the option of showing changes in the levels either in absolute terms or in percentage terms. Variation in attribute levels must be realistic and large enough to cover any possible variations of the policy outcome.

However, it is common in CE studies to use qualitative approaches to inform the choice of attributes and their levels to be included in choice cards. The most common source of this measurement is through literature review (e.g. Oh et al., 2007) and focus group meetings (e.g. Hanley et al., 2001) or a combination of both (e.g. Christie et al., 2006).

In the focus group meetings, analysts typically conduct a series of discussion with members of the public (Christie et al., 2006) where the size of the group is between 6 and 10 (Morgan, 1997). The meetings are held for various reasons. For example, Blamey et al. (2002) conducted their meeting to classify the various types of attribute in their study, while Christie et al. (2006) held theirs to identify respondents' understanding and opinions of the proposed attributes. Once attributes and their levels have been identified, experimental design follows.

4.2.2 Experimental Design

According to Scarpa and Rose (pg. 254, 2008), experimental design can be defined as the systematic arrangement in matrices of the values that analysts use to describe the attributes representing the alternatives policy options of the hypothetical choice cards. In environmental valuation studies the importance of experimental design has been highlighted by several analysts (e.g. Alberini, 1995; Kanninen, 1993).

Experimental design can include either full factorial or fractional factorial arrays. The total number of alternatives that can be generated is subject to the number of attributes, and their levels. Specifically, the total number of alternatives can be obtained by calculating the expression n^x where *n* refers to the number of levels and *x* refers to the number of attributes (Garrod and Willis, 1999). For example, a good that can be defined by five four level attributes and two three level attributes $(4^5 \times 3^2)$ will eventually produce 9216 alternatives. To use all possible alternatives that are available gives the full factorial design (Bennett and Adamowicz, 2001).

The premise of providing all possible alternatives is based on the completeness argument. Analysts may prefer to do this because they want respondents to consider all possible alternatives and therefore achieve a data set that will produce better coefficients in terms of statistical efficiency and overall model goodness of fit (Lancsar and Louviere, 2006). However, full factorial designs are associated with a higher cognitive burden on respondents and might result in less reliable information (Hensher, 2006). A trade-off between completeness and complexity of CE tasks must be made; hence fractional factorial designs are usually preferred (Blamey et al., 2001). Experimental designs can be described as orthogonal or efficient, depending on certain features.

4.2.2.1 Orthogonal Design

An experimental design is said to be orthogonal when correlations of all attributes in the design are zero (or uncorrelated) (Bliemer and Rose, 2006). This uncorrelated property has led to the orthogonal design being favoured among CE practitioners (Kuhfeld et al., 1994). Different types of experimental design produce different kinds of effect (i.e. main effects and two-factor interaction effects). Main effects refers to a scenario where the utility for a change in a particular attribute level remains the same, while changes are introduced in other attributes (Garrod and Willis, 1999). Whilst, interaction effects refer to a situation where the effect of particular attribute is dependent on other attribute levels in the design (Bateman et al., 2002).

Orthogonal designs, however, have various limitations. First, such designs are unable to measure interaction effects (Bateman et al., 2002). Therefore, the results derived from this design may be biased if an interaction effect is significant but not be tested in the model. In addition, even though orthogonal experimental design can be generated, achieving orthogonality in the choice data is doubtful, particularly when one of the following situations occurs. These include (1) a non-response to a choice situation; (2) unequal frequency of a block in a block design; and (3) unequal ranges in attribute levels (Bliemer and Rose, 2006). In order to overcome these shortcomings, some analysts have suggested using an efficient design.

4.2.2.2 Efficient Design

The objective of an efficient design is to extract the maximum amount of information from respondents, subject to the number of attributes, attribute levels and other characteristics of the survey (e.g. cost and length of survey) (Carlsson and Martinsson, 2003). A design that produces parameters with standard errors kept as low as possible is considered to be efficient (Bliemer and Rose, 2006). Since the standard errors can be predicted *via* the Asymptotic Variance Covariance (AVC) matrix, the efficiency of the design is subject to the AVC value.

A common measure of design efficiency is *D-error* which refers to the determinant of the AVC matrix. Two types of *D-error* are available, one is *D-optimal* where the *D-error* is the lowest, and another one is *D-efficient* where the *D-error* is sufficiently low (Bliemer and Rose, 2006). Usually, the latter is calculated compared to the former because in practice, the lowest *D-error* is very difficult to find. The *D-error* can be denoted as D_z*-error,* D_p*-error* and D_b*-error,* depending on relative availability of prior information for estimating the design efficiency parameter. The first error represents no prior information being available (zero), the second refers to some information being available (prior) and the final one is based on the Bayesian approach.

Another type of efficiency criterion is *A-error*, which is based on the diagonal elements of the AVC matrix. In other words, this error only considers the variance and not the covariance of matrix. The *A-error* is not generally preferred to the *D-error* because of the way that it is calculated. By looking at the way the error is calculated, the larger magnitude element will tend to dominate the calculation. This is known as the scaling problems in *A-error* calculation (Bliemer and Rose, 2006).

Generally, efficient designs are preferred because they enable estimation of unbiased parameters, increase sampling efficiency, and possibly facilitate a reduction in survey costs (Huber and Zwerina, 1996). This assertion was supported by Campbell (2007) where the author found that the sampling efficiency increases by 44% and the cost of survey decreases by 30% when the efficient design is used. After alternatives have been identified, the next question is how to pair them into choice cards?

4.2.2.3 Pairing Alternatives

The effectiveness of CEs in explaining consumer preferences does not only depend on their design, but also on how alternatives are paired into choice cards (Street et al., 2005). A simple technique to pair alternatives is "random pairing" using an Orthogonal Main Effects Plan (OMEP) or Statistical Package for the Social Science (SPSS) Orthoplan (Bergmann et al., 2008). The alternatives can be paired into choice cards in many different ways as long as the pairing procedure is random.

Another pairing technique is based on difference designs (Louviere and Woodworth, 1983). Assuming that the initial set of alternatives possesses A attributes, an additional set of choice alternatives, M, can be created by using an orthogonal difference design based on the L^{MA} factorial, where L is the number of levels and is assumed to be constant for all attributes (Louviere et al., 2000).

To illustrate, if the initial set of alternatives is created from the orthogonal design of 3^A, therefore an additional M x A columns are needed as pairing alternatives. The total of M x A columns generated from this procedure belongs to a particular set of alternatives. For instance, based on the total of 8 columns created from a study of 4 attributes and 2 choice alternatives, the first 4 columns represent the first alternative and the last four represent the second alternative.

The third pairing technique is based on a search algorithm approach. In this technique, an OMEP generated from the Statistical Analysis Software (SAS) program is used as a starting design to construct choice sets (Street et al., 2005).

The fourth technique is called the "cyclical or foldover" approach, where construction of a second alternative is based on the level of the first alternative (Louviere et al., 2008). For example, the coding value for 3 levels of an attribute are 0, 1, and 2, the value of level in the first alternative (obtained from OMEP) will be change systematically by adding 1 so that $0 \rightarrow 1$, $1 \rightarrow 2$ and $2 \rightarrow 0$ for the second alternative.

The fifth approach uses software developed by Burgess (2007). In this technique, based on OMEP in the first alternative, Burgess (2007) and Street et al. (2005) use a set of generators to construct the second alternative. The set of generators depends on the number of attributes and their levels. In a study to compare the efficiency of pairing alternative based on various techniques, Street et al. (2005) demonstrated that the pairing generated from the this technique was better than other techniques in terms of efficiency.

The availability of possible alternatives to be used in choice sets, informs experimental design, permitting analysts to present them to respondents through an appropriate questionnaire format. The questionnaire, however, must be designed in such a way that respondents can give reliable responses.

4.2.3 Design of Questionnaire

Questionnaire design involves several aspects such as: (1) whether the alternatives in choice cards need to be labelled; (2) whether the status-quo option need to be included in the alternatives; (3) the optimum number of the alternatives for each choice card; and (4) the optimum number of choice cards to be presented to respondents. The questionnaire also needs to be structured into various sections (i.e. introduction, choice cards questions, follow-up questions, and socio-demographic characteristics).

One of the issues in questionnaire design for CEs is whether to portray the alternatives in a generic or labelled format (Blamey et al., 2000). Generic formats are associated with the assignment of a generic label to each alternative in the choice cards (i.e. alternative A, alternative B, etc.). The labelled format on the other hand, refers to a situation where analysts assign information, either directly or indirectly, that could reflect the alternatives. Blamey et al. (2000), for example, use the label of river quality with increases of 10% in fish stocks, river quality with increases of 50% in fish stocks, etc. in their CE study.

The labelled format is sometimes favoured due to its ease of response, and lower cognitive demands (Blamey et al., 2000). The format, however, is susceptible to "take it for granted" responses. Generic formats help to avoid confounding results between the effect of the information (i.e. by labelling the alternatives) and the alternatives (Hensher, 2006).

As shown in Table 4.1, many previous CE studies in environmental valuation have included a status quo, or ‘do nothing’ option in the choice sets. The inclusion of the status quo option can be for several reasons, including to mimic a real market transaction where the customer cannot be forced to buy a product (Carson et al., 1994), and most importantly to enable interpretation of the results in standard welfare economic terms (Hanley et al., 2001). As explained in Section 3.2.6, welfare economic measurement (i.e. Hicksian compensation or equivalent) is valid if the utility is constant at the initial level or some specified alternative level. Therefore, the status quo option is needed to serve as a benchmark for changes in welfare.

Incorporating status quo, however, can also introduce problems. For example, respondents might choose the status quo option not because it provides highest utility among alternatives (Banzhaf et al., 2001), but to avoid making difficult decisions (Carson et al., 1994) or to protest about the attributes trade-off (Von Haefen et al., 2005).

Table 4.1: Selected Choice Experiment Studies from 1990-2008

Author(s)	Experimental Designs	No of Attributes	No of Alternatives in each Choice Sets	No of Choice Sets	Data collection	Sample size
Adamowicz et al.(1994)	Orthogonal main effects design	10	2+status quo	64 (Blocking into 4 blocks, 16 choice sets for each block)	Mail survey	413
Adamowicz et al.(1997)	Orthogonal main effects design	6	2+status quo	16	Personnel interview in group meetings	271
Bullock et al.(1998)	Fractional factorial (1/3 of full factorial)	4	2+status quo	6	Mail survey	854
Blamey et al.(2000)	Fractional factorial orthogonal	5	2+status quo	64 (Blocking into 8 blocks, 8 choice sets in each block)	Drop-off and pick-up	481
Hanley et al.(2001)	Fractional factorial	6	2+status quo	4 or 8	Mail survey	267
Boxall and Adamowicz (2002)	Orthogonal main effects design	5	2+status quo	64 (Blocking into 8 blocks, 8 choice sets in each block)	Mail survey	620
Lawson and Manning (2003)	Fractional factorial orthogonal	6	2	36 (Blocking into 4 blocks, 9 choice sets in each block)	Personal Interview-computer	311
Christie et al.(2006)	Fractional factorial	5	2+status quo	25 (Blocking into 10 blocks, 5 choice sets in each block)	Personal Interview-computer	741
Oh et al.(2007)	Fractional factorial-main effects and two-way interaction	7	2+status quo	56 (Blocking into 7 blocks, 8 choice sets in each block)	Mail survey	648
Bergmann et al.(2008)	Fractional factorial orthogonal	5	2+status quo	4	Mail survey	240

In the CE literature, various suggestions have been made regarding the number of attributes to include in choice alternatives. Carson et al. (1994) suggest using seven attributes per alternative, while others use four, five or six attributes (e.g. Blamey et al., 2000; Boxall and Adamowicz, 2002; Christie et al., 2006; Bergmann et al., 2008).

In terms of the number for alternatives in each choice card, Carson et al. (1994) propose four alternatives per choice card. This is consistent with the findings of Smith and Desvousges (1987) where they found that four to six alternatives produced better results. In addition, Caussade et al. (2005) gave a rank to the various alternatives.

A study with two alternatives was undertaken by Rolfe and Bennett (2008). The two alternative version was compared with the three alternative scenario and it was found that three alternatives produce more robust results. The two alternative version, however, is commonly used in CE studies.

The number of choice cards adopted in CEs varies across studies. For example, Caussade et al. (2005) suggest using not more than nine or ten choice cards, whilst Carson et al. (1994) proposed four choice cards. Generally, most studies use between four and nine choice cards.

One of the problems in applying CEs in environmental valuation is respondents being unfamiliar with the goods being valued. Since the environmental goods and services may not exist or will not exist for some time, respondents do not always have experience of the alternatives offered to them. To mitigate the problem, Carson et al. (1994) suggested a few elements to be included in the questionnaire. One is to ensure respondents understand the product attributes and their levels. Various techniques can be applied to achieve this, for example glossaries of attributes (e.g. Blamey et al., 2000; Adamowicz et al., 1997), detailed explanatory text or visual aids (e.g. Bullock et al., 1998).

As a general rule the more concrete the context provided for the CE, the more reliable the results are likely to be (Carson et al., 1994). Also, it is useful to provide some warm-up choice tasks to respondents. This could help to familiarise them with the tasks and focus their attention on the study (Krupnick and Adamowicz, 2007). The next task is determining the sample to be taken for the study. This is explained in the following section.

4.2.4 Sampling

Sampling involves many considerations like identifying target populations, and determining the sampling frame, sampling design and sample size. The sampling frame refers to a list of the target population in the study, whilst target population refers to those who are affected by the environmental changes outlined in the study (Bateman et al., 2002). In many cases, a reliable sampling frame may not be available for a study and some other sampling approach must be adopted.

Champ and Welsh (2007) suggested random digit dialling as one solution to this problem. Here, analysts will identify a particular area code number and then choose individuals randomly therein.

Respondents can be selected using probability or non-probability based techniques. In non-probability sampling, each individual in the population does not have a known and nonzero probability of being chosen (Champ and Welsh, 2007). In probability sampling, on the other hand, every unit in the sampling frame has a known and nonzero probability of being chosen (Bateman et al., 2002). Techniques available in this category include simple random sampling, stratified random sampling, cluster sampling, and multistage sampling.

According to Louviere et al. (2000) two common sampling techniques applied in CEs are simple random samples and stratified random samples. The latter may be preferred because they enable estimation of separate strata coefficients. Stratified sampling involves division of the sampling frame into distinct subpopulations, or strata, and then separate samples are randomly selected from each stratum.

The optimal sample size for a CE study depends on several factors including the amount of variation in the target population with respect to characteristics of interest. The greater the variation in the population the larger the sample required (Bateman et al., 2002).

In addition, the level of statistical precision needed in the estimation determines sample size. Statistical precision is measured in terms of statistical power and sampling error. Statistical power measures the probability of rejecting the null hypothesis when it is false, and it increases as the sample size increases. Sampling error, however, may occur because the sample does not provide complete information about the population. Once the samples have been identified, the next task is to collect the choice data.

4.2.5 Data Collection

CEs can be conducted either through an interviewer-administrated survey or a self-administrated survey (Champ and Welsh, 2007). The first approach requires analysts to ask survey questions (i.e. through face-to-face or telephone interviews) and then record the answers from the respondent. Face-to-face (or in-person) surveys are generally preferred because the analyst has substantial control in terms of 'survey' information, and it is possible to provide further clarification to respondents. The interviewer-administrated survey, however, may be susceptible to bias because of the interviewer's influence.

Self-administered surveys, on the other hand, allow respondents to record their answers directly. Commonly used techniques in the approach include mail surveys (e.g. Oh et al., 2007). Respondents are sent the questionnaire *via* mail and asked to fill it in and return it using the stamped-addressed envelope provided. Alternatively respondents may be given the questionnaire at an entrance gate of a study site (i.e. a recreational park) and then asked to fill it in and return it at the exit gate.

The self-administered survey is usually cheaper because it does not involve survey staff and associated travel costs. The absence of an interviewer can also avoid some of the potential for bias in responses. The self-administered survey, however, does not allow analysts to control or clarify the information presented to the respondent.

According to the National Oceanic and Atmospheric Administration (NOAA) panel report, the most suitable approach to collecting information from respondents in any stated preference approach is through face to face interviews (Portney, 1994). By using this approach, goods and services can be defined and explained thoroughly to respondents and the non-response can be minimised (Garrod and Willis, 1999).

Although the approach is recommended by the NOAA, the application of this approach in CE studies is not likely to happen in all cases because it involves a high cost. This can be seen from Table 4.1 where majority of the CE studies reported used a mail survey approach (e.g. Hanley et al., 2001; Boxall and Adamowicz, 2002).

Other studies combine different survey approaches. Schroeder and Louviere (1999), for instance, combined a random draw from a telephone directory with a mail-shot, then contacted respondents by phone and lastly through a mailed choice survey. Boxall et al. (1996) in their study of recreational moose hunting preferences in Canada mailed a letter to all licensed hunters based on the records of the Alberta Fish and Wildlife Services. In the letter, respondents were told about the study and then, the hunters were telephoned and asked to participate in a group discussion. Blamey et al. (2000) used a 'drop-off and pick-up' procedure. To conclude, the choice of data collection method is also subject to the budget of the research and the nature of the study. Respondents' responses to the questionnaire survey need to be coded for further analyses and this is discussed in the following section.

4.2.6 Data Coding

Attributes with multiple levels in CEs are coded using an effects coding (e.g. Oh et al., 2007; Lawson and Manning, 2003; Kemperman et al., 2000) or dummy coding approach (e.g. Bergmann et al., 2008; Rolfe and Bennett, 2008). Effects coding uses the values of -1 and 1, while dummy coding uses 0 and 1. The former, however, is recommended when the Alternative Specific Constant (ASC) in the estimation model is statistically significant (Bech and Gyrd-Hansen, 2005).

The ASC is similar to the constant term in the regression model and captures the average effect on utility of all factors not included in the model (Train, 2003). Studies include the ASC in the model either in the generic alternatives format (e.g. Blamey et al., 2002) or labelled alternatives format (e.g. Morrison et al., 2002). The inclusion of the ASC, however, is considered more appropriate when using labelled alternatives because its value is meaningless in the generic format as trade-offs in choice sets are between attribute levels that have no association with a particular label (Hensher et al., 2005).

4.3 Analytical framework

Suppose a visitor faces a choice among *J* alternative parks in a choice set. The utility that visitor *n* derives from choosing a park can be expressed as:

$$U_n = V_n + e_n$$

4.1

Based on the Random Utility Model (RUM) framework as explained in Section 3.2.5, the indirect utility function of U_n can be decomposed into two components, V_n the part that is a function of factors observed by analysts which is known as deterministic element, and e_n the stochastic component (Hanley et al., 2001). The stochastic component is assumed to be random with density $f(e)$.

In a simple scenario that only consists of two parks in a choice card, i or *j*, the behavioural model is therefore, choose park i if and only if $U_{in} > U_{ij}$. In random utility terms, the probability that visitor *n* chooses park i (P_{in}) is shown in equation 4.2:

$$\begin{aligned} P_{in} &= P_r(U_{in} > U_{jn}) \\ &= P_r(V_{in} + e_{in} > V_{jn} + e_{jn}) \\ &= P_r(e_{jn} - e_{in} < V_{in} - V_{jn}) \end{aligned}$$

4.2

Equation 4.2 indicates that the probability of choosing park i from the entire possible outcome (in this context, park i and *j*) is equal to the probability of the stochastic component when the outcome of park i is chosen. This is elaborated further in the following sections.

4.3.1 Multinomial Logit Model

The probability of choosing park i can be obtained by specifying assumptions on the distribution of the error terms, e_n. Note that, basically, the error terms are assumed to be distributed independently and identically (iid) with a Gumbell (or Type 1 extreme-value) distribution (Swait, 2007):

$$f(e) = \exp\left(-\exp(-\mu e)\right)$$

4.3

Following equation 4.3, McFadden (1973) showed that the selection of park *i* can be expressed in terms of a logistic function where the error terms are assumed to be distributed as Gumbell, with a scale factor μ . The logistic distribution can be generalised to the case of three or more parks, and the function can be expressed as a MNL model.

The scale factor, however, cannot be identified in the estimation model because its value is confounded with the vector of utility parameters (Swait and Louviere, 1993) and it is therefore assumed that $\mu = 1$ (Swait, 2007; Hanley et al., 2001). The probability of choosing park *i* in the MNL model is shown in equation 4.4.

$$P_{in} = \frac{\exp(V_{in})}{\sum_{j\in J_n}\exp(V_{jn})}$$

4.4

The MNL model can be estimated through maximum likelihood (ML) procedures as stated in equation 4.5 (Hanley et al., 2001).

$$\log L = \sum_{i=1}^{N}\sum_{j=1}^{J} y_{in}\log\left[\frac{\exp(V_{in})}{\sum_{j=1}^{J}\exp(V_{in})}\right]$$

4.5

where y_{in} will take the value of 1 if the visitor *n* choose park *i* and zero otherwise. MNL is the most frequently applied model for parameter estimation in CEs (e.g. Hanley et al., 2001; Adamowicz et al., 1998; Boxall et al., 1996). The popularity of the model is due to its ease of estimation compared to other models such as the multinomial probit (Train, 2003).

Due to the fact that the MNL model is derived from the error terms which are assumed to be distributed iid, the model is subject to the Independence from Irrelevant Alternatives (IIA) property (Lusk and Norwood, 2005). The IIA implies that the ratio of probabilities of choosing any two parks does not depend on the availability of a third park. With the assumption of $\mu = 1$, the ratio of probabilities between parks *i* and *j* is shown in equation 4.6 (Train, 2003).

$$\begin{aligned}\frac{P_{in}}{P_{jn}} &= \frac{\exp(V_{in})/\sum_{j \in J_n} \exp(V_{jn})}{\exp(V_{jn})/\sum_{j \in J_n} \exp(V_{jn})} \\ &= \frac{\exp(V_{in})}{\exp(V_{jn})} \\ &= \exp(V_{in} - V_{jn})\end{aligned} \qquad \mathbf{4.6}$$

Equation 4.6 shows that the ratio of probabilities only depends on the parks *i* and *j*, and not on other park(s) in the choice sets, J_n. The Hausman- McFadden test has frequently been used to test whether or not the IIA property holds in empirical studies (Hausman and McFadden, 1984).

