AN APPLICATION OF TRAVEL COST METHOD IN THE VALUATION OF RECREATIONAL PROPERTIES

CASE STUDY OF NAIROBI ARBORETUM

BY

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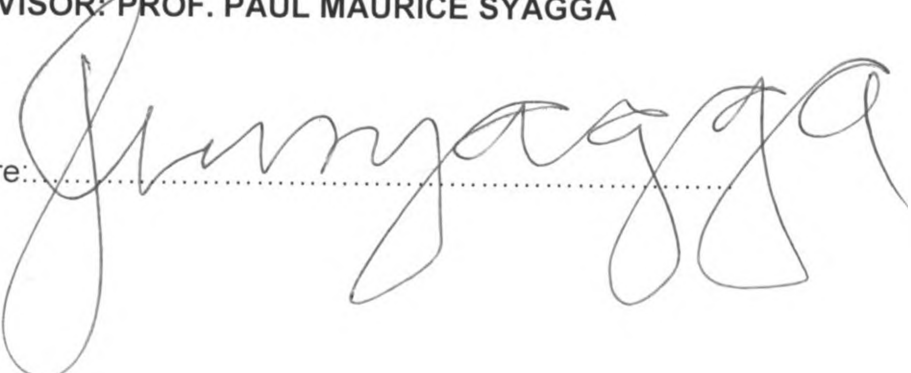
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DECLARATION

This thesis is my original work and has not been presented for a degree in any University.

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ABSTRACT

This research is aimed at not only enlightening the readers on the need to assign monetary values to natural resources particularly recreation sites but also to compare suitability of various models.

Recreation sites are important to any population especially the urban population. New recreation sites need to be provided while existing ones are conserved and expanded to meet the needs of the ever growing urban population.

Travel cost method is suitable for valuation of recreation sites and its premise is that the total cost incurred in visiting a recreation site is the 'price' paid for buying the product. The number of visits to a site is determined by the total cost incurred in accessing it hence the demand function.

Travel cost has various variations such as individual travel cost model and zonal travel cost model which employs different approaches in analysis of travel cost. They are suitable under different circumstances as they result in different valuation outcomes. It is therefore important to use the model which gives the most optimal recreation value to enable it compete effectively with other uses.

The recreational values calculated using the two models was compared with what the market would offer for the next best alternative use. The next best alternative is residential since the case study falls under zone 4. The optimal value equals or greater than market based appraised value. The comparison revealed that individual travel cost model resulted in a comparatively more optimal recreational valuation.

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LIST OF ABBREVIATIONS & ACRONYMS

AA   -   Automobile Association

AATC   -   Average Annual Travel Cost

ATTC   -   Annual Total Travel Cost

CBD   -   Convention on Biodiversity

CS   -   Consumer Surplus

CCN   -   City Council of Nairobi

DWTP   -   Derived Willingness to Pay

DUV   -   Direct Use Value

EMCA   -   Environmental Management and Coordination Act

EPA   -   Environmental Protection Agency

EIA   -   Environmental Impact Assessment

EWTP   -   Expressed Willingness to Pay

FONA   -   Friends of Nairobi Arboretum

HPF   -   Household Production Function

Hr   -   Hour

ITCM   -   Individual Travel Cost Model

Km	-	Kilometer
MBAV	-	Market Based Appraised Value
MR	-	Multiple Regression
NGO	-	Non Governmental Organization
PPA	-	Physical Planning Act
PSV	-	Public Service Vehicle
RUM	-	Random Utility Model
RWTP	-	Revealed Willingness to Pay
RV	-	Recreation Value
SMC	-	Site Maintenance Cost
TEV	-	Total Economic Value
TCRDM	-	Travel Cost Recreation Demand Model
TCM	-	Travel Cost Method
WTP	-	Willingness to Pay
WTA	-	Willingness to Accept
YP	-	Year's Purchase
ZTCM	-	Zonal Travel Cost Model

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CHAPTER ONE

1.1 INTRODUCTION

In our daily life we use various resources for production of goods and services to satisfy our needs. The resources range from financial to human resources, from man made to natural resources. Natural resources are bestowed to us by mother nature and are self existing such as forests, flora and fauna, lakes, wetlands, recreation sites, scenic views, precious stones just to mention but a few.

Natural resource is made up of biodiversity as a component. Biodiversity is the variability of living organisms from all ecosystems ranging from aquatic to terrestrial and other ecological complexes for which they are part (King, 2003). Omunga (2001) defines the term biodiversity as denoting biological diversity which is used to describe the number; variety and variability of living organisms in a given assemblage. Biodiversity has several levels; genetic diversity, species diversity, and ecosystem diversity amongst others. The scope of such biodiversity ranges from intra-species through inter-species to other inter-relations.

Ecosystems which are the functional units of natural resources has been defined by EMCA (1999) as the dynamic complex of animals, plants, other micro organisms and their non living environment interacting as a functional unit, for example, forests, wetlands, estuaries e.t.c. More often than not, people do not directly attach monetary values to natural resources. In fact economists have been criticized for trying to put a "price tag" on nature. This has made valuation of natural resources both controversial and difficult.

Authorities responsible for managing and protecting natural resources are often confronted with difficult spending decisions involving trade offs in allocating resources. These decisions are more often than not economic decisions and they are either implicitly or explicitly based on societal values. Economic valuation of ecosystems is therefore important and very useful in providing facts for justifying and setting priorities for policies, programs and actions for protecting or restoring ecosystem and their services.

The economic value of a natural asset and/ or the services / functions provided by that asset is the sum of all the present and future benefits that the asset (or the services/ functions provided by the asset) provides (EPA, 2003). This is irrespective of the possibility that the resource (or its services or functions) and its derived benefits may not be valued (traded) in the market economy (priced). Economic value is one of many possible ways to define and measure value. Although other types of value are often important, economic values are useful to consider when making economic choices i.e. choices that involve trade offs in allocating resources

The environment can be valued by observing the behaviours on usage of the environment (Herriges, 1999).The data obtained in such valuation is referred to as revealed preference data. The models employing the data are termed as Revealed Preference Methods and include Travel Cost Method, Hedonic Method, Random Utility Models of Recreational Use, and Averting Behaviour models.

Smith (1993) explains that revealed preference approach for describing consumer behaviour relies on the idea that an individual's choice of a consumption bundle of marketed goods (given their prices) conveys information. The bundle that a consumer with a given income purchases must (because of its selection) be preferred to all others at that particular set of prices.

The logic behind travel cost approach was first suggested by Harold Hotelling in 1947 and the methodology was subsequently developed in the late 1950s and 1960s by among others; Trice and Wood (1958); Clawson (1959); and Clawson and Knetsch (1966).Since then, numerous studies have adopted a methodology based on this approach. The method relies on observing quantities and imputing prices (Smith, 1996). Travel cost method is employed to estimate the demand or marginal valuation curve for recreation sites (Garrod, 1999).

In light of the fore going, and as is suggested by Omunga (2001), we need to learn more