In addition, the basic MNL does not account for taste heterogeneity. Taste heterogeneity implies that individuals do not have identical preferences when choosing alternatives in the choice cards. According to Bhat (1997), taste heterogeneity can be classified into two parts: systematic heterogeneity, and random (or stochastic) heterogeneity. Systematic heterogeneity explains variation that happens due to observable individual characteristics, while random (or stochastic) heterogeneity accommodates the variations due to unobservable individual characteristics.

Systematic heterogeneity can be accommodated in MNL through an interaction between socio-demographic characteristics, and constant terms and/or attribute(s) of the alternatives (e.g. Blamey et al., 2000; Adamowicz et al., 1997). The socio-demographic characteristics have to be interacted with constant terms and/or attribute(s) because they do not vary across alternatives. This model is known as MNL with interactions. The model, however, does not account for random heterogeneity, which can be captured by the Mixed Logit (MXL) model that is explained in section 4.3.3. Before explain further the MXL, it is noteworthy to discuss the rationale for taste heterogeneity in this study.

4.3.2 Rationale for Taste Heterogeneity in this Study

In general, any population consists of different types of individuals, with different characteristics and tastes (or preferences). Also individuals are assumed to attempt to maximize their utility from visiting a recreational park, subject to any constraints that they face.

Since recreational parks can be designed using various attributes (i.e. amenities, recreational facilities, etc.) at different levels (i.e. basic, medium or higher levels), every individual has different tastes subject to their characteristics (i.e. age, gender, ethnicity, etc.). For instance, young visitors may have different tastes for the attributes available at recreational parks compared to older ones. The same situation may happen with males and females.

It is reasonable to assume that visitors to recreational parks do not have identical socio-demographic characteristics and preferences for different park attributes. Therefore, the average results obtained from the analysis could be biased if the estimation does not consider taste heterogeneity.

The average results obtained from an analysis that does not consider taste heterogeneity are also unrealistic because a homogenous group of visitors is unlikely to exist in the real world. This is one of the reasons why analysts wish to consider heterogeneity in their analyses. By doing so, they can help policy makers to design better recreational parks as this will enable them to better understand visitors' preferences.

4.3.3 Mixed Logit Model

The MXL model obviates certain limitations of the MNL by accounting for both systematic and random heterogeneity, and not assuming IIA. The distribution of MXL can be either: continuous, or discrete (or finite) (Bhat, 1997). Discrete distributions can be exogenous or endogenous. The endogenous approach is also known as LCM or Finite Mixture Model (Scarpa and Thiene, 2005), while the continuous distribution is called RPL model.

4.3.3.1 Random Parameter Logit

The RPL model allows the taste parameters for attributes to be varied continuously across the sample. The distribution of taste parameters for attributes in the RPL approach must be specified $((f(\beta|\theta))$ where β refers to the coefficient for taste parameters and θ is their unique mean or standard deviation (Train, 1998). β and θ will be explained further in the following paragraphs.

In RPL, the general utility function $U_n = V_n + e_n$ is written as $U_{int} = \beta_n X_{int} + e_{int}$ where β refers to the taste parameter row vector and X is a column vector of alternatives attributes and individual characteristics. Subscripts n and i are the same as those used before except for *t*, where *t* refers to choice situations. Since the taste parameters vary in the population, the β_n in U_{int} can be explained as $\beta_n = b + \eta_n$ where b refers to the population mean and η_n is an individual mean. Substituting $\beta_n = b + \eta_n$ into U_{int} yields $U_{int} = \underbrace{bX_{int}}_{A} + \underbrace{\eta_n X_{int} + e_{int}}_{B}$.

The components in U_{int} can be decomposed in two parts: an observable part (denoted by A), and an unobservable part (denoted by B). The unobservable part is correlated over choices due to common influence of η_n (Train, 1998). This happens because the individual uses the same taste to evaluate choices.

The choice probability of alternative i in t by individual n (P_{int}) can be calculated as shown in equation 4.7 (Train, 2003).

$$P_{int} = \int L_{int}(\beta_n) f(\beta_n) d(\beta_n)$$

4.7

where $L_{int}(\beta_n)$ is the logit probability evaluated at parameters β_n:

$$L_{int}(\beta_n) = \frac{\exp(V_{in})}{\sum_{j \in J_n} \exp(V_{jn})}$$

4.8

Equation 4.7 becomes a standard logit function (as shown in equation 4.4) when the mixing distribution is degenerate at the fixed parameter *b*: $f(\beta_n) = 1$ for $\beta_n = b$ and $f(\beta_n) = 0$ for $\beta_n \neq b$.

There are two sets of parameters that enter into equation 4.7. First, are the parameters of β_n which enter the logit function (equation 4.8). These parameters have density $f(\beta_n)$. The second set are parameters that describe the density of $f(\beta_n)$ which can be denoted as θ^*. Thus, the appropriate way to denote this density is $f(\beta_n|\theta^*)$.

Estimation of θ^* can be made based on assumptions on its distribution. In most applications the normal and lognormal specifications are used. The former is applied because it has no constraints on the signs of parameters, while the latter is used in a situation when the sign of the coefficient should be identical for all respondents (i.e. negative signs for the coefficient of price) (Train, 2003).

After the distribution is specified the estimation of parameters to describe density *f* (i.e. means and standard deviation) can be estimated. This can be done by maximizing the log likelihood function as stated in equation 4.9 (Revelt and Train, 1998).

$$LL(\theta^*) = \sum_n \ln P_n(\theta^*)$$

4.9

However, the exact ML cannot be estimated because the integral in equation 4.7 does not have a closed-form. Therefore, an approximation of probability is made through simulation to maximize the log likelihood function (Train, 2003).

Following Train (2003) the simulation of the log likelihood function can be done using a simulation procedure for any given value of θ^*. The procedure is as follows. First, draw a value of β from $f(\beta_n|\theta^*)$, and denote the value with β_r where subscript r=1 refers to the first draw. Second, calculate the logit formula $L_{int}(\beta_r)$ for this draw. Lastly, repeat steps 1 and 2 across many draws and average the results. The number of draws will be explained in the following paragraphs. The average results are the simulated probability as shown in equation 4.10.

$$\check{P}_{int} = \frac{1}{R}\sum_{r=1}^{R} L_{int}(\beta_r)$$

4.10

The simulated log likelihood (SLL) can then be derived by substituting equation 4.10 into the log-likelihood function to obtain:

$$SLL = \sum_{n=1}^{N}\sum_{j=1}^{J} d_{nj} ln\check{P}_{jnt}$$

4.11

where $d_{nj} = 1$ if individual n chose alternative j and zero otherwise. One of the issues in the RPL is the number of draws r to be applied in the analysis. Usually this depends on the purpose of the study. If the objective is for exploratory purposes, 10 to 20 draws is said to be sufficient (Greene, 2002). The number of draws has to be increased when the final estimation model is identified, while Bhat (2001) recommends 1000 draws. The number of draws also depends on the simulation method applied.

Pseudo-random draws have been used extensively for the estimation of random parameters (e.g. Revelt and Train, 1998). The method requires a large number of draws and the process is time-consuming. Bhat (2001) has shown that the results obtained from an alternative quasi-random simulated maximum likelihood method are comparable to the pseudo-random method. And yet, the method only uses one-tenth of the pseudo-random draws and is less time-consuming. The method proposed by Bhat (2001) is known as Standard Halton Sequences (SHS).

Though the RPL model seems to be flexible in dealing with taste heterogeneity, it requires specific assumptions about the distribution of parameters (Greene and Hensher, 2003). In some cases identifying an empirically tractable distribution is not an easy task particularly for "lumpy" preferences (Scarpa and Thiene, 2005). Therefore, discrete distributions are preferred (Boxall and Adamowicz, 2002; Scarpa and Thiene, 2005).

4.3.3.2 Discrete Heterogeneity Distribution

The discrete distribution approach is based on the premise that the individual belongs to one of a finite group of individuals observed in the population. This group is called a segment. Individuals in the same segment have relatively homogenous preferences. Preferences, however, are not homogenous across segments. Discrete heterogeneity in taste can be investigated by unearthing the segments (exogenously or endogenously).

4.3.3.2.1 Exogenous Market Segmentation

There are two approaches to exogenous market segmentation: an *a priori* approach and a two stage procedure. The former refers to a method where segments are based on the observable characteristics of individuals, and then aggregate preference functions for each segment are estimated (Kamakura et al., 1994).

The two stage procedure, by contrast, begins with the estimation of preferences for each individual (i.e. implicit prices), which are then used as a criteria to form segments for individuals who have similar preferences (Kamakura et al., 1994). The exogenous segmentation approach has been applied extensively in marketing research (e.g. Desarbo et al., 1995).

The total number of segments is a function of the number of segmentation variables and the number of segments defined for each segmentation variable. Ideally, analysts consider all socio-demographic variables in the data for segmentation. This segmentation scheme is known as full-dimensional exogenous market segmentation (Bhat, 1997).

The scheme, however, has a practical problem as the number of segments grows very quickly with the number of segmentation variables. This creates interpretational and estimation problems. Bhat (1997) suggested two methods to deal with this: by introducing key segmentation variables directly into the model, or by using a subset of the demographic variables for segmentation.

Although exogenous market segmentation is easy to implement (i.e. in MNL software) it suppresses potentially higher-order interaction effects of the segmentation variables on preference and response to level of service measures (Bhat, 1997).

In addition, the success of the *a priori* segmentation approach depends heavily on the strength of the relationship between the choice of observable characteristics and individual preferences. The relationship between socio-demographic characteristics and individuals' preferences may also be too weak to explain differences across individuals. Moreover, the two-stage estimation procedures ignores the estimation error associated with the preferences (Kamakura et al., 1994).

4.3.3.2.2 Endogenous Market Segmentations

The endogenous segmentation method is a *post hoc* analysis where the number of segments is determined by the data. Instead of suppressing the high-order interaction effects of segments, the endogenous approach reduces dimensionality of the segment-space. The appropriate number of segments in the reduced dimensionality segment-space is determined by successively adding additional segments till a point is reached where an additional segment does not improve the goodness of fit in the estimated model. Individuals will be assigned to segments in a probabilistic way based on the segmentation variables (Bhat, 1997). This approach is also known as the LCM.

An explanation of the LCM begins with assumptions on the existence of the S segments and that visitor n belongs to a particular segment s (s=1, 2, ..., S). To illustrate this model, the general utility function $U_n = V_n + e_n$ has to be rewritten in the form of $U_{in} = \beta X_{in} + e_{in}$ where the interpretation of β and X is the same as used in the RPL. The utility obtained by the visitor n in segment s from park i is shown in equation 4.12:

$$U_{in|s} = \beta_s X_{in|s} + e_{in|s}$$

4.12

The probability of visitor n choosing park i given that she belongs to segment s ($P_{in|s}$) can be written as equation 4.13. This is true provided that visitor n follows the random utility framework when making a decision and the $e_{in|s}$ is assumed to be iid.

$$P_{in|s} = \frac{\exp(\mu_s \beta_s X_{in|s})}{\sum_{j=1}^{J} \exp(\mu_s \beta_s X_{jn|s})}$$

4.13

Assuming μ_s=1 and normalising equation 4.13 with respect to alternative J (to secure the identification of model), will yield to:

$$P_{in|s} = \frac{\exp(\Delta\beta_s X_{in|s})}{1 + \sum_{j=1}^{J-1} \exp(\Delta\beta_s X_{jn|s})}$$

4.14

Following Swait (1994) it can be assumed that the unobservable latent segments S in the population is a function of general perceptions and attitudes, as well as socio-demographic characteristics:

$$Y_{ns}^{*} = \gamma_s Z_n + \zeta_n, s = 1,2, \ldots, S$$

4.15

where Z_n is a vector of psychometric constructs (i.e. perceptions and attitudes) or socio-demographic characteristics, while γ_s is a vector of parameters to be estimated.

If the error terms are iid, and $\mu = 1$, the probability that visitor *n* belongs to segment *s* (P_{ns}) is expressed as (Gupta and Chintagunta, 1994):

$$P_{ns} = \frac{\exp(\gamma_s Z_n)}{\sum_{s=1}^{S} \exp(\gamma_s Z_n)}$$

4.16

where γ_s(*s*=1, 2, 3, ..., *S*) are unknown segment-specific parameters. The γ_s denotes the contribution of individual characteristics to the probability of segment membership. Simply put, equation 4.16 is a logistic probability for the visitor *n* belonging to segment *s*. Other functional forms can be used to represent membership in a segment subject to the constraints of $\sum_{s=1}^{S} P_{ns} = 1$ and $0 < P_{ns} < 1$ not being violated. Normalising the right hand side of equation 4.16 with respect to the parameters of segment *S* gives:

$$P_{ns} = \frac{\exp(\Delta\gamma_s Z_n)}{1 + \sum_{s=1}^{S-1} \exp(\Delta\gamma_s Z_n)}$$

4.17

where $\Delta\gamma_s = \gamma_s - \gamma_S$ is the difference in the effect of the demographic variable Z_n on the probability of membership in segment *s* from the effect of that variable belonging to segment *S*. The size of each segment can be calculated as:

$$W_s = \frac{\sum_n P_{ns}}{N}$$

4.18

The probability of visitor *n* in segment *s* choosing alternative *i* ($P_{in(s)}$) can be calculated as the product of the probabilities in equations 4.14 and 4.17.

$$P_{in(s)} = \sum_{s=1}^{S} \left[\frac{\exp(\Delta\beta_s X_{in|s})}{1 + \sum_{j=1}^{J-1} \exp(\Delta\beta_s X_{jn|s})}\right] \left[\frac{\exp(\Delta\gamma_s Z_n)}{1 + \sum_{s=1}^{S-1} \exp(\Delta\gamma_s Z_n)}\right]$$

4.19

γ_s and β_s in the latent class model can be estimated *via* ML procedures with respect to the parameter vector (Swait, 1994). The log likelihood function is shown in equation 4.20 (Boxall and Adamowicz, 2002).

$$\ln L(\alpha, \beta | S) = \sum_{n=1}^{N} \sum_{m} \sum_{i \varepsilon J_n} \delta_{nmi} \ln \left(\sum_{s=1}^{S} P_{in(s)} \, x \, P_{ns} \right)$$

4.20

where *n* refers to the number of respondents, *m* is the total number of choice sets, *i* represents the alternatives from the CEs, and δ_{nmi} is equal to 1 if the visitor chooses alternative *i* and 0 otherwise.

The existence of heterogeneity in the choice data can be determined through the adjusted psuedo-R^2. If the adjusted psuedo-R^2 increases as the number of segments is increased, it indicates that there is heterogeneity in the choice data (Boxall and Adamowicz, 2002).

The number of latent segments can be determined using various criteria including: (1) information criteria such as Akaike Information Criterion (AIC); Bayesian Information Criterion (BIC); etc. where the number of segments is based on the minimum value of the information criteria, or (2) by considering the objective of the study, expert judgement, and past experience.

Though no specific guidance is given on this criterion, Swait (1994) emphasized the importance of considering other factors when selecting an optimal number of latent segments. Scarpa and Thiene (2005) noted that the number of classes influences the significance of parameters. Classes with low membership probabilities tend to have less significant parameters as the number of segments increase. Finally, the decision on whether to use RPL or LCM depends on the analyst's choice because there is no empirical evidence to support one over the other (Provencher et al., 2002).

4.4 Welfare Measures from Choice Data

Several welfare measures can be estimated using choice data. These include the welfare implications for environmental or management changes. The parameters estimated in section 4.3 can be used to derive the Hicksian compensating variation.

Without considering the income effects, the compensating variation (CV) in MNL can be estimated as (Boxall and Adamowicz, 2002):

$$CV_n = \frac{1}{\varphi}\left[ln\left(\sum_{i\epsilon J} \exp\,(V_i^0)\right) - ln\left(\sum_{i\epsilon J} \exp\,(V_i^1)\right)\right]$$

4.21

where CV_n is the compensating variation for the visitor *n*, φ is the marginal utility of income, V_i refers to indirect utility function of choice *i* and the superscript as 0 and 1 represent the initial state and new state with changes, respectively.

If the objective is to estimate changes in particular attributes, for example an improvement in attribute *k*, this can be done by estimating the appropriate implicit price. The value of the implicit price explains the amount of money that respondents are willing to pay in order to get an additional improvement in *k* attribute and it can be obtained as (Bennett and Adamowicz, 2001).

$$\text{Implicit Price (IP)} = \frac{\beta_k}{\varphi}$$

4.22

where k refers to the parameter of a non-monetary k attribute while φ is a parameter for the price or cost. The equation for CV in MNL is not suitable for LCM because the former assumes homogenous preferences in the choice data.

The compensating variation in LCM in each segment can be estimated using the segment-specific utility parameters as (Boxall and Adamowicz, 2002):

$$CV_{n|s} = \frac{1}{\varphi_s}\left[ln\left(\sum_{i\epsilon J} \exp\left(V_i^0\right)\right) - ln\left(\sum_{i\epsilon J} \exp\left(V_i^1\right)\right)\right]$$

4.23

where s refers to the value of utility parameters specific to segment s. By taking account of the segment membership in the formula, equation 4.23 can be expressed as (Boxall and Adamowicz, 2002):

$$CV_n = \sum_{s=1}^{S} \gamma_s\left(\frac{1}{\varphi_s}\left[ln\left(\sum_{i\epsilon J} \exp\left(V_i^0\right)\right) - ln\left(\sum_{i\epsilon J} \exp\left(V_i^1\right)\right)\right]\right)$$

4.24

where γ_s is the probability of membership in segment s.

4.5 Benefit Transfer

The extrapolation of estimates from one or more sites to other similar sites is known as benefit transfer (Colombo et al., 2007; Bueren and Bennett, 2004; Garrod and Willis, 1999). The original site is sometimes referred to as the study site, while the destination site is known as the policy site. A benefit transfer is undertaken in environmental valuation because original studies are considered expensive and time-consuming (Harrison and Lesley, 1996). Therefore, exploring transferability of existing estimates of environmental benefits could help to reduce costs.

4.5.1 Criteria for a Benefit Transfer

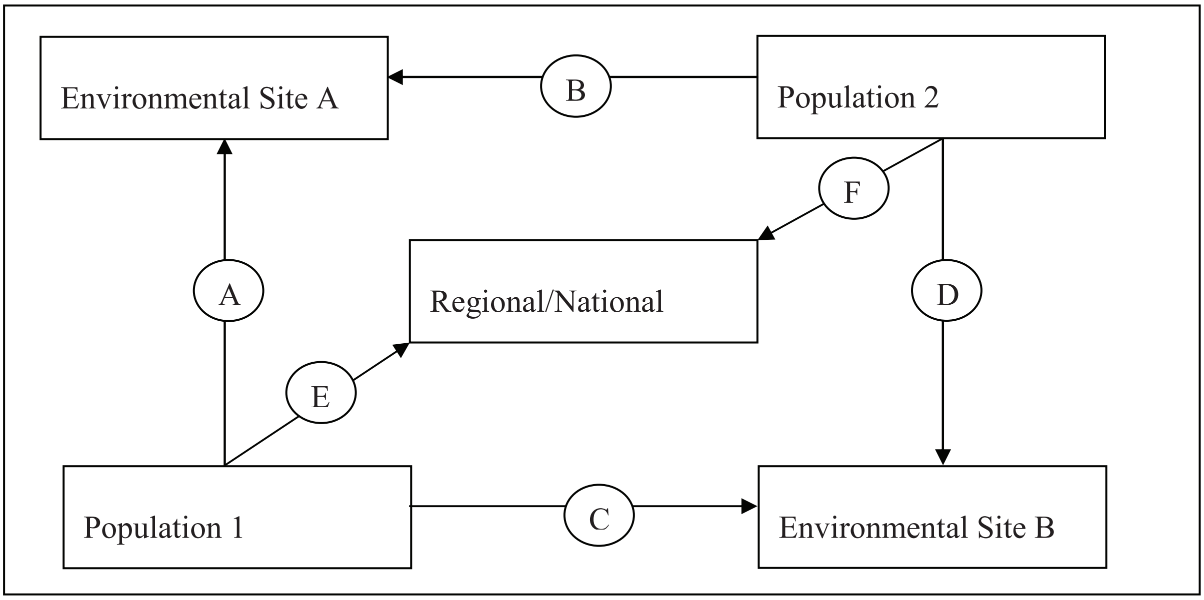
There are various considerations that must be taken into account when conducting benefit transfer. These include: (1) the environmental goods at the study site must be identical to the environmental goods to be valued at the policy site; (2) the study site must exhibit the same population characteristics as the policy site; and (3) the impacts of environmental changes on consumer welfare at the study site must be identical to the impacts on consumer welfare at the policy site. These guidelines are necessary to avoid a problem of estimate discrepancies between study site and policy site (Boyle and Bergstrom, 1992).

However, discrepancies of estimates between the study site and the policy site could arise from the different availability of substitute sites at the policy area, failure to account for the scale of environmental changes, natural characteristics, cultural attitudes and site usage (Bueren and Bennett, 2004; Hanley et al., 2006; Morrison and Bennett, 2004).

4.5.2 Benefit Transfer in Choice Experiments

The application of CE data for benefit transfer has been made in various studies including river ecology quality (e.g. Hanley et al., 2006; Morrison and Bennett, 2004), recreational activities (e.g. Morey et al., 2002), coastal land management (e.g. Jiang et al., 2005), wetlands area (e.g. Morrison et al., 2002) and conservation-development (e.g. Johnston, 2007).

Figure 4.1: Types of Benefit Transfer in Choice Experiments



Source: Adapted from Morrison and Bergland (2006)

As illustrated in Figure 4.1, there are four types of benefit transfer in CEs and each transfer can be denoted by the letters A, B, C, D, E or F. The four benefit transfers are: (1) the value of one study site held by two different populations- A and B or C and D; (2) a multiple site value given by a particular population- A and C or B and D; (3) a different site value for a different population- A and D or B and C; and (4) the value of a site for different geographical areas (e.g. regional or national)- A and E or D and F (Morrison and Bergland, 2006).

4.5.3 A Benefit Transfer Test

Usually, two types of transferability tests are undertaken in CEs: transferability of the demand function and transferability of implicit prices (Colombo et al., 2007; Morrison et al., 2002).

4.5.3.1 Transferability of Demand Function

The demand function test investigates whether estimates in the study site can be transferred to the policy site. The transferability (i.e. $H_0: \beta_{SS} = \beta_{PS}$) can be tested with a likelihood ratio (LR) test as proposed by Swait and Louviere (1993). This test has been used in various studies (e.g. Colombo et al., 2007; Morrison et al., 2002). Hanley et al. (2006) however, applied the LR test analogous to the so-called "Chow test for structural break" as:

$$LR = -2(LL_p - (LL_{ss} + LL_{ps})) \quad \textbf{4.25}$$

where *LL* refers to log likelihood value. The subscript *p* is for the pool data, *ss* is the study site data and *ps* for the policy site data. The test statistic is approximately chi-square distributed with degrees of freedom equal to the number of parameters added. If the test statistic is larger than the appropriate chi-square statistic, then H_0 will be rejected, suggesting that there is a significant difference in the parameter vectors for the study site and policy site models.

4.5.3.2 Transferability of Implicit Prices

The transferability of implicit prices (i.e. $H_0: IP_{ss} = IP_{ps}$) is important in cost-benefit analysis and has been used by various analysts (e.g. Colombo et al., 2007; Morrison et al., 2002). The test can be implemented through various approaches such as the Wald test (Hanley et al., 2006), the equivalence test proposed by Kristofersson and Navrud (2005), and the means equality test proposed by Krinsky and Robb (1986).

Krinsky and Robb (1986) demonstrated that the values (i.e. elasticises) calculated from a bootstrapping simulation method produce a precise distribution compared to a linear approximation approach. Based on their findings, the mean and standard deviations derived from the bootstrapping simulation of 1000 draws were better than results from a linear approximation. Thus, the confidence intervals generated from the mean and standard deviations in simulation are more reliable than linear approximations. These confidence intervals can then be used to test the transferability of implicit prices.

Implicit prices that overlap with the confidence intervals are said to be similar (Morrison et al., 2002). This means for instance that, if the implicit price of Park A falls between the confidence interval of Park B's implicit price and the implicit price of Park B falls between the confidence interval of Park A's implicit price, then these values are transferable between the two sites.

4.6 Conclusion

This chapter reviews techniques, applications and benefit transfer in CEs. Two issues were reviewed: design and estimation. Design involves selecting attributes and their levels. This includes the type of measurement for attributes and the number of attributes to be used in a CE study. Then, the experimental design follows. This includes the generation of alternatives for CE surveys. The remaining discussion involved the design of the questionnaire, sampling, data collection and data coding.

This chapter also reviews some models that are commonly used to estimate choice models. These include MNL, RPL and LCM. Several aspects were discussed for each model including ML procedure and their advantages and limitations. Application of CEs in welfare measurement was also discussed.

Finally, benefit transfer criteria and tests were explained. Two transferability tests were reviewed: transferability of demand function; and transferability of implicit prices. The implementation of CEs in this study is explained in the next chapter.

Chapter 5 : Research Methodology

5.1 Introduction

The main objective of this study was to evaluate public preferences about attributes of parks with a Choice Experiment (CE) technique. A secondary objective was to investigate transferability of values between two sites, Kuala Lumpur (KL) and Shah Alam (SA). How were these objectives achieved? This is discussed in eight sections, beginning with an explanation of the process of generating attributes and their levels for the CE questions in Section 5.2.

Section 5.3 discusses how the final attributes and their levels were chosen. For this task, two qualitative techniques were used: focus group meetings, and stakeholder interviews. The selected attributes and their levels allowed alternatives to be generated, and eventually presented in choice cards, as explained in Section 5.4.

Section 5.5 discusses the questionnaire used to elicit information from the respondents. This section also explains some questions for identifying ill-informed responses on CE questions. Section 5.6 discusses the criteria for choosing a benefit transfer site, followed by a discussion of the pilot survey. The sampling method used in the study is described in Section 5.8. Finally, Section 5.9 provides a conclusion for the chapter.

5.2 Generating Attributes for the Choice Experiments

A review of economic studies of outdoor recreation parks reveal that many have investigated public preferences for site attributes using techniques such as CEs or hedonic pricing. Such studies tend to focus on objective and measureable attributes, rather than on subjective attributes. Such a focus is more relevant to managers who generally have more control over the provision of objective site attributes, such as a 'picnic site,' rather than a subjective one such as 'family atmosphere'. Most objective site attributes can be shown to belong to one of the following general attribute categories: (1) amenities; (2) recreational facilities; (3) informational attributes; (4) natural attractions; and (5) price attributes.

5.2.1 Generic Attributes of Outdoor Recreation Parks

Table 5.1 illustrates how the various site attributes investigated in a range of economic studies in Malaysia and other parts of the world may be divided into these five general attributes.

Table 5.1: Categories for Specific Attributes used in Economic Studies

Attribute Categories	Specific Attributes	Relevant Studies
Amenities	boat launch, patrols, picnic shelters, paths/seating, accommodation	(e.g. Zinkhan et al., 1997; Schroeder and Louviere, 1999; Bullock, 2008, Shuib et al., 2006)
Recreational Facilities	play facilities, playgrounds, athletic fields, swimming pools,	(e.g. Bullock, 2008; Schroeder and Louviere, 1999)
Information	maps and signs, education	(e.g. Chin et al., 2000)
Natural Attractions	number of birds, plants, water features, natural features, lake conditions	(e.g. Othman et al., 2004; Bullock, 2008; Laitila and Paulrud, 2006; Siderelis and Moore, 1998)
Price	entrance fee, package price, license fee, nightly camping fee	(e.g. Shuib et al., 2006; Zinkhan et al., 1997; Jamal and Shahariah, 2004; Laitila and Paulrud, 2006; Kemperman et al., 2000; Schroeder and Louviere, 1999)

As this study is designed to provide both a specific valuation of the site attributes of Malaysian Agricultural Park (MAP) and a more generic benefit transfer model for recreational parks in Malaysia, it is appropriate to use generic rather than specific site attributes in the study. Given the review reported above, the same generic site attributes identified in Table 5.1 are incorporated in the CE design for this study. This requires a careful definition and explanation of both the generic attributes and the associated levels of provision (i.e. how to explain the difference between low, medium, and high levels of the generic attribute “recreational facilities”).

5.2.2 Attribute Levels

Levels in generic attributes are described according to the number of specific attributes available. Attributes with higher levels comprised of more specific attributes compared to those with medium and basic levels. Four three-level attributes and one two-level attribute have been chosen for this study. The attributes with three levels include recreational facilities, informational attributes, activities related to nature appreciation, and package price. The levels are basic, medium and higher. The amenity attribute is described with two levels: basic and higher.

To assist respondents answering the CE questions, these attributes were presented in a pictograph format. Such a strategy (i.e. using symbols, graphics, or pictures) has been employed by analysts such as Rolfe and Bennett (2008), Álvarez-Farizo and Hanley (2002), and Campbell (2007). The candidate attributes and their levels are shown in Table 5.2.

Table 5.2: List of Candidate Attribute and Their Levels

Attribute	Level
Amenities	Basic Higher
Recreational Facilities	Basic Medium Higher
Information	Basic Medium Higher
Natural Attractions	Basic Medium Higher
Package Price	Basic Medium Higher

The suitability of these attributes and their levels were investigated by using two qualitative techniques: focus group meetings and stakeholder interviews.

5.3 Testing the Attributes and their Levels through Focus Group Meetings and Stakeholder Interviews

One of the main reasons for utilising qualitative techniques is to obtain comments from the participants about the suitability of attributes and their levels. Suitability is assessed in three realms, including (1) participants' understandings of the attributes, and trade-offs between alternatives, (2) possible range of levels the attributes may take, and (3) which pictographs are most appropriate to represent the attributes.

5.3.1 Focus Group Meetings

A series of focus group meetings was organised to test the appropriateness of the attributes and their levels. The structure outlined by Powe (2007) was adopted for these meetings. Three focus group meetings were conducted before the pilot survey. The number of participants in each meeting was between six and eight people. A preliminary meeting was held in Newcastle. Participants in the meeting came from Malaysian families studying at Newcastle University, a majority of whom had higher levels of education. This was a pilot meeting before the actual focus group meetings in Malaysia were held.

In the first focus group held in Newcastle, the discussion began with a brief introduction about the purpose of the meeting. This was followed by an explanation of the topic to be discussed. Participants were asked to answer several general and specific questions. General questions included what types of recreational parks they visited, and how frequently they visited these parks in a three-month period, the reasons for their visits to recreational parks, the activities they were involved in during these visits, and any problems they may have faced in the parks.

The participants were also shown the list of attributes and their levels, and they were asked to answer three CE questions. It is worth noting here that the attributes had been discussed earlier in the meeting before they were revealed.

For example, one participant discussed the natural attractions attribute when explaining the reasons for her visits to recreational parks. She also discussed the importance of information provided to visitors at recreational parks. For her, information was very important if she was visiting a park with friends. This attribute, however, was not important when she visited a park with family members, because in such cases she preferred to spend time with her family instead of reading the information. To conclude, this participant explained that the importance of information depended upon who was accompanying her during her visit to the park.

Meanwhile, attributes of recreational amenities and facilities surfaced when participants discussed various problems that they faced when visiting recreational parks. These problems included low levels of maintenance, as sometimes even when amenities and facilities would be provided, they were not friendly to disabled visitors, and often had low levels of security. Security was not only discussed in terms of lack of staff or forest rangers (for example, in forest parks) but also in terms of lack of signs about dangerous areas, accessibility to emergency treatments, etc.

The package prices for adults proposed in the meeting were RM5, RM20, and RM35 per person. These amounts were chosen based on the current charges at the most interesting places in Malaysia. The reason for including package prices was to examine participants' opinions of parks' entrance charges for visitors. Some of the participants agreed with the idea, and some did not. Those who agreed were more concerned with the benefits that they would get from visiting the parks in exchange for the charges that they would have to pay.

Suggestions were given about the pictographs used for the attributes. People suggested using coloured pictographs, and avoiding vague pictographs, particularly those related to reading activities, prayer halls, and picnic areas.

The final session at the meeting involved the CE questions. One of the participants was confused with the attributes offered in the hypothetical parks. He asked why he would have to pay a higher amount for fewer attributes (or low levels) compared to other hypothetical parks with more attributes (or higher levels). His question was answered by another participant, who explained the element of trade-off in the CE questions. Ultimately, all the participants were happy with the attributes, and gained an understanding of the concept of trade-offs.

The second focus group meeting was conducted in Kuala Lumpur (KL), Malaysia. The participants in this meeting were selected from lower education and lower income level groups. Seven out of the eight participants had been educated below the SPM level, and earned less than RM2000 per month. A majority of them were doing menial jobs. These demographic characteristics were chosen for investigating this particular group's understandings of the attributes and their levels. Though levels of understanding had been tested in the pilot meeting with encouraging results, this could have been influenced by those participants' more affluent and educated backgrounds.

In general, the results of the second meeting confirmed that a majority of the participants understood the attributes and agreed with their levels, apart from the package price. Initially, they totally disagreed with this attribute, because they felt that the costs of activities and facilities provided at parks should be met by the government and not be borne by themselves. However, they ended up agreeing with this attribute after the reasons they would have to pay were explained to them.

In reality, minimal or no charges are usually imposed on visitors of public recreational parks in Malaysia. Based on this fact, the maximum price (RM35) seemed unrealistic in the real world. To investigate this perception, an interview was conducted with the officers of the MAP and the City Hall of Kuala Lumpur (CHKL). These two officers gave different opinions about what the maximum price should be. The officer working with the MAP suggested that the maximum price was too low for the variety of facilities offered. The officer from the CHKL, on the other hand, indicated that the public would not pay such a high price. The disagreement between these two officers provided the motivation for a third focus group meeting. The report of these interviews is presented in Section 5.3.2.

The main objective in the third focus group meeting was to investigate the maximum package price. Should the price be increased from RM35 to RM50? To achieve a fair discussion, the participants selected for the meeting came from a mixture of lower and higher-level income groups. The results of this meeting suggest that participants preferred the maximum package price of RM35 over that of RM50. Furthermore, participants also suggested the inclusion of a children's price in the attribute. Half the adult's price was suggested for children.

The initial list of the attributes and their levels, together with the comments from the focus group meetings, prepared the attributes for discussions with parks stakeholders. A number of park managers were identified to be interviewed.

5.3.2 Stakeholder Interviews

The main reason for having these interviews was to have stakeholders verify the attributes that would be used in the actual survey. This was important because the attributes in the survey needed to be seen as policy-relevant (Blamey et al., 2002). Additionally, the interviews would ensure the suitability of the pictographs, and be used to gain information about future plans in recreational parks.

A letter to conduct an interview involving several officers from governmental departments was sent out a month before scheduled interview date. The selection of officers was guided by the purposes of the meeting, as presented in Table 5.3.

Table 5.3: The List of Park's Stakeholder Interviews and Its purposes

Department	Purpose
Malaysian Agricultural Park (MAP)	Attributes and levels
City Hall of Kuala Lumpur (CHKL)	Attributes and levels
Forestry Department of Peninsular Malaysia	Attributes and levels
National Landscape Department (NLD)	Pictographs suitability
Economic Planning Unit (EPU)	Government future plans

Those interviewed were officers in charge of parks of the MAP, the CHKL, and the National Landscape Department (NLD). The first interview was held with an officer from the CHKL, in the first week of April 2009. Interviews with officers from the MAP and the NLD followed.

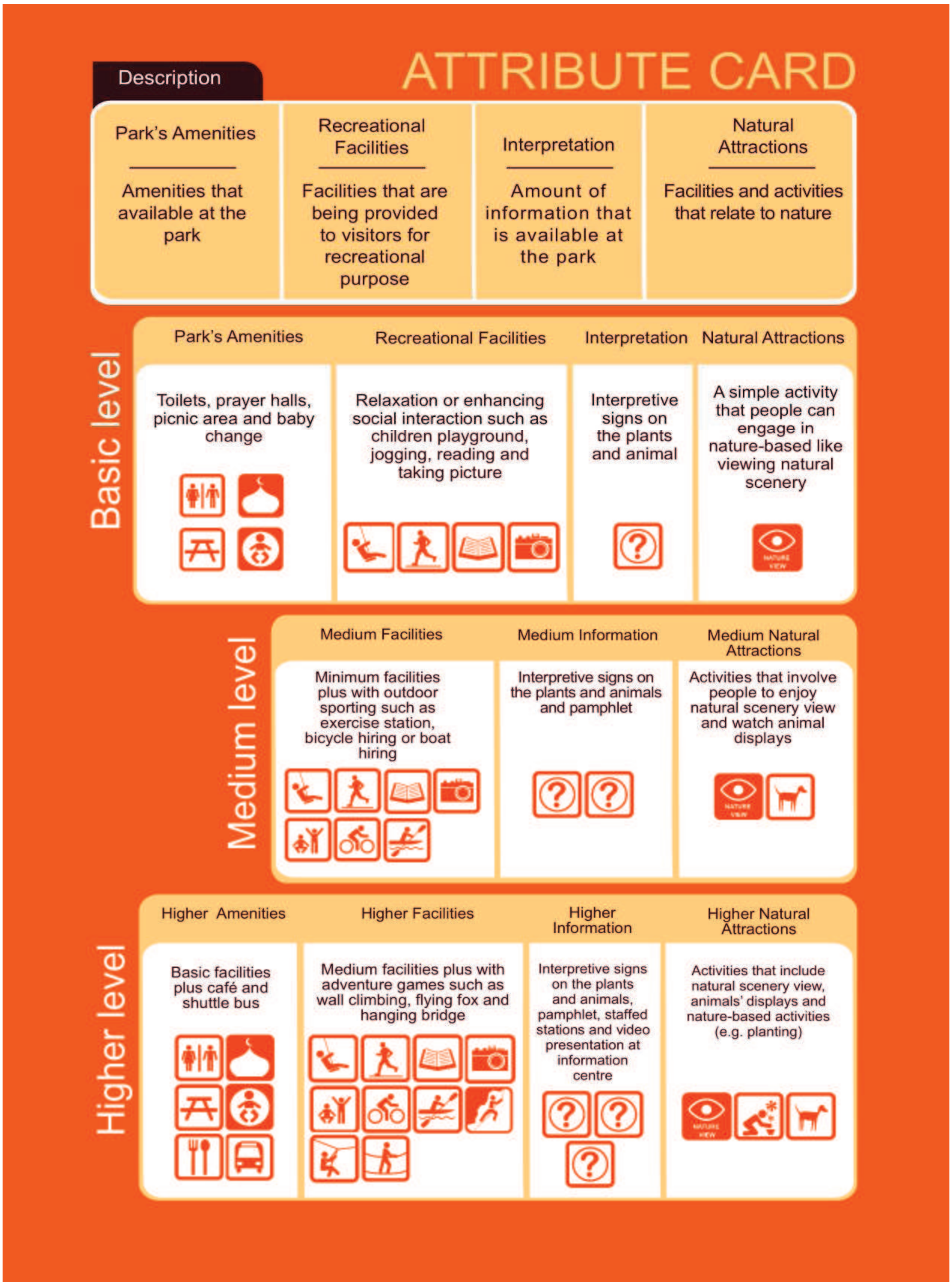
The interviews began with explanations of the attributes and their levels, which participants were asked to rate. On the whole, the interviewees were happy with the proposed attributes and their levels, aside from price. They wondered why visitors would have to pay, because traditionally, public recreational parks are always visited without charge. The details of the interviews are explained below.

The main topic of the interviews was the value of the package price. The proposed prices for adults were RM5, RM20, and RM 35, while the costs for children were RM2, RM10, and RM17. According to the officer at the CHKL, RM35 was reasonable, in terms of the extent of facilities and activities provided, but he still had doubts that visitors would be willing to pay that amount. The officer at the MAP, on the other hand, stated that RM35 was too low for the range of facilities and activities offered, especially for the extreme recreation games. He actually suggested that the price should be increased to RM100, rather than to RM50. His suggestion was made based on the costs of providing the facilities and activities, as well as on the actual charges made by present-day operators. The disagreement between these officers was solved through a focus group meeting, as explained in section 5.3.1.

Interviews to assess the appropriateness of pictographs to be used in the CEs were made with officers from the NLD and the Public Works Department of Malaysia (PWDM). Findings show that there are no standard pictographs presently used in Malaysia. Officers were shown a list of coloured pictographs representing proposed specific attributes. They were asked about the clarity and suitability of the pictographs in representing the attributes. Comments received from the officers were encouraging, because they believed that the proposed coloured pictographs were suitable for representing the attributes.

The proposed coloured pictographs needed to be verified by officers at the CHKL and the MAP, because these officers are familiar with what pictographs would be suitable for their parks. Results show that they were happy with the proposed pictographs. The pictographs were approved to represent the attributes in the study. Descriptions of the attributes and their pictographs are presented in the attribute card as shown in Figure 5.1.

Figure 5.1: The Attribute Card



Based on the attributes and their levels generated, the next section explains how pair-wise alternatives were created and eventually presented in a choice card form. This process is explained in Section 5.4.

5.4 Experimental Design

The experimental design in this study was developed in three stages. The first stage determined the number of choice tasks. With four three-level attributes and one two-level attribute, the results of the Statistical Analysis Software (SAS) programme indicate that the number of choice tasks (or runs) suited to the perfect balance and orthogonal elements is eighteen.

The second stage involved creating an Orthogonal Main Effect Plan (OMEP). For this stage, software developed by Nguyen was used, with the software accessible at http://designcomputing.net/gendex/noa/. OMEP generated by Nguyen is said to have a nearly orthogonal array (Kuhfeld, 2004).

The last stage involved pairing the alternatives, using the software package developed by Burgess (2007). The eighteen choice tasks of the OMEP generated from Nguyen were used as a starting design with a generator of 1,1,1,1,1. It is worth noting here that the study only considers main effects. The results of the software package, with two options in each choice task, show that the design is 100% efficient, with the main effects uncorrelated. The design generated by the software was *D-efficient*, with the *D-error* is sufficiently low (Rose and Bliemer, 2006)

The status quo option was also included in the alternatives, where the option represents the current situation in the study area. By combining the status quo along with the two options, the total number of alternatives used in the study is three. The combination is known as a choice card. The combination (two options and one status quo) has been employed by many analysts in CEs (e.g. Bergmann et al., 2008; Boxall and Adamowicz, 2002). See Table 4.1 for further studies using the combination. All the eighteen choice cards are shown in Appendix 5.1.

Asking respondents to answer all eighteen choice cards may be too much of a burden for them. The number of choice cards, therefore, was reduced to six. This number was seen as a manageable amount for respondents. This study used a rotating approach to select the six choice cards, rather than a blocking approach, as is commonly reported in the CE literature. The explanation of the rotating approach is as follows.

The procedure first divides the eighteen choice cards into eighteen groups, where each group contained a different combination of six choice cards. Next, these groups were alternatively presented to each respondent. For instance, the first respondent was presented group 1, containing cards 1, 2, 3, ..., and 6, while group 2 (cards 2, 3, 4, ..., and 7) was shown to the second respondent. This rotation continued until the eighteenth respondent, who was shown the group 18. Group 18 contained cards 18, 1, 2, ..., and 5. The nineteenth respondent was shown group 1 and the rotation continued.

The choice cards to which respondents were asked to give their response are contained in one of the sections of the questionnaire. Other sections included in the questionnaire are explained in Section 5.5.

5.5 Questionnaire Design for Choice Experiments

Questions in the questionnaire were divided into three sections, starting with a section for gathering information about respondents' attitudes towards parks. In the first section, respondents were asked about their past experiences visiting recreational parks. They were asked to indicate the types of parks that they have visited and the frequency of their visits over the last twelve months. In addition, respondents were also asked about the typical recreational amenities and facilities that they have used at recreational parks. These questions were skipped if respondents have not visited recreational parks over the last twelve months.

Respondents were also asked the importance they attach to various recreational parks attributes such as amenities, facilities, information and natural attractions. These questions were not only used as warm-up questions, but also helped respondents to focus on the subject of the study (Krupnick and Adamowicz, 2007). The questions were asked using a 1 to 5 likert scale format. Other questions included motivation questions, as employed by Boxall and Adamowicz (2002) in their study of moose hunting, used to determine respondents' motives for visiting parks.

The second section was the CE. This section began with a brief introduction about the attributes and their levels used in the study. Respondents were told about the experiment's rules. Respondents were shown a sample choice card before being presented with the actual choice cards.

In total, six choice cards were shown to respondents. At the end of the section, respondents were asked some questions about how they made their choices. In these questions, respondents were asked to specify the attributes or a combination of attributes they considered when making choices. These questions were used to identify ill-informed responses.

The last section gathered information on socio-demographic characteristics, such as participants' ethnic identities, ages, highest levels of education attained, household incomes and household size.

These questions were translated into the national language of Malaysia, *Bahasa Malaysia*. Each questionnaire took approximately 25 to 30 minutes to complete. Before applying the questionnaire in the survey, the questionnaire was tested in a pilot survey, in accordance with recommendations in the CE literature (e.g. Morrison et al., 2002; Colombo et al., 2007). After taking into account the comments in the pilot survey, the final questionnaire was developed. This questionnaire is presented in Appendix 5.2. Details about the pilot survey are explained in Section 5.7.

As explained earlier in this chapter, this study was designed to provide both a specific valuation of the site attributes of the MAP, and to develop a generic benefit transfer model for recreational parks in Malaysia. Therefore, the next section explains how the choice of site for a benefit transfer model was made.

5.6 Choice of Benefit Transfer Site

The benefit transfer site consisted of recreational parks in KL. This site was chosen according to three criteria: (1) the location of parks in KL and the MAP in Shah Alam (SA) are identical, as both are located in urban areas. These parks are considered urban parks. (2) KL is located nearer to SA than other cities in Malaysia. The distance between KL and SA is 32km. Therefore, it is easy to collect data in KL than in other cities. (3) In terms of socio-demographic characteristics, the population in KL is similar to that in SA, particularly in relation to people's education levels.

As shown in Table 5.4, education levels in KL are similar to those in SA than in other cities in the Peninsular Malaysia, such as Kangar (located in the north), K. Terengganu (in the north-east) and Seremban (in the south). For example, 9% of the population of KL, and 11% of the population of SA are educated to degree level. In other cities, however, only 4% (Kangar and K. Terengganu) and 6% (Seremban) possess degrees.

Table 5.4: Census Data for Selected Cities in the Peninsular Malaysia (%)

Education Levels	SA	KL	Kangar	K. Terengganu	Seremban
Up to SPM	76	79	89	89	86
Up to Diploma	13	11	7	7	8
Up to Degree	11	9	4	4	6

Source: Department of Statistics Malaysia (2005)

In this study, a benefit transfer model investigates whether or not the estimates for parks in KL can be transferred to the MAP in Shah Alam. For this purpose, KL is considered as the study site while SA is the policy site. The locations of KL and SA are shown in Figure 5.2.

Figure 5.2: The location of MAP, Shah Alam and Kuala Lumpur

Source: ssa-sba.com/images/map_selangorb.jpg

5.7 Pilot Survey

Twenty participants were interviewed for the pilot survey. The participants were equally divided between KL and SA and an equal of male and female were interviewed in both areas. However, the participants all had different educational backgrounds. In the survey, some of the participants had post-graduate degrees, and some of them had only primary school educations. Participants in the survey came from various age groups and ethnicities.

In general, all ethnic groups were willing to participate in the survey, except for the Chinese. This group was unwilling to participate for many reasons, including lack of time to be interviewed and lack of interest in recreational park issues. This was particularly the case amongst middle-aged groups (i.e. 25 to 40 years old).

Initially, participants in the pilot survey were approached on weekdays at their homes. This approach, however, failed to reach many participants, because a majority of them were working during this time. The survey days were then changed to the weekends. Though the participants were more easily reached at home on the weekends, most of them were not willing to be interviewed. Eventually, the pilot survey was changed back to weekdays, but targeted public areas such as shopping complexes, restaurants, etc. This approach appeared to work.

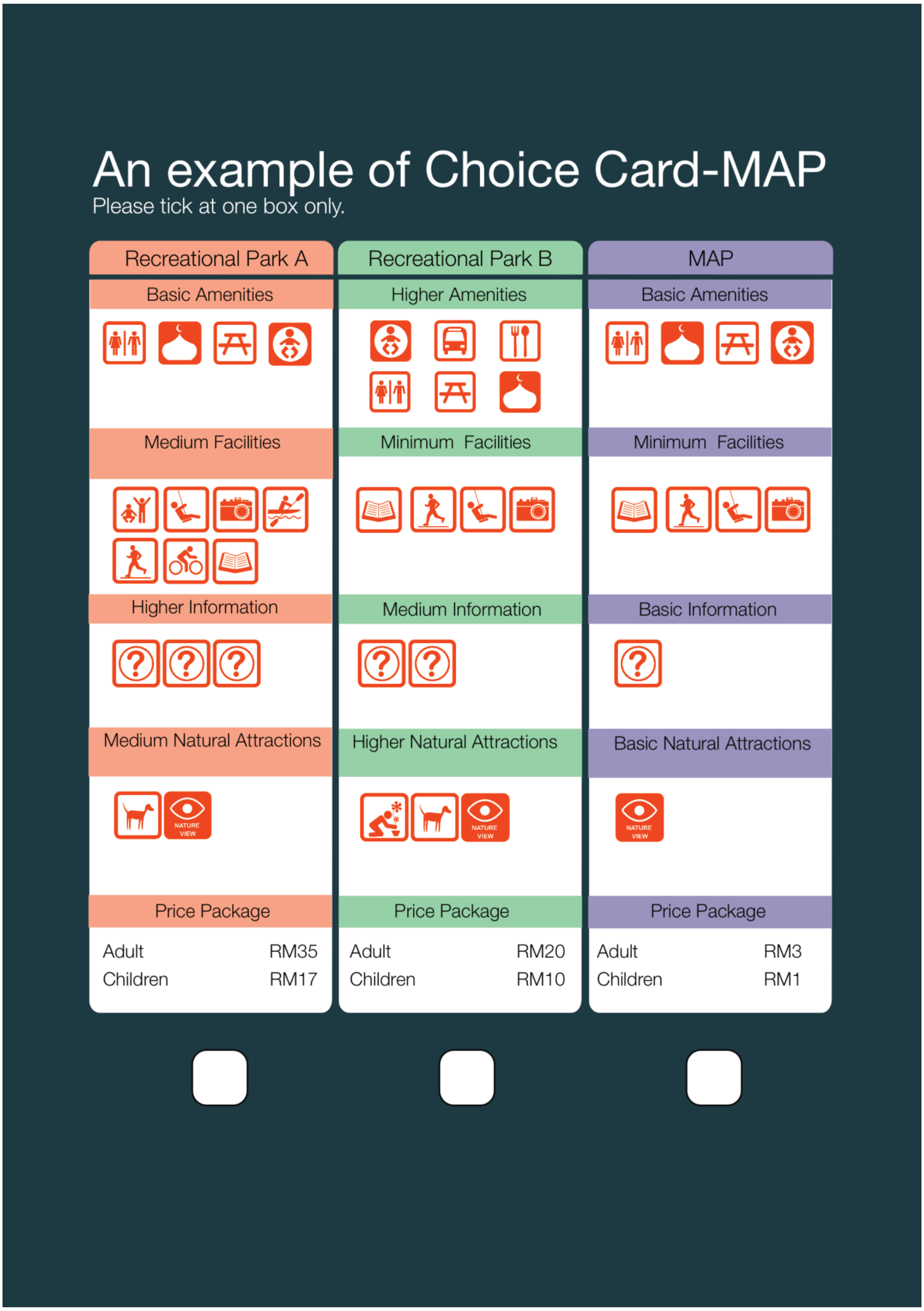
In the survey, a face-to-face interview technique was chosen. Such a method works very well, particularly when involving the CE questions. Participants who did not understand the questions were assisted by the interviewers.

As explained in Section 5.5, one of the objectives in the pilot survey was to test the appropriateness of the translated questionnaire. The translated questionnaire was well-understood by the participants, except for the questions about motivation. In these questions, two problems encountered were similarity of motives and the difficiulty of finding a suitable translated phrase. Overall, the translated questionnaire was able to convey the same information as the original questionnaire.

Another objective of the pilot survey was to assess the duration of time taken by participants to complete the questionnaire. The results show that a majority of the participants took, on average, 20 to 25 minutes to complete the questionnaire. Most of them were satisfied with the length of the proposed questionnaire.

The use of coloured pictographs in the CE was helpful in reducing the time it took to complete the questionnaire, because participants did not have to continually read the attributes offered in each of the cards in order to make a decision. Choices could be made based on pictographs representing particular levels of attributes offered in the choice cards. Coloured pictographs also helped to prevent participants from becoming bored or tired while answering the choice questions. In conclusion, participants were happy with the use of coloured pictographs in the pilot survey. Sample of choice card for MAP is presented in Figure 5.3.

Figure 5.3: The example of Choice Card



The success of the pilot survey suggests that the designed questionnaire was ready to be used for gathering information from respondents. The sampling methods used in KL and SA and the implementation of the questionnaire are explained in Section 5.8.

5.8 Sampling and Implementation

The target population for the study consisted of residents of KL and SA, Selangor aged eighteen years and over. The study follows a stratified random sampling technique, as applied by Bullock (2008) and Campbell et al. (2008).

There are three major ethnic groups in KL, namely Malays, Chinese, and Indians. The population of KL over the age of fifteen is dominated by Chinese (47%) and Malays (39%), followed by Indians and others (12%) (Department of Statistics Malaysia, 2005). In SA, the area is dominated by Malays (68%). The remaining percentage is approximately equally shared between Chinese, and Indians and others with 16% of each.

Four hundred respondents were interviewed, about half from KL and half from SA. The total number of respondents interviewed for each stratum in both areas is reported in Table 5.5. This number has been calculated based on the stratification in socio-demographic characteristics: gender, ethnicity and age. For instance in Table 5.5, the total sample size for male Malays is 40.

This study used face-to-face interviews, as suggested by the National Oceanic Atmospheric Administration (NOAA) panel, for collecting information from respondents. This is one of the most popular techniques applied by CE analysts (e.g. Christie et al., 2006; Lawson and Manning, 2003).

The procedure for collecting information from respondents was as follows. Respondents were approached in public areas such as shopping complexes. Respondents were first given a brief introduction about the purpose of the survey and were asked for their permission to conduct an interview. The interview continued if the respondents agreed. Otherwise, interviewers approached another respondent in their place. Substitute respondents were sought from the same social stratum as the respondents who refused.

Table 5.5: Target Respondents in Kuala Lumpur and Shah Alam Stratified by Ethnic Groups, Age and Gender

	KL		SA	
Ethnic Groups	Male	Female	Male	Female
Malays				
Age G1 (18-24 years)	14	12	28	28
Age G2 (25-39 years)	16	16	28	26
Age G3 (40 years and above)	10	10	14	12
Chinese				
Age G1 (18-24 years)	12	12	4	4
Age G2 (25-39 years)	16	16	6	6
Age G3 (40 years and above)	10	18	6	6
Indians				
Age G1 (18-24 years)	4	4	4	4
Age G2 (25-39 years)	4	4	6	6
Age G3 (40 years and above)	4	4	6	6
Other ethnics	2	2	-	-

Source: Department of Statistics Malaysia (2005)

Four enumerators were employed, including undergraduate students at local universities. A series of two-day training sessions were organised covering issues such as approaching respondents, introducing themselves and the project, explaining questions in the questionnaire and conducting interviews. During the actual survey, all interviewers were provided with a set of instructions and procedures for conducting the survey.

5.9 Conclusion

To provide a specific valuation model for specific sites at the MAP, as well as a more generic benefit transfer model for recreational parks in Malaysia, this study adopted a generic attributes approach, rather than a specific attributes approach. The transfer site consisted of parks in KL. The generic attributes consisted of four attributes (recreational facilities, information, natural attractions, and package price) with three levels (basic, medium and higher) and one attribute (amenities) with two levels (basic and higher). These attributes produced eighteen choice tasks, and this eighteen were applied as a number of runs to generate an OMEP. The generated OMEP then was used as a starting design to generate pair-wise alternatives.

In total, two alternatives and a status quo option (this is known as choice card) were shown to the respondents. The respondents were only required to answer six choice cards. Ill-informed responses to the choice cards were identified through the use of some follow up questions. Valid responses were analysed, and the results of this analysis are discussed and explained in the following chapter.

Chapter 6 : Results and Interpretation

6.1 Introduction

This chapter presents the empirical results of the study. The results are presented in three sections: (1) the samples' socio-demographic characteristics; (2) modelling; and (3) the benefit transfer analysis. Section 6.2 describes the samples' socio-demographic characteristics, such as gender, age group, ethnicity, etc. The sample profiles have been compared to census data as a means of identifying whether or not the samples are representative of the population in the study areas. Other results reported in this section include respondents' attitudes towards, and experiences of, recreational parks.

Section 6.3 discusses the estimated model coefficients. The section begins with an explanation of the variables that were used in the study, in terms of their meaning, type and label. The rest of the section discusses the estimation models. The interpretation of estimates is explained, starting with the Multinomial Logit (MNL) model, Random Parameter Logit (RPL) model and finally, the Latent Class models (LCM). The estimated implicit prices for each model are also presented in this section.

Section 6.4 demonstrates whether or not the results estimated from the study site, Kuala Lumpur (KL), can be transferred to the policy site, Shah Alam (SA). The transferability for each is reported in two sections: (1) the transferability of the demand function, and (2) the transferability of implicit prices and the transfer errors. At the end of this section, an estimation of consumer welfare for hypothetical parks is calculated. Finally, section 6.5 provides a summary of the chapter and a conclusion.

6.2 Characteristics of the Sample

The face-to-face survey was completed in four weeks, commencing in early May 2009. Four enumerators were employed to undertake the survey. At the end of the second week, an initial enumeration of the interviewed respondents was made. This was done to ensure that the respondents were consistent with the planned stratified sample. The results show that some groups were over-sampled in the KL area but not in SA. Therefore, the remaining interviews concentrated on groups that required more respondents.

As explained in Chapter 5, some follow up questions were used to determine the usable respondents in KL and SA. These questions required the respondents to state the level of frequency for attributes used in the study, when they were answering the Choice Experiment (CE) questions. The frequency was measured as: always; seldom; and never. The respondents who stated "never" to all of these attributes were removed from the analysis because their answers to the CE questions might be ill-informed.

Of the total number of respondents interviewed, 54 respondents in KL and 43 in SA had never considered any of the attributes used in the CE questions. These respondents were removed from the analysis. The total numbers of usable respondents in KL and SA were 188 and 169, respectively. Both totals included the 10 pilot surveys.

In this study, the samples from the KL and SA areas were analysed separately to determine population characteristics for each area. This was undertaken to identify whether or not the sample was fully representative. A further reason for doing a separate analysis was the benefit transfer study. In the benefit transfer study, population characteristics are one of the factors that could lead to discrepancies when the value is transferred from the study site to the policy site. Therefore, before undertaking a benefit transfer, one has to understand the population characteristics for each site (i.e. study and policy site).

Table 6.1 presents both sample and census statistics for socio-demographic characteristics in KL and SA. The right hand column reports the results of statistical tests on differences in proportions between these characteristics. The results show that the samples in KL and SA were statistically different at a level of at least 10% for most characteristics except for gender and membership in a recreation club. In terms of age group, only the group "35 years old and above" was not significantly different.

There were similar proportions of males and females in KL and SA. In terms of ethnic groups, in KL, the proportional breakdown was Malays (52%), followed by Chinese (38%) and Indians and others at 10%. In SA, the ethnic groups incorporated Malays with 68%, Chinese (14%) and Indians and others (18%).

Table 6.1: Socio-demographic Characteristics of Respondents in Kuala Lumpur and Shah Alam

Socio-demographic characteristics		KL (%)		SA (%)		Sig.[b]
		Sample	Census[a]	Sample	Census[a]	
Gender	Male	48	50	50	51	
Ethnicity	Malay	52	43	68	76	***
	Chinese	38	44	14	11	***
	Indian and Others	10	13	18	13	*
Education	Non-degree	53	91	75	89	***
	Degree	47	9	25	11	***
Age Group	18-24 years old	27	23	40	33	***
	25-34 years old	43	28	28	31	***
	35 years old and above	30	49	32	36	
Household Income	Less than RM2,000	9	-	49	-	***
	RM2,000-RM4,999	58	-	33	-	***
	RM5,000-RM9,999	33	-	18	-	***
Presence of Child?	Yes	64	-	79	-	***
Employed?	Yes	76	-	44	-	***
Member of Recreation Club?	Yes	13	-	18	-	

***significant at 1%, ** significant at 5%, and *significant at 10%
a- Department of Statistics Malaysia (2005)
b-The proportion test of socio-demographic characteristics between KL and SA
Source: Survey, 2009

Almost half of the respondents in KL had attained a higher education (i.e. at least completed a first degree at university) compared to SA (25%) where the majority of them were in the younger age group category (i.e. 18 to 24 years old) and still studying. The KL sample, for example, recorded 27% in the age group 18 to 24 years and 43% aged 25 to 34 years. However in SA, the percentage for the age groups 18 to 24 and 25 to 34 years was 40% and 28%, respectively.

The total household income for the samples in KL and SA is also shown in Table 6.1. The majority of respondents in KL were in the middle income category (i.e. RM2000-RM5000). This category accounted for more than 50% of respondents. The percentage in SA, however, was different from that observed in KL, as the majority (49%) were in the low income category (i.e. less than RM2000).

In KL, 76% of the sample was in employment. This percentage was higher than for SA (44%). Students accounted for a higher percentage of those who were not currently in employment in both areas. The percentage was 24% and 83%, respectively. It is worth noting here that there is one established polytechnic, the Polytechnic of Sultan Salahuddin Abdul Aziz Shah, and several private colleges in the SA area. The probability of interviewing students was therefore high when the target locations for sampling were concentrated in public areas, such as in this study. The samples' respondents' membership in recreational clubs for KL and SA were 13% and 18%, respectively.

Table 6.1 also presents the census statistics for socio-demographic characteristics in KL and SA. The sample characteristics for both areas were similar to the census, except for education. Table 6.1 reveals that the samples in KL and SA were biased in favour of respondents who had attained a higher education (i.e. having at least a university degree). In KL, the percentage with higher education in the sample was 47% compared to 9% in the census, whilst in SA the percentages observed in the sample and the census were 25% and 11%, respectively. This therefore indicates that the samples used in the study did not fully represent the population in KL and SA in terms of educational attainment.

As explained in Chapter 5, this study followed a stratified random sampling technique whereby the samples were stratified using three socio-demographic characteristics, namely gender, ethnicity and age. Due to the poor response to pilot interviews in respondents' homes, the actual interviews were conducted in public places. However, these places were visited by high numbers of students and professionals, and it is for this reason that the samples are biased towards young and highly educated respondents. More representative samples could be obtained if the survey was given a greater time input and more financial support.

The analysis of the respondents' attitudes towards, and experience of, recreational parks covers several aspects including the frequency of visits, discouraging factors for visiting parks, etc. This is described in the following section.

6.2.1 Did Respondents Visit Recreational Parks?

In KL, 76% of respondents had visited recreational parks at least once in the last 12 months. The majority of them visited local and council parks 3 to 6 times within this time period. Local parks also recorded a high percentage of respondents making 7 to 12 visits (i.e. 23%). This is because these parks are located close to residential areas. For designated parks, the percentage of respondents who visited less than 6 times in the last 12 months was 95%. No regular visitors (i.e. 26 and more visits) were recorded for this type of park. For details as to the frequency of visits see Table 6.2. However, in SA, 55% of respondents had visited MAP in the last 12 months. On average, they visited the park 1 to 2 times (32%) or 3 to 6 times (32%).

Table 6.2: Respondents' Frequency of Visits (%) to Recreational Parks in Kuala Lumpur

	Types of Park		
Frequency of visits (in the last 12 months)	Local play area (i.e. playground area)	Municipal parks (i.e. Titiwangsa Lake Garden)	Designated parks (i.e. MAP, FRIM)
a)1-2	13	36	89
b)3-6	43	46	6
c)7-12	23	11	4
d)13-25	8	3	1
e)26-52	4	1	-
f)53 and more	10	4	-

Source: Survey, 2009

In KL, the percentage of female visitors to parks in the last 12 months was higher than for male visitors. These were recorded as 77% for the former, compared to 74% for the latter. The scenario is different in SA where the percentages for male and female visitors were 52% and 49%, respectively. The age group 18 to 24 years also showed a higher percentage of visits to recreational parks at least once in the last 12 months in both KL and SA. The percentage for KL was 78% and for SA was 41%.

Many factors discourage respondents from visiting parks (i.e. the location of parks, safety issues, health concerns, etc.). In this study, these factors were explored by including them within the questionnaire survey. Respondents were allowed to choose more than one factor that might discourage them. All these factors are explained in the next section.

6.2.2 Factors Discouraging Respondents from Visiting Recreational Parks

Parks in KL and SA are located near to residential areas. This is illustrated by the study, where the distance from the respondent's home address to the nearest park, was, on average, 4.1km for KL and 2.9km for SA (refer Table 6.3). Although the difference between the average distance observed for the KL and SA samples appears to be small, a test is required to demonstrate whether this difference is statistically significant. This can be undertaken by conducting a *t* test. The results show that the average distance from the respondent's home address to the nearest recreational park is significantly different between KL and SA, at a level of 5% (ρ <0.05).

Table 6.3: Mean and Standard Deviation of Distance from Respondents' Home Address to the Nearest Park in Kuala Lumpur and Shah Alam

Respondents Area	Mean (in km)	Standard Deviation
Kuala Lumpur (n=188)	4.10	7.31
Shah Alam (n=169)	2.94	2.77

Source: Survey, 2009

From the survey, 28% of the 46 respondents in KL stated that one of the reasons they do not visit parks is because the parks are located too far away from their home. This also happened in SA where 24% of the 76 respondents did not go to parks for the same reason.

In KL, other factors that discourage respondents from visiting parks were lack of time (67%) and safety concerns (24%). The percentage of respondents who were discouraged by the poor condition of the parks or the activities available within them was recorded at 15%. However in SA, the order of factors was lack of time, preference for other activities, health problems, etc. The poor condition of parks was the least discouraging factor at only 3%. These percentages are presented in Table 6.4.

Table 6.4: Factors Discouraging Respondents from Visiting Recreational Parks

Factors	KL (%)	SA (%)
Lack of time	67	53
Parks too far from home	28	24
Safety concerns	24	4
Preference for other activities	15	11
Poor condition of park	15	3
Not interested in activities on offer	15	5
Health problems	4	7
Traffic congestion	7	5

Source: Survey, 2009

Other questions in the questionnaire focused on the types of amenities and facilities used by respondents when they visited parks. This is reported in the next section.

6.2.3 Amenities and Facilities Used by Respondents

Amenities and facilities used in the study were classified into four categories. These were services that are available in parks, land-based recreation, water recreation, and extreme recreation. Each category contains several elements. Elements within the service category were a cafe, shuttle bus, and information. For the land-based recreation category, the elements were a playground, animal shows, hands-on-training, picnic area, and camping. The water-based recreation category consisted of fishing, boating, and kayaking. Finally, paintballing, wall climbing, and the hanging bridge were the components of the extreme recreation category. Table 6.5 reports the elements used by respondents at least once a year for each category in KL and SA.

The most popular elements in the first category in KL and SA were information and cafeteria services, respectively. For the land-based recreation activity, the majority of respondents in KL and SA used children's playground facilities. The most popular activities in the water recreation category were similar in KL and SA. The percentage use for these activities was between 21% and 29%, with the most frequently used being kayaking in KL (29%) and boating in SA (27%). The hanging-bridge was the most popular extreme recreation activity for respondents in both KL and SA.

Table 6.5: Amenities and Facilities Used by Respondents (at least once a year) in Kuala Lumpur (n=142) and Shah Alam (n=93)

	KL (%)	SA (%)
Services/Amenities		
Café	67	73
Shuttle bus	14	31
Information	83	71
Land-based Recreation		
Playground	82	72
Animal shows	28	53
Hands-on-training	13	30
Picnic area	32	60
Camping	21	28
Water Recreation		
Fishing	21	23
Boating	22	27
Kayaking	29	23
Extreme Recreation		
Paintballing	7	9
Wall Climbing	6	12
Hanging Bridge	21	28

Source: Survey, 2009.

After identifying respondents' use of the amenities and facilities in parks, their preferences for attributes are then investigated. Six attributes were selected for this exercise on the basis that they are the one most frequently considered by respondents when selecting a park to visit. These are discussed in the next section.

6.2.4 Levels of Importance for Attributes

Respondents were asked to rate how important selected attributes would be when considering which parks to visit in the future. The six attributes were amenities/services, recreational facilities, information, natural attractions, entrance fee, and travel time. To rate the attributes, a 1 to 5 likert scale was used, starting from "not at all important" to "very important". Table 6.6 reports the mean scores for these attributes.

Table 6.6: The Mean Score of Attributes for Selecting a Park- Kuala Lumpur (n=188) and Shah Alam (n=169)

Attribute	KL	SA	p-value
Amenities/Services	4.61	4.56	0.008
Recreational Facilities	4.09	4.07	0.868
Information	4.37	4.37	0.881
Natural Attractions	4.66	4.52	0.000
Entrance Fee	2.75	2.53	0.606
Travel Time	4.04	3.66	0.006

Source: Survey, 2009.

The results in KL reveal that all attributes were rated as at least "important" (i.e. the mean scores were 4.00 and above) except for the entrance fee. The mean score for this attribute was 2.75. The highest rated attribute was natural attractions followed by amenities/services, information, recreational facilities, and lastly travel time. Similar results were obtained in SA. In this area, the highest and lowest mean scores were for services (4.56) and entrance fee (2.53), respectively. Other mean scores were 4.52 (natural attractions), 4.37 (information), 4.07 (recreational facilities), and 3.66 (travel time). The low mean scores for entrance fee for both samples indicates that respondents in KL and SA did not perceive this attribute to be an important factor for park selection. In other words, they are largely indifferent as to whether or not they have to pay.

Equality in the mean scores for attributes between KL and SA was tested using the *t*-test. The results show that the mean scores for amenities/services, natural attractions, and travel time in the two areas were statistically different at the 1% significance level. This is the final analysis in the first section. The next section discusses the analysis of the choice data.

6.3 Results of Choice Experiment

An econometric analysis of CE data in this study is used to estimate the economic value of recreational parks. Since one of the study objectives is to undertake a benefit transfer, two economic values were estimated: (1) the economic value of recreational park attributes for KL (study site), and (2) the economic value of recreational park attributes for MAP at Shah Alam (policy site). The value for each site was obtained from the response to CE questions by the relevant population. This means that the population for

KL provided the economic value for generic recreational parks in KL and the population for SA provided the economic value for MAP.

The results for this section are presented in the following structure: (1) definitions of variables; (2) the estimation of the MNL model; (3) the estimation of the RPL model; and (4) the estimation of the LCM.

6.3.1 Definitions of Variables for Random Utility Models

The variables used in the random utility models are presented in Table 6.7. The variables can be divided into two types. The first type encompasses the variables that are linked to parks and the second comprises variables that relate to respondents' socio-demographic characteristics. The variables linked to parks, or known as parks' attributes, were amenities, facilities, information, natural attractions, and package price.

All variables have three levels, except for amenities. The three levels were basic, medium and higher. Levels for amenities were basic and higher. The package price variable, however, was measured in a quantitative manner with the value of RM5.00, RM20.00, and RM35.00.

Table 6.7: Variables for Random Utility Models

Variable	Type	Definitions
Amen	Qualitative	Amenities and services available at parks. It has two levels- **basic** and higher levels.
Fac	Qualitative	Facilities available at parks. It has three levels- **basic**, medium and higher levels.
Info	Qualitative	Information available at parks. It has three levels- **basic**, medium and higher levels.
NAtt	Qualitative	Natural attractions available at parks. It has three levels- **basic**, medium and higher levels.
Pri	Quantitative	Park entrance fee. The levels for package price were **RM0** or **RM3.00**, RM5.00, RM20.00 and RM35.00.
AgePri	Qualitative	The interaction between age of respondent and package price. It has three levels- **18 to 24 yrs old**, 25 to34 yrs old and 35 yrs old and above.
EduPri	Qualitative	The interaction between education level attained by respondent and package price. It has two levels- **Non-university degree** and university degree

Continuation of Table 6.7: Variables for Random Utility Models

EthPri	Qualitative	The interaction between ethnic group of respondent and package price. It consists of three groups- **Malays**, Chinese, and Indians and others.

*The bold denotes base level.

The number of categorical variables that can be entered into the estimation model is equal to J-1 where J is the total number of categories. The categories for each variable are explained in Table 6.7. As explained in Section 4.3.1, respondents' characteristics were inserted into the model by interacting them with the variable package price. This is because they do not vary across decision. This means that analysts cannot estimate parameters for these characteristics in the utility functions if they enter them directly into the model. All the qualitative variables were coded with the dummy coding.

The variables and the levels used for KL and SA were identical, except for the status quo package price. The status quo package price for MAP is RM3.00 and there is no charge for KL recreational parks. This is because, at present, MAP charges visitors RM3.00 as an entrance fee, whereas there is no entrance charge for parks in KL. Three types of random utility models were investigated - namely MNL, RPL and LCM. These models are, in turn, discussed in the following sections, starting with the MNL model.

6.3.2 Multinomial Logit Model

In this section, the estimated MNL models for KL and SA are presented in Table 6.8. For both areas, two models were estimated. One is the basic MNL model and the other is the MNL model incorporating interactions with the socio-demographic characteristics. Both models were estimated using maximum likelihood (ML) procedures. The indirect utility function (V) for KL and SA is shown in equation 6.1. The difference between the basic MNL model and the MNL with interactions model lies in the coefficient β_n where n denotes socio-demographic characteristics. The latter model includes these coefficients, whilst the former model does not.

$$V = \beta_1.\text{Amen} + \beta_2.\text{Fac1} + \beta_3.\text{Fac2} + \beta_4.\text{Info1} + \beta_5.\text{Info2} + \beta_6.\text{NAtt1} + \beta_7.\text{NAtt2} + \beta_8\text{Pri} + \beta_n.Z_n \quad (6.1)$$

where Z_n refers to interactions between socio-demographic characteristics and the package price. In general, the results reported in Table 6.8 show that the significance of variables estimated from the basic MNL and the MNL with interactions models are similar, except for the variable NAtt for both levels in SA.

In each model, the coefficients for Amen, Fac1, Fac2, Info at both levels, and Price are significant at least at the 10% level and have the *a priori* expected signs. It is noteworthy that the coefficient values for the higher level were greater than the coefficient values for the lower level. This indicates that the marginal utility received by respondents for higher levels of an attribute are greater than the utility received at the lower level. This follows the axioms of choice: *non-satiation,* where the utility received by a consumer increases if the commodity used by the consumer increases.

The attribute of natural attractions (NAtt) is significant (at the 1% level) in the basic and interactions models in KL. This indicates that the respondents in KL appreciate natural attractions and this is expected, because by living in an urban area, such as KL, opportunities to participate in activities such as "hands-on training on planting" are limited. The attribute, however, is not significant in MAP for either model. MAP is located in an urban area and yet, educates visitors through 'hands-on training', so the results contrast with those found in KL.

Most of the estimated interactions variables were significant in KL at 5% or a higher level. The only insignificant variable is AgePri2. In SA, all the estimated interactions variables are significant at 5% or a higher level, except for variables AgePri1 and AgePri2. The results for interactions with the prices attribute also show that the estimated coefficient for respondents who have a university degree is greater than the estimated coefficient for those who do not. This indicates that a respondent who has attained higher education is willing to pay more, compared to a respondent with a lower level of education.

Table 6.8: Coefficients of MNL Models for Kuala Lumpur and Shah Alam

	Basic MNL		Basic MNL with interactions	
Variable	KL	SA	KL	SA
	Coeff.	Coeff.	Coeff.	Coeff.
Amen	0.52***	0.54***	0.57***	0.56***
	(0.09)	(0.08)	(0.09)	(0.08)
Fac1- medium	1.05***	0.98***	1.15***	0.99***
	(0.12)	(0.10)	(0.11)	(0.10)
Fac2- higher	1.62***	1.32***	1.74***	1.34***
	(0.12)	(0.11)	(0.13)	(0.11)
Info1- medium	0.20**	0.28**	0.30***	0.30**
	(0.10)	(0.13)	(0.11)	(0.13)
Info2- higher	0.23*	0.33***	0.34**	0.37***
	(0.14)	(0.10)	(0.15)	(0.10)
NAtt1- medium	0.34***	0.08	0.40***	0.10
	(0.11)	(0.10)	(0.12)	(0.11)
NAtt2- higher	0.35***	0.14	0.43***	0.14
	(0.12)	(0.11)	(0.12)	(0.11)
Pri	-0.08***	-0.04***	-0.06***	-0.05***
	(0.00)	(0.00)	(0.01)	(0.01)
AgePri1: 25 to 34 yrs old	-	-	-0.02**	-0.003
(Age1 x Price)			(0.01)	(0.01)
AgePri2: 35 yrs old and above	-	-	0.01	-0.01
(Age2 x Price)			(0.01)	(0.01)
EduPri: University Degree	-	-	0.02***	0.03***
(Edu x Price)			(0.01)	(0.01)
EthPri1: Chinese	-	-	-0.10***	0.05***
(Ethnic1 x Price)			(0.01)	(0.01)
EthPri2: Indian and others	-	-	-0.06***	-0.02**
(Ethnic2 x Price)			(0.01)	(0.01)
Summary Statistics				
Log-likelihood function: $L(\beta)$	-970.50	-919.04	-873.56	-893.03
Log-likelihood: $L(0)$	-1239.23	-1113.99	-1239.23	-1113.99
Psuedo-R^2	0.22	0.18	0.30	0.20
Adjusted Psuedo-R^2	0.21	0.17	0.29	0.19
Number of observations	1128	1014	1128	1014

***significant at 1%, ** significant at 5%, and *significant at 10%; std. errors are in brackets

In terms of ethnic groups in KL, the interaction coefficients for price for Chinese, Indians and others show a negative sign. This suggests that these ethnic groups were not willing to pay as much as Malays. The results in SA, however, are different, where the Chinese ethnic group were willing to pay more compared to Malays, but not in comparison with Indians and others. All these coefficients are significant at least at the 5% level.

The explanatory power for the basic MNL model in KL is higher than for SA. The adjusted psuedo-R^2 in KL is 21% and 17% in SA. The percentage, however, increased to 29% in KL and 19% in SA for the MNL with interactions model. This indicates that the inclusion of socio-demographic characteristics improves model fit.

A Likelihood Ratio (LR) test is employed to determine whether or not the coefficients are jointly zero. The basic MNL model for KL and SA shows that the null hypothesis that the coefficients are jointly zero is rejected at the 1% significance level and 8 degrees of freedom, $(\chi^2_{(0.01,8)}) = 20.09$. The LR statistics for KL and SA were 537.46 and 389.90, respectively. The model in the MNL with interactions was also significant at the 1% level for KL and SA. In KL the LR value was 731.35 and SA it was 441.92. These values were compared to the critical chi-squared value 27.69 $(\chi^2_{(0.01,13)})$.

The implicit price for each attribute was calculated as the ratio of coefficients for the attribute (or level) with the parameter of cost using the Wald procedure (Delta method) in Limdep 8.0. Table 6.9 shows the implicit price for each attribute in KL and SA for both estimation models.

The implicit price measures the respondents' willingness to pay. For example, the implicit price for attribute Fac2 in SA means that the respondents in SA are willing to pay an extra RM30.52 (in the basic MNL model) or RM29.51 (in the MNL with interactions model) to obtain an improvement to the attribute from the basic to the higher level. The respondents in KL are willing to pay an extra RM19.41 in the basic MNL model (or RM16.86 in the basic MNL with interactions model) for a similar improvement.

Table 6.9: Implicit Price (in RM) of MNL Models for Kuala Lumpur and Shah Alam

Attribute	Basic MNL		Basic MNL with interactions	
	KL	SA	KL	SA
Amen- basic to higher	6.20***	12.50***	5.54***	12.22***
	(1.03)	(2.01)	(0.85)	(1.93)
Fac1- basic to medium	12.58***	22.52***	11.19***	21.80***
	(1.34)	(2.79)	(1.11)	(2.67)

Continuation of Table 6.9: Implicit Price (in RM) of MNL Models for Kuala Lumpur and Shah Alam

Fac2- basic to higher	19.41***	30.52***	16.86***	29.51***
	(1.38)	(3.09)	(1.16)	(2.95)
Info1- basic to medium	2.42**	6.51**	2.94***	6.60**
	(1.21)	(2.80)	(1.02)	(2.72)
Info2- basic to higher	2.81*	7.71***	3.29**	8.01***
	(1.63)	(2.26)	(1.39)	(2.20)
NAtt1-basic to medium	4.02***	1.93	3.86***	2.22
	(1.28)	(2.38)	(1.08)	(2.29)
NAtt2- basic to higher	4.21***	3.12	4.22***	2.99
	(1.33)	(2.49)	(1.12)	(2.41)

***significant at 1%, ** significant at 5%, and *significant at 10%; std. errors are in brackets

SA recorded a higher implicit price for amenities, compared to KL. In the basic MNL model visitors are willing to pay an extra RM12.50 in SA, compared to RM6.20 in KL, for an improvement in amenities from the basic to the higher level. The results in Table 6.9 also show that the implicit price for attribute Info1 is slightly lower than for Info2. This is logical because the level of information provided in Info2 is greater than in Info1. The other implicit prices significant at the 5% or higher level for KL were for the attribute natural attractions provided at both the medium and higher levels.

The results for the MNL with interactions model provide some illustrations of implicit price that take into account the respondents' socio-demographic characteristics. In KL for instance, the average implicit price for a young Chinese respondent (i.e. 18 to 24 years old) who has attained higher education (i.e. having a University degree) is 71% less compared to the Malay respondents with similar characteristics. However, the scenario is different in SA. With the same characteristics for age and education, the Chinese in SA are willing to pay 16% more compared to the Malays. However, the Indians and others are willing to pay 13% and 7% less compared to the Malays in KL and SA, respectively.

In general, the implicit price for attributes in KL and SA are in the range of RM2.40 to RM30.50. This range is plausible based on current charges for a variety of entertainment activities that are available in Malaysia.[6.1]

Even though the MNL model has been used by many analysts (e.g. Morrison et al., 2002) for investigating choice data, the model is restricted to a situation where the taste parameters are assumed constant across visitors. In order to relax this restriction, other less restrictive models were applied, and this is explained in the following sections.

6.3.3 Random Parameter Logit Model

The RPL model relaxes the assumption that taste parameters are constant across visitors to parks. In other words, by allowing the taste parameters to vary, the model takes into account the random heterogeneity in preferences between visitors. Estimation of the RPL model in the study is divided into two sections.

The first section will determine whether or not heterogeneity exists around the population mean parameter. This can be determined by the significance of estimated standard deviation coefficients from the estimation model. A significant standard deviation indicates that heterogeneity exists around the mean parameters. The second section will discuss possible sources of heterogeneity.

6.3.3.1 An Investigation of the Presence of Heterogeneity in Taste Parameters

An analysis of the RPL model for both areas assumed that the taste coefficients for all attributes used in the study are normally distributed, except for the package price. Fixing the price parameter helps analysts to interpret the model. For example, Revelt and Train (1998) argue that by fixing the price parameter, the implicit price for each attribute will

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[6.1] To make a comparison of these implicit prices, several entertainment charges have been identified. Among them are a charge for a football match (RM15-RM30); a price for a cinema ticket (RM15 to RM20); an entrance price for the National Zoo (RM20.00); the KL PETROSAINS (RM12.00) and a package price for Sunway Lagoon Park (RM45 to RM90).

be distributed in the same way as the attribute's coefficients. Based on this argument, the coefficient of price was assumed to be fixed (non-random).

With the assumption of a normal distribution for the random parameters, the coefficient vector can be expressed as $\beta_n = b + W\mu_n$ where W is a diagonal matrix whose elements are standard deviations and μ_n is a vector of independent standard normal deviates (Revelt and Train, 1998). The distribution of β_n was estimated through a maximum simulated likelihood procedure. As explained in Section 4.3.3.1, the simulation was performed using 100 draws of Standard Halton Sequences (SHS) as recommended by Bhat (2001). The estimation results are reported in Table 6.10.

The results in Table 6.10 show both models are significant at the 1% level (the coefficients are jointly not equal to zero). This can be seen from the chi-squared value for KL and SA where the values exceeded the critical chi-squared value, $\chi^2_{(0.01,15)}$=30.58. In terms of model fit, the adjusted psuedo-R^2 value in KL and SA was 21% and 17%, respectively. In a comparison with the basic MNL model, the results of the LR test for KL and SA did not permit the conclusion that the RPL model fitted better than the basic MNL model. The LR value for KL and SA was 6.44 and 8.51, against the critical chi-squared value $\chi^2_{(0.01,7)}$=18.48.

Table 6.10: Estimation Results of Random Parameter Logit Model - Kuala Lumpur and Shah Alam

Variable	KL	SA
Random Coefficients (mean)	Coefficient	Coefficient
Amen	0.56***	0.65***
	(0.14)	(0.16)
Fac1- medium	1.42***	1.45***
	(0.25)	(0.28)
Fac2- higher	2.09***	1.92***
	(0.28)	(0.34)
Info1- medium	0.29**	0.32
	(0.13)	(0.20)
Info2- higher	0.25	0.44***
	(0.21)	(0.15)
NAtt1- medium	0.38**	-0.05
	(0.16)	(0.18)
NAtt2- higher	0.57***	0.15
	(0.19)	(0.17)

Continuation of Table 6.10: Estimation Results of Random Parameter Logit Model-Kuala Lumpur and Shah Alam

Non-random Coefficient		
Pri	-0.11***	-0.07***
	(0.02)	(0.01)
Std. Deviations		
Amen	1.37***	1.41**
	(0.42)	(0.60)
Fac1- medium	0.08	0.11
	(0.92)	(0.50)
Fac2- higher	0.56	0.96
	(0.72)	(0.73)
Info1- medium	0.014	0.72
	(0.87)	(0.77)
Info2- higher	1.13**	0.33
	(0.52)	(0.65)
Natt1- medium	0.86	1.61**
	(0.65)	(0.66)
Natt2- higher	0.13	0.56
	(0.59)	(0.86)
Summary Statistics		
Log-likelihood function: $L(\beta)$	-967.43	-914.79
Log-likelihood: $L(0)$	-1239.23	-1113.99
Psuedo-R^2	0.21	0.18
Adjusted Psuedo-R^2	0.21	0.17
Chi-squared	543.60	398.41
Number of observations	3384	3042

***significant at 1%, ** significant at 5%, and *significant at 10%; std. errors are in brackets

All of the mean parameters in the RPL models for both areas have signs identical to those observed in the basic MNL models. Some coefficients that were significant in the basic MNL model (i.e. Info2 and Info1 in KL and SA, respectively) are not significant in the RPL model. Interpretation of the results in the RPL and the basic MNL models is the same, except for the estimated standard deviation coefficients.

The estimated standard deviation coefficients explain whether or not heterogeneity exists in the estimated mean parameters. The statistical significance of the estimated standard deviations suggests the presence of heterogeneity. By referring to Table 6.10, the results suggest the existence of heterogeneity in the parameters of Amen and Info2 in KL, and Amen and Nat1 in SA. The mean parameter of Info2 in KL and Nat1 in SA, however, are not statistically significant. Since the model fit in the RPL model is not statistically different from the basic MNL model, implicit prices for the RPL model are not computed.

6.3.3.2 Possible Sources of Heterogeneity in Mean Parameters

The RPL model is not only able to determine the existence of heterogeneity in an estimated model, it can also be applied to determine the possible sources of heterogeneity (Hensher et al., 2005). Based on the results of Table 6.10, heterogeneity exists in both the KL and the SA estimation models.

The estimation of the models for KL and SA in this section begins by dropping all of the insignificant mean parameters and estimated standard deviations reported in Table 6.10 from the random parameter list. Since they were not significant, this is similar to treating them as fixed parameters (Hensher et al., 2005). The attribute retained for investigating the possible source of heterogeneity in the mean parameters is, therefore, Amen. This attribute was investigated extensively using socio-demographic variables such as age group, ethnicity, and level of education. This investigation reveals that only education level produces promising results for further analysis. The effect of education is therefore used to investigate the possible source of heterogeneity. The estimation results are reported in Table 6.11.

In Table 6.11, the row labelled "heterogeneity in the mean of parameter" refers to the coefficient of a particular education level that deviates from the base level. As explained in Table 6.7, the baseline for this parameter was education to non-degree level. Therefore, the results reported in the row labelled "Amen: university degree" reveal that the coefficient of the attribute amenities for respondents educated to degree level in KL and SA deviates from those without degrees by 0.52 and 0.50, respectively. [6.2] The positive sign suggests that the value attached by a respondent who has a degree is greater than that of a respondent without a degree. This positive sign is consistent with the results from the MNL with interactions model, when price was interacted with the education variable.

[6.2] Simply put, by taking into account the heterogeneity that exists in the coefficient for Amen: university degree, the coefficient value for respondents educated to degree level for the attribute amenity, for example in KL, is equal to 0.25+0.52=0.77. This computed coefficient will be used to calculate the implicit price for the attribute Amen: higher education.

The values reported in the next row (Std. Deviations: Amen) are also significant at the 1% level. This confirms that the education variable significantly explains the mean of parameter distribution for the amenities attribute.

Table 6.11: Estimation Results of Random Parameter Logit Model with the Effects of Education

Variable	KL	SA
Random Coefficient (mean)	Coefficient	Coefficient
Amen	0.25*	0.41***
	(0.14)	(0.12)
Non-random Coefficient		
Fac1- medium	1.20***	1.21***
	(0.15)	(0.17)
Fac2- higher	1.86***	1.65***
	(0.19)	(0.20)
Info1- medium	0.25**	0.36**
	(0.11)	(0.16)
Info2- higher	0.32*	0.39***
	(0.17)	(0.12)
Natt1- medium	0.36***	0.04
	(0.13)	(0.13)
Natt2- higher	0.43***	0.12
	(0.14)	(0.14)
Pri	-0.10***	-0.50***
	(0.01)	(0.22)
Heterogeneity in the mean of parameter		
Amen: university degree	0.52***	0.50**
	(0.18)	(0.22)
Std. Deviations		
Amen	1.17***	1.42***
	(0.38)	(0.46)
Summary Statistics		
Log-likelihood function: $L(\beta)$	-964.36	-914.00
Log-likelihood: $L(0)$	-1239.23	-1113.99
Psuedo-R^2	0.22	0.18
Adjusted Psuedo-R^2	0.22	0.18
Chi-squared	549.74	399.98
Number of observations	1128	1014

***significant at 1%, ** significant at 5%, and *significant at 10%; std. errors are in brackets

The overall model is significantly different from zero with the chi-squared values for KL and SA being 549.74 and 399.98, respectively. The adjusted psuedo-R^2 in KL (22%) and SA (18%) in the model was slightly improved compared to the model in Table 6.10. The LR test concludes that the RPL models in both areas, which take into account the source of heterogeneity, fitted better than the basic MNL model. The LR value for KL and SA was 12.27 and 10.08, against the critical chi-squared value $\chi^2_{(0.01,2)}$=9.21.

The results in Table 6.11 were therefore used to calculate the implicit price. The implicit price results are shown in Table 6.12 and the interpretation is similar to Table 6.9. The results in Table 6.12 suggest that the respondents in KL and SA who attained a higher education are willing to pay more compared to the respondents with a lower educational attainment. The implicit price for the attribute of natural attraction - which was not significant in previous estimation models (i.e. the basic MNL and the MNL with interactions) remains insignificant in this model.

Table 6.12: Implicit Prices (in RM) of RPL Models by Education for Kuala Lumpur and Shah Alam

Attribute	KL	SA
Random Coefficient		
Amen: non-degree	2.57*	7.61***
	(1.51)	(2.41)
Amen: degree	7.93***	16.99***
	(1.49)	(3.75)
Non-random Coefficient		
Fac1	12.46***	22.65***
	(1.32)	(2.79)
Fac2	19.36***	30.74***
	(1.35)	(3.02)
Info1	2.62**	6.65**
	(1.19)	(2.77)
Info2	3.35**	7.28**
	(1.64)	(2.25)
Natt1	3.71***	0.71
	(1.31)	(2.50)
Natt2	4.49***	2.27
	(1.35)	(2.57)

***significant at 1%, ** significant at 5%, and *significant at 10%; std. errors are in brackets

The analysis of choice data that takes into account taste heterogeneity in the RPL model is restricted to heterogeneity that is continuously distributed. In other words, if the heterogeneity is distributed discretely it cannot be investigated using the RPL model. Therefore, the following analysis of choice data is extended to explore the possibility of heterogeneity that is distributed discretely.

6.3.4 Latent Class Models

An alternative model for taking into account heterogeneity in preferences is the LCM. Strictly speaking, this model is suitable for investigating taste heterogeneity that is distributed discretely (Bhat, 1997). The discussion of the LCM is presented in three sections. The first section will discuss the number of segments that should be employed in the study. This will be followed by the estimated model. The final section will explain the characteristics of respondents in each segment.

6.3.4.1 Number of Segments

The number of segments is one of the crucial factors that should be addressed in the LCM (Swait, 1994). Usually, analysts (e.g. Boxall and Adamowicz, 2002; Haener et al., 2001) use statistical information criteria values such as Akaike Information Criteria (AIC), Bayesian Information Criteria (BIC), and Consistent Akaike Information Criteria (cnAIC) to determine the number of segments. However, this is not a foolproof solution because some analysts (e.g. Ruto et al., 2008; Scarpa and Thiene, 2005) argue that other factors can be used to determine it. These factors include judgement, the objectives of the study, the significance of parameters, etc. as discussed in Section 4.3.3.2.2.

When using statistical information criteria, the procedure to determine the number of segments begins by examining the value of the adjusted psuedo-R^2 statistic when the number of segments is increased sequentially ($S=1,2,3,...$). If the adjusted psuedo-R^2 increases when segments are added, this indicates the existence of heterogeneity in the choice data. The process of adding a new segment will continue up to the point when an additional segment does not significantly improve model fit. Table 6.13 reports the value of adjusted psuedo-R^2 for different segments.

The results in Table 6.13 show that the value of adjusted psuedo-R^2 increases when additional segments are added to the model. For example, in SA, the value increases from 0.17 to 0.26 when there is an increase from one to two segments. The adjusted psuedo-R^2 value for SA, however, started to flatten when more segments were added to the model.

The model merely exhibits an increase of 0.02 for the adjusted psuedo-R^2 when the segment is increased from two segments to three segments.

In KL, the adjusted psuedo-R^2 increased by 67% by moving from a one segment to a two segment model. The value for the one segment and two segment models was 0.21 and 0.35, respectively. The adjusted psuedo-R^2 with three and four segments, however, cannot be determined because the estimated variance matrix of estimates is singular. The value increased to 0.40 in the five segment model, an increase of 0.05 if compared to the two segments model.

Although the results for the adjusted psuedo-R^2, as shown in Table 6.13, reveal the existence of heterogeneity and suggests that segments in the choice data for both areas could be identified, this does not indicate the number of segments that should be employed in the estimation model. A common approach to determining the number of segments is the use of information criteria (e.g. Ruto et al., 2008; Boxall and Adamowicz, 2002).

Three information criteria were calculated in the estimation models and they were AIC, BIC and cnAIC. These criteria can be calculated as follows (Scarpa and Thiene, 2005):

AIC: $$C = -2LL + 2J \quad \textbf{6.2}$$

BIC $$C = -2LL + Jln(N) \quad \textbf{6.3}$$

cnAIC $$C = -2LL + J[ln(N) + 1] \quad \textbf{6.4}$$

where *LL* is the log likelihood at convergence, *N* is the number of observations, and *J* is the number of estimated parameters in the model. Different numbers of segments were applied to each estimation model. The decision should be made based on the lowest value of the information criteria, because the lower the criterion value the better the model fit (Provencher et al., 2002).

The results for information criteria in Table 6.13 were not consistent. Whereas in the SA model, the AIC criterion favours the five segments, the BIC and cnAIC criteria favour three and two segments, respectively. In their paper, Provencher et al. (2002) have discussed the strengths and weaknesses of these information criteria, apart from the cnAIC criterion. The AIC criterion tends to overestimate the number of segments (McLachlan and Peel, 2000), whilst the BIC criterion does not (Leroux, 1992).

Table 6.13: Comparison of Adjusted pseudo R^2 in Different Segments - Kuala Lumpur and Shah Alam

Number of Segments	1		2		3		4		5	
	KL	SA	KL	SA	KL	SA	KL	SA	KL	SA
Log-likelihood	-970.50	-919.04	-789.89	-819.76	na	-787.34	na	-761.02	-725.45	-741.57
No of Parameters	8	8	18	18	na	27	na	36	45	45
No of observations	1128	1014	1128	1014	na	1014	na	1014	1128	1014
AIC	1957.01	1854.09	1615.78	1675.52	na	1628.68	na	1594.03	**1540.91**	**1573.14**
BIC	1997.23	1893.46	**1706.29**	1764.11	na	**1761.57**	na	1771.21	1767.18	1794.62
Consistent AIC	2005.23	1901.46	**1724.29**	**1782.11**	na	1788.57	na	1807.21	1812.18	1839.62
Adjusted psuedo-R^2	0.21	0.17	0.35	0.26	na	0.28	na	0.30	0.40	0.32

Since information criteria did not conclusively indicate the number of segments, an alternative way to determine these is explored. These approaches suggested by analysts (e.g. Ruto et al., 2008; Swait, 1994) include theoretical prior information, analysts' interpretation, and parameter significance. In this study this is achieved by examining the number of significant parameters in different segments. The results show that the number of significant parameters decreased when the number of segments was increased from two to three, in both estimation models. The two segment model is therefore employed for the purposes of estimation.

6.3.4.2 Estimation of the Latent Class Models

Table 6.14 presents the results of the two-segment LCM. The LCM was estimated using an ML procedure, as shown in equation 4.19. In general, the choice data in KL and SA exhibit heterogeneity of preferences for the attributes used in the study. This can be seen from the differences in magnitude and significance of the estimated coefficients.

Table 6.14: Coefficients Estimates of Two Segments Latent Class Models- Kuala Lumpur and Shah Alam

	KL				SA			
	Segment 1		Segment 2		Segment 1		Segment 2	
Attribute X	Coeff.	P-values	Coeff.	P-values	Coeff.	P-values	Coeff.	P-values
Amen	1.12	0.003	0.72	0.000	0.71	0.000	0.38	0.068
Fac1	2.38	0.000	1.36	0.000	1.24	0.000	1.20	0.000
Fac2	2.36	0.000	1.98	0.000	1.65	0.000	1.08	0.000
Info1	0.18	0.516	0.58	0.000	0.45	0.007	0.35	0.328
Info2	0.07	0.890	0.63	0.000	0.41	0.001	0.26	0.211
Natt1	0.57	0.062	0.43	0.000	0.29	0.022	-0.25	0.313
Natt2	1.20	0.003	0.49	0.000	0.31	0.031	0.12	0.609
Price	-0.34	0.000	-0.05	0.000	-0.02	0.000	-0.20	0.000
Statistical Information								
Log-likelihood	-789.89				-819.76			
psuedo-R^2	0.36				0.264			
Adj. psuedo-R^2	0.36				0.26			
Number of observations	1128				1014			

The results in Table 6.14 show that all attributes are significant in both segments for KL, except the attribute for information (i.e. Info1 and Info2). The attribute which is insignificant in segment 1 becomes significant in segment 2. Interestingly, the attributes for natural attractions (i.e. NAtt1 and NAtt2) in SA, which are not significant in segment 2, become significant in segment 1. This is not the case in previous estimation models (i.e. the basic MNL, the MNL with interactions and the RPL). Although the results are not comparable to other estimation models, such as the basic MNL and the RPL, the results indicate that the attribute is suitable for analysis with the LCM. The estimated coefficients in the choice model are then used to calculate the implicit price for the LCM. The results are presented in Table 6.16.

Before discussing the implicit prices based on the LCM, it is useful to understand the characteristics of the respondents' in these two segments. This can be done by profiling the samples. The profiling begins by assigning a respondent to the segment where the respondent has the highest probability of being located. The analysis then continues by investigating the respondents' socio-demographic characteristics by segment. The results of this analysis are presented in the following paragraphs.

The relative proportions in segments 1 and 2 in the KL area were 48% and 52%, respectively. However in SA, the proportions in segments 1 and 2 were 73% and 27%, respectively. Table 6.15 presents the descriptive statistics for the characteristics of segments 1 and 2 in both areas. One of the purposes of Table 6.15 is to demonstrate statistical differences between segments in these two areas. The common variables for socio-demographic characteristics such as gender, age, level of education and ethnicity were used for this purpose. In both areas, the results show that the profiles of respondents in each segment showed statistically significant differences across the majority of the socio-demographic characteristics under consideration.

Table 6.15: Descriptive Statistics for the Characteristics of Each Segment- Kuala Lumpur and Shah Alam

	KL			SA		
	Seg 1	Seg 2	Sig.	Seg 1	Seg 2	Sig.
Male	40%	56%	**	55%	40%	**
Education: University Degree	38%	56%	**	24%	27%	
Age: 18 to 24 yrs old	29%	24%		42%	33%	
Age: 25 to 34 yrs old	40%	45%		31%	20%	
Age: 35 yrs old and above	31%	29%		27%	47%	**
Ethnicity: Malay	27%	74%	***	18%	4%	***
Ethnicity: Chinese	59%	18%	***	13%	3%	***
Ethnicity: Indian and Others	14%	7%	*	14%	29%	**
Motivation factor [a]						
Social activities	-0.09	0.13	na	0.01	-0.13	na
Enjoying nature	-0.04	-0.10	na	0.12	-0.05	na
Seeking peace and quiet	0.03	-0.18	na	0.15	-0.09	na
Enhancing skills	-0.09	-0.17	na	0.19	0.02	na

[a] mean value
na - not applicable
***significant at 1%, ** significant at 5%, and *significant at 10%

The results in KL suggest that the majority of the respondents in segment 2 are male, Malays and have attained higher education. However in SA, the majority of respondents in segment 1 are male, Malays or Chinese.

In this study, respondents were also questioned as to why they visit recreational parks. The motivation questions employed from Boxall and Adamowicz (2002) were analysed through factor analysis, where the principal component with the varimax rotation method was applied (Hair et al., 2006). The results of the analysis suggest that these twenty motivation questions could be reduced to four motivation factors. Labels for each factor were drawn up based on the questions that loaded significantly to each other. The first motivation factor involves social activities (i.e. to be with family and friends), the second involves enjoying nature (i.e. to observe the beauty of nature), the third is to find peace and quiet, and the last factor is to enhance personal skills such as self-reliance. These motivation factors were reported as mean values where a positive value suggests that respondents visit parks because of this factor.

The implicit prices in Table 6.16 are similar in interpretation to those reported in Table 6.9 and Table 6.12. The findings in Table 6.16 are similar to the previous results, apart from the implicit price for Fac1 and Fac2 for segment 1 in the KL model. Based on the implicit price of Fac1 and Fac2, it seems illogical to find that the value of Fac1 (medium level) is greater than for the high level (Fac2). The difference, however, is small. For example, the difference between Fac1 and Fac2 in KL is only RM0.06. Other implicit prices that exhibit a similar relationship are Info1 and Info2, and Fac1 and Fac2, for segment 1 and 2 of the SA model, respectively.

Table 6.16: Implicit Prices (in RM) of Latent Class Models for Kuala Lumpur and Shah Alam

	KL		SA	
Attribute	Segment 1	Segment 2	Segment 1	Segment 2
Amen-basic to higher	3.25***	14.60***	28.59***	1.93*
	(0.78)	(1.71)	(6.67)	(1.056)
Fac1- basic to medium	6.90***	27.39***	49.78***	6.10***
	(0.88)	(2.68)	(11.19)	(1.31)
Fac2- basic to higher	6.84***	39.96***	66.01***	5.49***
	(0.96)	(2.99)	(13.83)	(1.26)
Info1- basic to medium	0.51	11.63***	17.87***	1.75
	(0.78)	(2.05)	(6.23)	(1.75)
Info2- basic to higher	0.21	12.63***	16.30***	1.30
	(1.49)	(2.42)	(5.33)	(1.02)
NAtt1- basic to medium	1.66*	8.62***	11.43**	-1.27
	(0.93)	(2.19)	(5.17)	(1.26)
NAtt2- basic to higher	3.48***	9.89***	12.24**	0.61
	(0.90)	(2.09)	(5.65)	(1.18)

***significant at 1%, ** significant at 5%, and *significant at 10%; std. errors are in brackets

By linking the implicit prices shown in Table 6.16 with respondents' characteristics for each segment (see Table 6.15) several conclusions can be drawn regarding respondents' preferences. Firstly, in the KL model, the level of education attained by respondents in segment 2 could explain why information was significant at both levels in the segment compared to segment 1. In this segment, respondents with higher education are willing to pay more for the information provided at parks. This is consistent with the results found in previous estimation models (i.e. the MNL with interactions model and the RPL model with heterogeneity).

Secondly, respondents in segment 2 in the KL model and segment 1 in the SA model respectively, were consistently identified as having a higher implicit price for attributes. All of the attributes in these segments were significant at least at the 5% level. This indicates that respondents in these segments are willing to pay more compared to those in the other segment.

Finally, conclusions can be drawn concerning the relationship between respondents' characteristics and motivation factors for visiting parks. In the KL model, the motivation factor for segment 1 and 2 was to find peace, and quiet and to engage in social activities, respectively. However, segment 1 in the SA model reveals that respondents in that segment were motivated by all of the factors. In terms of ranking, the factor on enhancing personal skills had the highest value, followed by the factors regarding peace and quiet, enjoying nature, and last of all, social activities. For segment 2, respondents visit the park because they want to enhance their personal skills.

Based on the estimation results, the findings of this study suggest that the LCM and the MNL with interactions models outperformed the other estimated models in several ways. For example, the models recorded high psuedo-R^2 values and in terms of the significance of coefficients, more significant coefficients were estimated compared to other models. These findings suggest that the following analysis should be undertaken using the LCM and the MNL with interactions models.

6.3.5 Estimating Consumer Welfare

Four hypothetical parks were used to illustrate how respondents might respond to different combinations of attributes. The results of this illustration are shown in terms of compensating variation estimates, which are computed using equation 4.21 and 4.24. The reasons for using the estimates were explained in Section 3.2.6. The first hypothetical park illustrates an urban park scenario that comprises facilities provided at the medium level. The second hypothetical park only provides natural attractions at the higher level. This is appropriate for describing the national park scenario. The next hypothetical park encompasses information and natural attractions at the higher level (i.e. the educational park scenario). The final hypothetical park illustrates the MAP scenario, where all the attributes are provided at the higher level except for information (medium level).

Table 6.17 presents the mean for compensating variation per individual for these four hypothetical parks. In the MNL with interactions model, the provision of a hypothetical urban park generates welfare improvements of RM11.19 and RM21.80 per individual, for KL and SA, respectively. The lowest compensating variation in the model is the hypothetical national park in KL (RM4.22). Table 6.17 reports that the compensating variation for segment 2 of the hypothetical MAP by SA respondents is negative. This occurs because the costs respondents have to pay in the real world are greater than the total benefits that they received.[6.3] The positive estimates, however, are calculated for segment 1 of LCM (RM84.72) and the MNL with interactions models (RM11.32). Most of the compensating variation calculated in these hypothetical parks is statistically significant.

[6.3] The actual total costs calculated for this illustration is RM40.00. These costs include RM1.00 for parking a car, RM3.00 for the entrance fee, RM3.00 for entering the climate house, RM3.00 to hire a bicycle per hour, and RM30.00 for the cost of extreme games.

Table 6.17: Compensating Variation (in RM) for Hypothetical Recreational Parks

Attribute	Urban Park		National Park		Educational Park		MAP	
Amen-higher							√	
Fac-medium	√							
Fac-higher							√	
Info-medium							√	
Info-higher					√			
NAtt-medium								
NAtt-higher			√		√		√	
MNL with interactions								
	KL	SA	KL	SA	KL	SA	KL	SA
	11.19***	21.80***	4.22***	2.99	7.50***	11.00***	29.56***	11.32***
LCM (segment 1)								
	KL	SA	KL	SA	KL	SA	KL	SA
	6.90***	49.78***	3.48***	12.24**	3.69**	28.55***	14.08***	84.72***
LCM (segment 2)								
	KL	SA	KL	SA	KL	SA	KL	SA
	47.90***	6.29***	24.16***	1.55**	25.60**	3.61***	97.73***	-24.33***

***significant at 1%, ** significant at 5%, and *significant at 10%

The next analysis in the chapter investigates whether or not the estimates in the KL model are transferable to the MAP. Two transferability tests were undertaken: (1) a transferability of demand function, and (2) a transferability of implicit price. The results of the tests are reported in the following section.

6.4 Benefit Transfer Study

As explained in Section 6.2, differences in population characteristics between the study site and the policy site could lead to errors in a benefit transfer study. This occurs in this study where the percentage in the census for KL differs from SA. For example, the census data for ethnic Malays in KL (43%) is lower than in SA (76%). Transferability in implicit price is unlikely to succeed if these percentages were used in a benefit transfer model. Usually, analysts will incorporate specific individual variables in the utility function to control the differences in population characteristics (Bueren and Bennett, 2004). For example, analysts can correct the implicit price (or adjust the value) by using the valuation function for the study site and data on the sample percentage for the policy site (Colombo et al., 2007).

Benefit transfer in this study should be considered less controversial, on the basis that the study and policy site have similarities (Boyle and Bergstrom, 1992). The first similarity is the goods to be valued. This includes similarity in the questionnaires - for example, the way in which the good was described in the survey (i.e. the attributes and their levels), the number of alternatives and the use of generic rather than labelled alternatives. The good being valued at the study site is therefore considered to be sufficiently similar to the good at the policy site.

The second similarity is the population characteristics between the study and policy sites. To perform the test, the ideal is for the population characteristics at both sites to be identical. However, this is not always the case. This study aims to achieve similarity across all key socio-demographic characteristics for the populations in the study and policy sites. As a result, this study manages to find similar characteristics for gender, education and age distribution, but not ethnicity (refer to Table 6.1). Although comparability was not achieved for all key socio-demographic characteristics, biases that may be caused by this dissimilarity can be mitigated by adjusting the results from the study site using values from the policy site (Colombo et al., 2007). This will be explained further in the following sections. The results of the benefit transfer study are discussed in two sections: (1) transferability in the demand function, and (2) transferability in implicit prices.

6.4.1 Transferability of Demand Function

The coefficients estimated in the MNL with interactions model (Table 6.8), and the LCM (Table 6.14), are used to test whether the estimated coefficients in KL are statistically different to the estimated coefficients in SA. The test hypothesis can be shown as follows:

$$H_0: \beta_{KL} = \beta_{SA}$$
$$H_1: \beta_{KL} \neq \beta_{SA}$$

where β refers to the estimated coefficients and KL and SA are the study and policy sites, respectively.

Table 6.18 presents the results of transferability in estimated coefficients. The decision whether or not to reject H_0, implying that the parameters between study and policy site are statistically different, is subject to the value of the LR statistic and the calculated χ^2statistic. If the LR value is greater than the χ^2 value, then H_0 will be rejected. The LR value was calculated as shown in equation 6.5.

$$LR = -2(LL_P - (LL_{KL} + LL_{SA})) \tag{6.5}$$

where LL_P refers to the log likelihood of the pool data. The results in Table 6.18 show that there are significant differences in the estimation model between the study and policy sites for both estimated functions. Therefore, it suggests that the estimated function of the study site cannot be transferred to the policy site; otherwise it could lead to inaccurate results.

Table 6.18: Results of Transferability in Benefit Transfer Function

Function	LL_P	LL_{KL}	LL_{SA}	LR	$\chi^2_{(0.01,df*)}$	Decision
MNL (interactions) (df=13)	-1869.49	-873.56	-893.03	205.80	27.69	Reject H_0
LCM (df=18)	-1639.07	-789.89	-819.76	58.84	34.81	Reject H_0

*df refers degrees of freedom which is equal to the number of estimated parameters in the estimation model

Even though the hypothesis of transferability in demand functions was rejected, it does not necessarily indicate that the hypothesis of transferability in implicit prices will also be rejected (Colombo et al., 2007; Morrison et al., 2002). For example, the study undertaken by Morrison et al. (2002) found that six out of the eight implicit price hypotheses were not rejected although the equality of the estimated coefficients was rejected. The transferability of implicit prices is therefore investigated and presented in the next section.

6.4.2 Transferability of Implicit Prices

To investigate transferability of implicit prices the study used the Krinsky and Robb (1986) bootstrapping simulation of 1000 draws technique. Although the technique produced the same coefficients as estimated in the previous estimation models, the standard deviations estimated from the technique are said to be better than the standard deviations based on linear approximation (Krinsky and Robb, 1986). This is because the calculated implicit prices are non-linear functions of the estimated coefficients, therefore linear approximation is unlikely to provide accurate estimates of the standard deviations (Foster and Mourato, 2000). The method used for the calculation of standard deviations is important in this transferability because the permissibility of transferability will be decided in terms of its confidence interval rather than the point estimate value. This is based on the fact that the implicit prices and their standard deviations are used to calculate the confidence interval.[6.4]

Although this study attempts to use a simulation of 1000 draws, as suggested by Krinsky & Robb (1986), this simulation cannot be undertaken using the LCM for the KL model because the estimated variance matrix of estimates is singular. Therefore, the confidence interval for the area was calculated, based on the estimated standard deviations generated from the LCM, as shown in Table 6.16. To ensure that similar estimated standard deviations are used when calculating the confidence interval and when testing the transferability, the standard deviations in Table 6.16 were also used to calculate the confidence interval in the SA model. Simulation for the MNL with interactions model used the Krinsky and Robb (1986) procedure, utilising 1000 draws.

The hypothesis to be tested – i.e. whether the implicit prices in KL are statistically different from the implicit prices in SA - is shown as follows:

$$H_0: IP_{KL} = IP_{SA}$$
$$H_1: IP_{KL} \neq IP_{SA}$$

[6.4] The 95% confidence interval (CI) was calculated based on the formula, *CI*= $IP \pm Z * \frac{sd}{\sqrt{n}}$ where *IP* refers to implicit price, *Z* is equal to 1.96, *sd* is a standard deviation and *n* is sample size. The value of Z in a two tail of 95% CI is 1.96 because P(Z>1.96)=0.025.

where *IP* refers to implicit prices and all the subscripts are as previously explained. The results for a 95% confidence interval of implicit prices are shown in Table 6.19. As explained in Section 4.5.3.2, the decision as to whether the implicit prices are transferrable between the study and policy site is subject to the value of 'implicit price confidence interval'. For example, if the implicit price for KL falls between the confidence interval for the SA implicit price, then it suggests that the implicit price in KL is statistically similar to the implicit price in SA. Therefore, it can be transferred to SA.

The discussion of the overlap in confidence intervals will only concentrate on the significant implicit price. As shown in Table 6.19, the implicit price for Info1 in KL can be transferred to MAP in the MNL with interactions model. Some analysts (e.g. Colombo et al., 2007) prefer to adjust the implicit price value by using the estimated function at the study site with the sample information at the policy site. The value generated from this procedure is known as adjusted implicit price. In contrast, the implicit price estimated by using the estimated function and sample information at the study site is known as the unadjusted value. The results in Table 6.19 show that the transferability of the adjusted implicit prices does not differ greatly from the unadjusted implicit prices, where the implicit price for Info2 in KL is transferable to MAP in the former, but not in the latter.

It is more challenging to investigate transferability in the LCM because each site consists of segments, and determining how to pair segments in KL with segments in SA is difficult. Since there was no discussion on transferability in LCM in the literature, this study attempts to investigate it by using the average implicit price. This means that the average implicit price for segments in KL was tested to identify whether or not they are transferable to the average implicit price for segments in SA. The average was calculated by summing up the implicit price in segment 1 and segment 2 and dividing the result by two. The results in Table 6.19 show that all the average implicit price values in KL were transferable to SA. This can be seen from the table where the implicit prices for KL fall between the confidence intervals for implicit prices in SA. All these values were also significant at least at a level of 10%, except for natural attractions (at both levels) in the MNL with interactions model for SA.

Table 6.19: The Benefit Transfer of Implicit Prices (in RM)

Attributes	MNL with interactions			LCM	
	KL[u]	KL[a]	SA	KL	SA
Amen	5.54***	6.63***	12.22***	8.93***	15.26***
	(3.85,7.23)	(4.57,8.69)	(8.41,16.03)	(7.11,10.74)	(8.66,21.86)
Fac1	11.19***	13.40***	21.80***	17.15***	27.94***
	(9.00,13.39)	(10.72,16.08)	(16.52,27.08)	(14.37,19.92)	(16.87,39.01)
Fac2	16.86***	20.18***	29.51***	23.40***	35.75***
	(14.55,19.17)	(17.17,23.20)	(23.41,35.61)	(20.26,26.54)	(22.07,49.43)
Info1	2.94***	3.52***	6.60**	6.07***	9.81***
	(0.90,4.98)	(1.20,5.83)	(1.12,12.07)	(3.93,8.21)	(3.54,16.08)
Info2	3.29**	3.93**	8.01***	6.44***	8.80***
	(0.57,6.01)	(0.75,7.12)	(3.75,12.27)	(3.72,9.17)	(3.53,14.08)
Natt1	3.86***	4.62***	2.22	5.14***	5.08*
	(1.73,5.99)	(2.06,7.18)	(-2.26,6.70)	(3.04,7.24)	(-0.11,10.27)
Natt2	4.22***	5.05***	2.99	6.68***	6.43**
	(2.03,6.41)	(2.39,7.71)	(-1.70,7.69)	(4.47,8.90)	(0.82,12.03)

[u] and [a] denote unadjusted and adjusted implicit price, respectively.
***significant at 1%, ** significant at 5%, and *significant at 10%; 95% of Confidence Interval are in brackets

Although the coefficients estimated in the demand functions were not transferable, all the implicit prices for the LCM estimated in the KL model can still be transferred to the SA model. This is consistent with the study done by Morrison et al. (2002).

A further analysis that can be undertaken when investigating benefit transfer in implicit prices is the measurement of the magnitude of transfer errors. This predicts the errors if the implicit price is transferred from the study site to the policy site and can be calculated by using the formula in equation 6.6 (Colombo et al., 2007), with the transfer error usually reported as a percentage.

$$\text{Transfer Errors} = \frac{\text{Predicted Value (KL)-Estimated Value (SA)}}{\text{Estimated Value (SA)}} \qquad \textbf{6.6}$$

where predicted value refers to implicit price calculated at the study site (KL) and estimated value is an implicit price computed at the policy site (SA). Table 6.20 presents the percentage transfer errors between KL and SA. The results are discussed for implicit prices which are significant in both sites. The negative sign on the errors indicates that the implicit price in KL is lower than the implicit price in SA.

Overall, the transfer errors in the study range from 1% to 58%. These are similar to other transfer errors found in other benefit transfer studies in CEs. For example, the transfer errors in Morrison et al. (2002) were 13% to 146.18% and in Colombo et al. (2007) were 0.3% to 33%. When comparing the transfer errors of implicit prices calculated using the unadjusted and adjusted approach, the results show that the transfer errors in the latter were lower than for the former approach. However, the results between the adjusted approach and the LCM are varied. Some of the transfer errors were lower in the LCM (i.e. Amen, Info1 and Info2) but Fac2 was lower in the adjusted approach.

Table 6.20: The Percentage of Transfer Error between Kuala Lumpur and Shah Alam[a](%)

Function	Amen	Fac1	Fac2	Info1	Info2	Nat1	Nat2
MNL (interactions)							
Unadjusted	-55	-49	-43	-55	-59	(74)	(41)
Adjusted	-46	-39	-32	-47	-51	(108)	(69)
LCM	-41	-39	-35	-38	-27	1	4

[a] The percentage in brackets show that at least one of the compared implicit prices are not statistically significant

6.5 Conclusion

A key issue when conducting choice data analysis is to determine the appropriate estimation models. The decision usually depends on the study and on whether or not its objective is to investigate systematic and/or random heterogeneity. Alternatively this could depend on the assumption of whether or not the random parameters distribution is discrete or continuous.

The estimation analysis undertaken in this study began with simple models, such as the basic MNL model. Analysis was then extended to a model that takes into account systematic heterogeneity, the MNL model incorporating interactions with socio-demographic characteristics. Finally, analysis was undertaken using models where the random parameters were assumed to be distributed either continuously (RPL) or discretely (LCM). The results from the analysis suggest that the appropriate models to be used in this study are the MNL with interactions model and the LCM.

In the MNL with interactions model, the preference order of attributes for respondents in KL was facilities, amenities, natural attractions and information. However in SA, the order was facilities, amenities and information. In terms of implicit prices, the results in these two estimation models indicated that the samples in KL and SA were willing to pay extra for facilities and amenities compared to natural attractions and information. An effort to extrapolate coefficients estimated in KL to the MAP was not encouraging for this choice data. In terms of the transferability of implicit prices, the results obtained from the adjusted and unadjusted approach in the MNL with interactions model were found to be similar. However, the transferability in the LCM was very encouraging with all of the implicit prices estimated in KL transferable to SA.

This summary permits some conclusions and suggestions to be drawn about the current preferences of Malaysian people for recreational parks. All these conclusions and suggestions will be discussed further in the next chapter.

Chapter 7 : Summary and Conclusion

7.1 Introduction

Outdoor recreation, or specifically recreational parks, offers a range of active and passive pursuits in which the public can engage. The activities available in parks have many benefits. These include improving social interaction, promoting a healthy lifestyle, and enhancing knowledge. These benefits have motivated the government to conserve some areas for the development of parks and to upgrade existing parks. However, the number of people visiting parks is variable. Some parks receive a high number of visitors, whilst others see relatively few visitors.

In reality, some parks have been designed and built without taking into account public preferences. Some of these parks may have facilities that are of no interest to the public and, this is likely to have an adverse impact on visitor numbers. Understanding public preferences could help to mitigate these problems and, for this reason, such information would be useful to parks' management. It is this factor that has motivated this study to investigate public preferences concerning the attributes of parks.

This study employed a case study approach, where the chosen study site was the Malaysian Agricultural Park (MAP) in Shah Alam (SA). The study also investigated whether or not the value estimates derived for other parks could be transferred successfully to the MAP. The valuation of a generic recreational park by residents of Kuala Lumpur (KL) was used for this purpose.

This study used the Choice Experiment (CE) technique to explore public preferences. It is appropriate to apply CEs when it is not desirable to restrict the valuation exercise to a particular change. The technique has several advantages, one of them being its flexibility. CEs can be applied to parks that have a variety of attributes and can investigate public preferences across different attributes. It can also be used for benefit transfer where the attributes (and their levels) of the policy site can be adjusted according to the values estimated at a study site.

Information is provided on public preferences for a range of attributes available in parks. This information can be used by management to determine what attributes the public prefer when visiting recreational parks. Using this information, proposals for the required public funding of parks can be justified and this can inform decisions concerning the appropriate levels of funding for recreational and other facilities. Finally, the information can also be used to suggest the appropriate level of entrance fees to be charged at parks.

7.2 Summary of the Study

The valuation exercise was carried out by asking a sample of residents in KL and SA to state their preferences for future visits to parks. A hypothetical park was created in the KL exercise by combining several selected attributes at different levels. The attributes were amenities, facilities, information, natural attractions and package price (see Section 5.2.1 for details). All attributes were provided at three levels apart from amenities, which were provided at two levels.

The responses were analysed using various estimation models. However, the discussion in this section is based on the results of the Multinomial Logit (MNL) model with interactions and the Latent Class models (LCM).

The first objective of this study was to explore public preferences for attributes provided by parks in KL and MAP in Shah Alam. The results in the MNL with interactions model show that the attributes preferred by the KL sample were facilities, amenities, natural attractions and information. However in SA, the order of preference was facilities, amenities and information.

The results in the LCM model, however, were varied. The respondents in segment 1 of the KL model preferred (1) facilities, (2) amenities, and (3) natural attractions. For segment 2, the preference order was facilities, amenities, information and natural attractions. The preference order in segment 1 of the SA model was similar to segment 2 in KL. In segment 2 of the SA model, only facilities and amenities were preferred by the respondents.

The second objective was to estimate public implicit price for attributes used in this study. It is noteworthy that by including the package price, the model allowed the computation of implicit price. Implicit price indicates how much individuals are willing to pay if the attributes were to be provided at the higher level. The results in the basic MNL with interactions model found that the respondents in KL and SA would be willing to pay between RM16.90 and RM29.50 if the facilities were upgraded from the medium to the higher level.

Respondents in both areas, however, were not willing to pay very much for improvements in information and natural attractions. For example, in segment 2 of the LCM model, the respondents in KL were willing to pay an extra RM1.00 if the information was improved from the medium level to the higher level. The same scenario was observed with regard to natural attractions in segment 1 of the LCM in SA, where the respondents were willing to pay an extra of RM0.80 for improvement from the medium level to the higher level.

The average implicit prices estimated in this study were considered reasonable compared to the current charges for such goods in the real world (i.e. entrance charges for theme parks in KL and SA).

The study estimates the total benefits that would be received by respondents if they could visit a hypothetical park. Benefits are calculated in terms of compensating variation and they are subject to park attributes and their levels. Parks with more attributes (or provided at higher levels) provide more benefits for visitors. The results in the MNL with interactions model show that a hypothetical park similar to MAP generates compensating variation of RM29.56 and RM11.32 in KL and SA, respectively. The benefits were much higher in the LCM. For example, in segment 1 of the SA model the estimated compensating variation was RM84.72, whilst the benefits for segment 2 in the KL model was RM97.73. This has implications for pricing and provision as shown in the following section.

The third objective of the study was to investigate the effect of random heterogeneity on public preferences for attributes at parks. As explained in the results chapter, two estimation models that accounted for random heterogeneity were estimated. They are the

Random Parameter Logit (RPL) model and the Latent Class models (LCM). The performance of the RPL model, however, was no better than the MNL with interactions model. The results of the model were not therefore discussed. The summary for this objective was drawn from the results of LCM.

Two segments of LCM were chosen to investigate random heterogeneity in KL and SA. Even though the presence of random heterogeneity was suspected, the initial results for both areas using interaction terms were inconclusive. Subsequent profiling of the respondents into segments, however, provides useful information on random heterogeneity for parks' management. For example, in KL this study found that the characteristics of respondents who were willing to pay more for attributes were male, attained a higher education and were of Malays ethnicity. They come to parks for social activities. Whilst in SA, the characteristics were male, of Malays and Chinese ethnicity. Respondents with these characteristics were believed to visit parks for various motives, such as social activities, enjoying nature, and skills development.

The next objective was to investigate the transferability of coefficients estimated in demand functions from KL to SA. The Likelihood Ratio (LR) test was undertaken to investigate this transferability. The results of the test found that none of the coefficients estimated in KL models could be transferred to MAP. Therefore, it can be concluded that to apply the KL model to MAP would lead to biased results.

The final objective of the study was to examine the transferability of the implicit price estimated from the KL model to MAP. The appropriateness of the transferability can be determined from the implicit price for KL and the confidence interval for implicit price at MAP. If the implicit price for KL falls within the confidence interval for MAP's implicit price, then the implicit price in KL is transferable to MAP.

The standard deviation for calculating the implicit prices were estimated from the Krinsky and Robb (1986) bootstrapping technique. However, the technique cannot be applied to the LCM because the estimated variance matrix of estimates is singular. Therefore, standard deviations estimated in the LCM using the Delta method were employed. The results in the MNL with interactions model indicate that the implicit price for information estimated at KL could be transferred to the MAP. In the LCM model, all the implicit prices were transferable.

In terms of transfer errors analysis, two types of transfer errors were calculated in the MNL with interactions model. They are transfer errors for (1) adjusted implicit prices, and (2) unadjusted implicit prices. The results found that the transfer errors for the adjusted implicit prices were lower than for the unadjusted implicit prices. This suggests that the adjusted implicit prices in KL were more suitable for transfer to the MAP than the unadjusted implicit prices.

The main focus of the study was to value the attributes of recreational parks. Therefore, the key findings were about attributes. What attributes do the public prefer when they visit parks? How much is the public willing to pay for these attributes? At the same time, the study also investigated the potential for benefit transfer. The corresponding results provide that can be put forward to the parks' managers. These recommendations will be explained in section 7.3.

7.3 Policy Implications

The findings of this study provide several policy recommendations for the parks' managers and for relevant policy makers. The first implication drawn from the study concerns the use of public funds to create or enhance the purpose of recreational parks. This allows park managers or policy makers to justify why public money should be invested in recreational parks. The second implication relates to funding management in parks. This includes determining the level of funding for the attributes available in parks. The next implication involves the level of entrance fee that can be charged. This recommendation suggests whether or not the current entrance fee at the MAP should be revised. The final implication is about the transferability of estimates across urban parks in Malaysia.

The funds for managing public parks generally come from two sources, public funds and/or entrance fees. The major source, however, involves public funding, because the entrance fee imposed in parks is usually minimal. The acquisition of public funding is no easy task in the face of competition with other government programmes. As a consequence, the funding received is often inadequate to cover the development and maintenance of parks. This situation is seen in many public parks and MAP is no exception. As discovered by Abdullah et al. (2003) the lack of public funding was the main problem faced by the MAP management in attempting to ensure a good level maintenance in the park.

In general, the computation of compensating variation as shown in Section 7.2 provides a value for parks in terms of the public. For example, when the compensating variation from the MAP are RM11.32 per visit and the number of visitors is 299,346 (number of visitors in 2009), the total public value provided by MAP in 2009 is RM3.4 million. In other words, this is the value that the government provides to the public through MAP. The government may increase funding if they are better able to understand the public benefits gained. Therefore, this value can be used to justify an increase in government funding for MAP.

The second implication concerns the distribution of funds, where the study provides evidence to inform decisions regarding the level of funding used for the provision of different recreational attributes. In many cases, managers of recreational parks face problems distributing the limited funds. Consequently, it is common to find that public funding for parks is invested unwisely. Some parks provide facilities that do not meet the public's needs. In the worst case scenario, unpopular attributes provided in parks could involve high maintenance costs and be impractical to maintain in the long term. This has happened at MAP where Abdullah et al. (2003) found that the attributes provided at the park are too costly to be maintained. Key attributes were also impractical to maintain in the long term.

In this study, the results regarding public preferences for attributes gives some useful hints as to how funding can be optimally invested. Usually, it is argued that funds should be invested in the attributes that were valued most highly by the respondents. The decision, however, might be inaccurate without taking into account the cost of providing it. For example, even though respondents for parks in KL, or MAP in Shah Alam, mostly valued the attributes relating to facilities and amenities this does not necessarily indicate that the funding should be invested in the attributes. Attributes such as information which attract lower costs might need to be considered on benefit-cost grounds even though they offer smaller benefits. At the same time, the required quality of the chosen attributes must also be affordable.

The next policy implication that can be drawn from the study concerns the entrance fee. As shown in Table 6.17 the compensating variation for a hypothetical park in the SA model, that similar to MAP in the MNL with interactions model and the LCM (segment 1), was RM11.32 and RM84.72, respectively.

Indirectly, the results of compensating variation in the study indicate that the current charge to the MAP was below the market value (so demand is price elastic). Therefore it is suggested that the entrance fee be reviewed in the light of this study's findings. The price, however, should no longer be a single entrance fee, but must be implemented as a package price. This suggestion will not only increase funds but will also increase use of the less popular attributes at the park because the visitor will have an incentive to use other attributes that are included in their package price. The combination of attributes offered in the package price can be defined by the management, after conducting consumer research on the results of public preferences with regard to the new packaged price.

The final implication concerns whether or not value estimates based on other parks can be extrapolated to the MAP. Extrapolating estimates from one site to another is desirable because of the high costs and time requirements of conducting separate studies. The transferability of estimates between samples in KL and SA suggests that the estimated implicit price for amenities and information in the MNL with interactions model were transferable. In other words, it implies that the implicit prices for information estimated in KL could be used as a proxy of implicit price for the attributes at other parks. In the LCM, all the implicit prices were transferable. Transferability, however, should be interpreted with caution because it applies to urban parks and not to all parks in Malaysia. This is because the parks in KL are located in an urban area.

In choosing the technique to calculate the implicit price in the MNL with interactions model, the transfer error results in the study suggest using the adjusted implicit price rather than the unadjusted version, because less errors are likely if the former implicit price is employed. By implementing this suggestion, park managers could save time and money in determining implicit prices at other urban parks. But according to the results of this study, this is very limited (i.e. only one less important attribute had this property).

7.4 Limitations and Future Research

The final section discusses the limitations of this study and possible recommendations for future research. A number of limitations were identified. The first is a component of elements representing the natural attractions attribute. As explained in the methodology chapter, this study uses generic attributes rather than specific attributes. This is because the objective in this study was to provide a more generic benefit transfer model for recreational parks in Malaysia. Although the generic attribute approach performed well for valuing attributes in KL and SA, the approach does not seems to work for the natural attractions in the MAP. The attribute was found not to be significant in most of the estimation models. Perhaps people just expect to see natural attractions in parks and are not willing to pay for this attribute.

The second limitation concerns non-attendance to attributes. This happens when respondents do not consider the attributes used to explain scenarios in the choice cards. In this study, respondents who were found not to consider all of the attributes were removed from the analysis. Even though this decision improved the model fit (i.e. adjusted R^2), it can be viewed as the analyst's own preferences on the data rather than providing a full understanding of the respondents' preferences (Lancsar and Louviere, 2006). Having said this, it can be concluded that the study concentrates on model fit rather than attempting to gain a full understanding of respondent preferences.

The assumption of a linear additive utility function (equation 6.1) in the study was for the sake of convenience rather than a reflection of economic theory (Garrod and Willis, 1999). Other functional forms (i.e. non-linear utility functions) could also be used; however, this comes at a price. For instance, the application of non-linear utility functions would require experimental designs that take into account interaction and higher order terms. Since the study only considered additive main effects designs this means that the results were limited by assumptions that higher order and interaction terms are insignificant. Though the results of this study are limited to the main effects attributes, typically these account for around 85-90% of utility (Willis, 2009).

The next limitation arises from the distributional assumptions of the RPL model. Usually, analysts (e.g. Revelt and Train, 1998) fix the price parameter to help them to interpret the implicit price. This approach was applied in this study. However, some analysts (e.g. Campbell et al., 2010) argue that it may be incorrect to assume that all respondents exhibit equal sensitivity in the price coefficient because respondents who are highly sensitive to price may follow a different distribution compared to those who are less price sensitive. At the same time, analysts have also specified a distribution for other attributes and derived estimates for the parameters of that distribution whereby normal and lognormal distribution are mostly used (e.g. Revelt and Train, 1998). This approach was applied in this study where all the attributes, except package price, were assumed to be normally distributed. This may be one of the factors that caused the results from the RPL model to be less satisfactory than those of other models.

Another limitation regards the functional form used to analyse the choice date. In this study, the analysis of choice data was limited to a few more well known estimation models such as multinomial logit (MNL), random parameter logit (RPL) and lastly, latent class models (LCM). Though these estimation models were suitable for the analysis of heterogeneity in tastes (except the basic MNL, Train, 2003) and the results from the analyses were sound, particularly in the LCM, the analysis had limited capacity to investigate issues in CE such as status-quo effect and uncertainty in choices between alternatives.

Having explained these limitations, it is recommended that further work be undertaken in the two following directions. One, concerns further methodological improvements and the second the future application of these methods to inform policy and management. The following methodological improvements are proposed:

a) to carry out a separate analysis for respondents who had visited recreational parks and those who had not. The results of this analysis could explain variation in the attributes preferred by visitors and their implicit prices compared to non-visitors;

b) to investigate the effect of higher order and interaction terms. For example, interaction effects between attributes could be analysed and this could potentially inform park managers about how changes to one attribute could influence preferences for other attributes;

c) to investigate heterogeneous price sensitivities in the RPL model. This analysis can be conducted by allowing the price parameter to be random. Apart from this, assumptions on the parameter attributes should be investigated for various forms of distribution such as triangular, uniform or truncated distributions because analysts are free to specify a distribution that fulfils their expectations (Train, 2003);

d) to explore an alternative functional form that is able to address other issues of interest in CE. For example, Willis (2009) applied the heterocedastic extreme value (HEV) model to investigate status-quo effects and uncertainty in choices between alternatives. Meanwhile, Scarpa (2009) employed the equality-constrained latent class (ECLC) and the Bayesian attribute selection approach to investigate the issue of non-attendance to attributes.

In terms of future application to inform policy and management, the choice-based approach is best suited to valuing the attributes of large-scale rather than small-scale parks (i.e. playing fields, playgrounds and local parks). Usually only basic amenities and facilities are available at these smaller parks, therefore any analysis of trade-offs across attributes would be limited. In addition, no entrance charges are imposed to visitors at these small parks. This suggests that the payment vehicle used in this study (i.e. entrance charges) would not be appropriate. For large-scale parks, the application of the approach can be applied to a variety of sites. For example, the approach can be applied to regional or national parks where wide range of attributes can be considered.

In future, the choice-based approach could be applied to investigate the quality of attributes (i.e. amenities and facilities) and not be restricted to the type and level of attributes only. This is important because as explained earlier, one of the factors that caused the public not to visit parks was the poor quality of certain attributes (rather than just their availability). Typically, the attractiveness of parks depends not only on the type or levels of attributes, but also on the quality of those attributes. For example, a playground facility provided at park must be safe and in good repair and public amenities such as toilets must be clean and functional.

Choice experiments could also be employed to determine specific attributes that could be provided at parks. The public may have different preferences for specific characteristics to represent, for instance, attribute information. Some may prefer to read information on signage, whilst others may wish to obtain the information from brochures. By applying this approach, park managers could concentrate on a particular attributes but further investigate their specific characteristics.

The choice-based approach could also be extended to include the cost of providing the attributes in the analysis. Doing this would not only help policy makers and park managers to understand visitors' preferences, but would also assist them in making decisions on resource allocation under uncertainty. This would provide sound justification for the allocation of funds on selected attributes.

Lastly, the benefit transfer analysis applied in this study has potential to be applied further in future. Even though the results from the analysis were not particularly promising, at least the study provides some justification for analysts to undertake similar exercises for the valuation of environmental goods and services in Malaysia.

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Appendix 5.1 Set of Choice Cards

Choice Card 1	Park A	Park B	Park C or MAP
Amenities	Higher	Basic	Basic
Recreational Facilities	Medium	Higher	Basic
Information	Basic	Medium	Basic
Natural Attractions	Medium	Higher	Basic
Package Price	Medium	Higher	Basic
Please check (√) only at ONE box			

Choice Card 2	Park A	Park B	Park C or MAP
Amenities	Higher	Basic	Basic
Recreational Facilities	Basic	Medium	Basic
Information	Basic	Medium	Basic
Natural Attractions	Medium	Higher	Basic
Package Price	Basic	Medium	Basic
Please check (√) only at ONE box			

Choice Card 3	Park A	Park B	Park C or MAP
Amenities	Basic	Higher	Basic
Recreational Facilities	Basic	Medium	Basic
Information	Medium	Higher	Basic
Natural Attractions	Higher	Basic	Basic
Package Price	Basic	Medium	Basic
Please check (√) only at ONE box			

Choice Card 4	Park A	Park B	Park C or MAP
Amenities	Basic	Higher	Basic
Recreational Facilities	Basic	Medium	Basic
Information	Higher	Basic	Basic
Natural Attractions	Basic	Medium	Basic
Package Price	Medium	Higher	Basic
Please check (√) only at ONE box			

Choice Card 5	Park A	Park B	Park C or MAP
Amenities	Higher	Basic	Basic
Recreational Facilities	Higher	Basic	Basic
Information	Basic	Medium	Basic
Natural Attractions	Higher	Basic	Basic
Package Price	Higher	Basic	Basic
Please check (√) only at ONE box			

Choice Card 6	Park A	Park B	Park C or MAP
Amenities	Basic	Higher	Basic
Recreational Facilities	Higher	Basic	Basic
Information	Basic	Medium	Basic
Natural Attractions	Basic	Medium	Basic
Package Price	Basic	Medium	Basic
Please check (√) only at ONE box			

Choice Card 7	Park A	Park B	Park C or MAP
Amenities	Basic	Higher	Basic
Recreational Facilities	Higher	Basic	Basic
Information	Higher	Basic	Basic
Natural Attractions	Medium	Higher	Basic
Package Price	Higher	Basic	Basic
Please check (√) only at ONE box			

Choice Card 8	Park A	Park B	Park C or MAP
Amenities	Higher	Basic	Basic
Recreational Facilities	Higher	Basic	Basic
Information	Higher	Basic	Basic
Natural Attractions	Higher	Basic	Basic
Package Price	Basic	Basic	Basic
Please check (√) only at ONE box			

Choice Card 9	Park A	Park B	Park C or MAP
Amenities	Higher	Basic	Basic
Recreational Facilities	Medium	Higher	Basic
Information	Medium	Higher	Basic
Natural Attractions	Basic	Medium	Basic
Package Price	Basic	Medium	Basic
Please check (√) only at ONE box			

Choice Card 10	Park A	Park B	Park C or MAP
Amenities	Basic	Higher	Basic
Recreational Facilities	Basic	Medium	Basic
Information	Basic	Medium	Basic
Natural Attractions	Higher	Basic	Basic
Package Price	Medium	Higher	Basic
Please check (√) only at ONE box			

Choice Card 11	Park A	Park B	Park C or MAP
Amenities	Higher	Basic	Basic
Recreational Facilities	Basic	Medium	Basic
Information	Medium	Basic	Basic
Natural Attractions	Medium	Basic	Basic
Package Price	Higher	Basic	Basic
Please check (√) only at ONE box			

Choice Card 12	Park A	Park B	Park C or MAP
Amenities	Basic	Higher	Basic
Recreational Facilities	Medium	Higher	Basic
Information	Medium	Basic	Basic
Natural Attractions	Higher	Basic	Basic
Package Price	Higher	Basic	Basic
Please check (√) only at ONE box			

Choice Card 13	Park A	Park B	Park C or MAP
Amenities	Basic	Higher	Basic
Recreational Facilities	Higher	Basic	Basic
Information	Medium	Higher	Basic
Natural Attractions	Medium	Higher	Basic
Package Price	Medium	Higher	Basic
Please check (√) only at ONE box			

Choice Card 14	Park A	Park B	Park C or MAP
Amenities	Basic	Higher	Basic
Recreational Facilities	Medium	Higher	Basic
Information	Higher	Higher	Basic
Natural Attractions	Medium	Higher	Basic
Package Price	Basic	Medium	Basic
Please check (√) only at ONE box			

Choice Card 15	Park A	Park B	Park C or MAP
Amenities	Higher	Basic	Basic
Recreational Facilities	Medium	Higher	Basic
Information	Higher	Basic	Basic
Natural Attractions	Higher	Basic	Basic
Package Price	Medium	Higher	Basic
Please check (√) only at ONE box			

Choice Card 16	Park A	Park B	Park C or MAP
Amenities	Basic	Higher	Basic
Recreational Facilities	Medium	Higher	Basic
Information	Basic	Medium	Basic
Natural Attractions	Basic	Medium	Basic
Package Price	Higher	Basic	Basic
Please check (√) only at ONE box			

Choice Card 17	Park A	Park B	Park C or MAP
Amenities	Higher	Basic	Basic
Recreational Facilities	Basic	Medium	Basic
Information	Higher	Medium	Basic
Natural Attractions	Basic	Medium	Basic
Package Price	Higher	Basic	Basic
Please check (√) only at ONE box			

Choice Card 18	Park A	Park B	Park C or MAP
Amenities	Higher	Basic	Basic
Recreational Facilities	Higher	Basic	Basic
Information	Medium	Medium	Basic
Natural Attractions	Basic	Medium	Basic
Package Price	Medium	Higher	Basic
Please check (√) only at ONE box			

Appendix 5.2.Questionnaire

Dear Respondents,

I am seeking your assistance in an important study on Malaysian citizen's preferences for recreational parks in Malaysia. This survey is part of my PhD research project at Newcastle University, UK. The research project is funded by the Universiti Utara Malaysia. Results obtained from this research project will be used to inform policy makers about Malaysian citizen's preferences on recreational parks. **Please be assured that the information you provided are strictly confidential and will ONLY be used for the study.** The survey will be conducted by an interviewer and will take about 30 minutes. Please complete all questions in the survey. Should you have any questions on the study, do not hesitate to forward them to me following to the address below:

Bakti Hasan Basri
PhD Student
School of Agriculture, Food, and Rural Development
Newcastle University,
NE1 7RU, UK
Phone:
Email: bakti.hasan-basri@ncl.ac.uk

To be completed by the Interviewer

Your Name	
Time start	
Time Finish	
Location (Respondent Address)	

KUL

Section A: Attitude towards Recreational Parks

1. Have you been to a Recreational Park in the last 12 months?

Please tick ONE box

a) Yes [1] **If yes, go to Q4**

b) No [2]

2. What are the possible reasons to explain why you have not visited a Recreational Park in the last 12 months? **Please tick box that applies**

Show CARD 1

a) Safety concerns [1]

b) Lack of time [2]

c) Prefer other recreational activities [3]

d) Poor condition of parks [4]

e) Parks too far away [5]

f) Health problems [6]

g) Parks don't offer the activities I would like [7]

Others: Please specify ____________________________

3. If these problems were resolved or changed, would you then go to Recreational Parks in future?

Please tick ONE box

a) Yes [1]

b) No [2] **Now Go to Q6**

4. Using the following card can you tell me **HOW OFTEN** you have visited each of the following types of recreational park over the last 12 months? **Please tick box that applies**
Show CARD 2

Frequency (in the last 12 months)	Types of Park		
	Local play area (i.e. playground area)	**Municipal parks** (i.e. Titiwangsa Lake Garden)	**Designated parks** (i.e. Malaysia Agricultural Park, FRIM)
a)1-2	☐ 1	☐ 2	☐ 3
b)3-6	☐ 1	☐ 2	☐ 3
c)7-12	☐ 1	☐ 2	☐ 3
d)13-25	☐ 1	☐ 2	☐ 3
e)26-52	☐ 1	☐ 2	☐ 3
f)53 and above	☐ 1	☐ 2	☐ 3

5. This is a list of typical services and recreational activities being provided at Recreational Parks. What have you and your household used or done when visiting the Recreational Parks in the last 12 months? **Please tick ONE box for each**
Show CARD 3
a) Amenities / Services
   i) Cafe ☐ 1 Yes ☐ 2 No
   ii) Shuttle bus ☐ 1 Yes ☐ 2 No
   iii) Viewed information on the plants and animals ☐ 1 Yes ☐ 2 No

b) Land Recreation
   i) Playground ☐ 1 Yes ☐ 2 No
   ii) Animal show / Seeing animals ☐ 1 Yes ☐ 2 No
   iii) Participated in "Hands-on" training (e.g. : planting and animal feeding) ☐ 1 Yes ☐ 2 No
   iv) Picnicking ☐ 1 Yes ☐ 2 No
   v) Camping ☐ 1 Yes ☐ 2 No

c) Water Recreation

i) Fishing — ☐ 1 Yes ☐ 2 No

ii) Boat paddling — ☐ 1 Yes ☐ 2 No

iii) Kayaking / Canoeing — ☐ 1 Yes ☐ 2 No

d) Extreme Recreation

i) Paintball — ☐ 1 Yes ☐ 2 No

ii) Wall climbing — ☐ 1 Yes ☐ 2 No

iii) Hanging bridge / Flying fox — ☐ 1 Yes ☐ 2 No

Any other services or activities: Please specify ____

____

6. Using the scale given on the card can you please tell me how important each of the following are to you in terms of your decision to visit a Recreational Park? **Please tick ONE box for each Show CARD 4**

Subject	**Not at all important**	**Not important**	**Neither important nor unimportant**	**Important**	**Very Important**
a) Amenities / Services	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b) Recreational facilities (i.e. paintball arena , fishing pond)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c) Information (i.e. signage, brochures)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d) Natural attractions (i.e. natural scenery)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
e) Entrance fee	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
f) Travel time	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

7. Using the scale given on the card could you please tell me your opinion of the following statements, **"I visit Recreational Parks ..." Please tick ONE box for each**
Show CARD 5

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a) to challenge my skills and abilities.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
b) to develop my skills.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
c) to be in charge of situation.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
d) to feel independent.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
e) to feel free from society's restrictions.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
f) to challenge nature.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
g) to be alone.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
h) to feel close to nature.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
i) to observe the beauty of nature.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
j) to obtain a feeling of harmony with nature.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
k) to find quiet places.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
l) to enjoy the sights, sounds and smells of nature.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
m) to be with my family or friends.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
n) to strengthen relationships with family or friends.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
o) to do things with other people.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
p) to be with people with similar interests.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
q) to escape from the pressures of work.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
r) to relieve my tension.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
s) to get away from my everyday routine.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
t) to be away from other people.	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

Section B: Choice Experiment

(READ ALOUD) INSTRUCTIONS

Please Read Carefully

This survey is about recreational parks. Recreational parks provide a wide range of activities, among them, recreational facilities and nature-based activities. In addition, recreational parks also provide amenities and information to visitors. Information is given in various ways such as information boards, brochures, pamphlets, etc. Some parks charge an entrance fee to the visitors.

In this section, you will be asked to **CHOOSE ONE** recreational park either, Recreational Park A; Recreational Park B or Recreational Park C for your next trip to the recreational park. Each park possesses different attributes and these attributes are explained below. To help you to make the decision, these levels are represented by their symbol. The attributes are:

Show CARD of Attributes

Imagine if a new recreational park was being provided near to where you live. The park can be designed to provide a higher or lower level of the different attributes that we have just been talking about and this will be reflected in the package price.

An example of imaginary recreational park for this study is shown now.

Show an example of CHOICE CARD

e.g. *If you were planning to go out to a recreational park in future, which park would you choose?*

Please tick ONE box

☐ 1	☐ 2	☐ 3
Park A	***Park B***	***Park C***

Based on the example given above, we are going to present you **SIX (6) Choice Cards** of **HYPOTHETICAL** recreational parks for you to visit in future. If you have any doubt on the attributes, please refer again to the **Card of Attribute**. Your park's decision on a particular card is **INDEPENDENT** with your chosen park in the other cards. Please bear in mind that any decision you made will be **AFFECTED** into your **INCOME BUDGET**.

Show CARD CE 1

8. If you were planning to go out to a recreational park in future, which park would you choose?

Please tick ONE box

☐ 1	☐ 2	☐ 3
Park A	***Park B***	***Park C***

Show CARD CE 2

9. If you were planning to go out to a recreational park in future, which park would you choose?

Please tick ONE box

☐ 1	☐ 2	☐ 3
Park A	***Park B***	***Park C***

Show CARD CE 3

10. If you were planning to go out to a recreational park in future, which park would you choose?

Please tick ONE box

☐ 1	☐ 2	☐ 3
Park A	***Park B***	***Park C***

Show CARD CE 4

11. If you were planning to go out to a recreational park in future, which park would you choose?

Please tick ONE box

☐ 1	☐ 2	☐ 3
Park A	***Park B***	***Park C***

Show CARD CE 5

12. If you were planning to go out to a recreational park in future, which park would you choose?

Please tick ONE box

☐ 1	☐ 2	☐ 3
Park A	***Park B***	***Park C***

Show CARD CE 6

13. If you were planning to go out to a recreational park in future, which park would you choose?

Please tick ONE box

☐ 1	☐ 2	☐ 3
Park A	***Park B***	***Park C***

14. **(Show CARD of Preferred Attributes)** Once you are finished to choose your preferred recreational parks to visit in future, we would like to know which attribute or combination of attributes you considered when making your choices. **Please tick ONE box for each**

	ATTRIBUTES	Always	Sometimes	Never
a)	Park's Amenities	☐ 1	☐ 2	☐ 3
b)	Recreational Facilities	☐ 1	☐ 2	☐ 3
c)	Information	☐ 1	☐ 2	☐ 3
d)	Natural Attractions	☐ 1	☐ 2	☐ 3
e)	Package Price	☐ 1	☐ 2	☐ 3

Section C: Some Information about You

Please complete the following questions about yourself by ticking to the appropriate box. All information remains **CONFIDENTIAL** and will **ONLY** be used for this study.

15. Gender

Please tick ONE box

a) Male [ ] 1

b) Female [ ] 2

16. **(Show CARD 6)** To which age group do you belong to?

Please tick ONE box

a) 18 - 24 [ ] 1

b) 25 - 34 [ ] 2

c) 35 - 44 [ ] 3

d) 45 - 54 [ ] 4

e) 55 and above [ ] 5

17. To which ethnic group do you belong to?

Please tick ONE box

a) Malay [ ] 1

b) Chinese [ ] 2

c) Indian [ ] 3

d) Others [ ] 4

18. **(Show CARD 7)** Highest level of education you have attained.

Please tick ONE box

a) No formal education ☐ 1

b) Education up to standard 6 ☐ 2

c) Education up to SPM ☐ 3

d) Education after SPM but NOT undergraduate degree or equivalent ☐ 4

e) Undergraduate degree ☐ 5

f) Postgraduate ☐ 6

19. Are you currently in formal employment?

Please tick ONE box

a) Yes ☐ 1 **If YES Go to Q20**

b) No ☐ 2 **If NO Go to Q21**

20. If employed, what is your current employment?

____

21. **(Show CARD 8)** If NOT currently employed, are you ...

Please tick ONE box

i) Seeking employment ☐ 1

ii) Retired ☐ 2

iii) Student ☐ 3

iv) Others ☐ 4

Please specify:

____

22. Are you a member of any Recreational Club?

Please tick ONE box

a) Yes 1

b) No 2

23. Numbers of member in your household who are

Please FILL in each box

a) 16 years old or under 1

b) Over 17 years old 2

24. **(Show CARD 9)** Please tell me which of the following categories indicate your **MONTHLY HOUSEHOLD** income (from all sources) before taxes. Stop when I reach your category.

a) Less than RM 2,000 1

b) RM 2,000 to RM 4,999 2

c) RM 5,000 to RM 9,999 3

d) RM 10,000 to RM 14,999 4

e) RM 15,000 to RM 19,999 5

f) RM 20,000 and more 6

Thank you for your time to complete this survey.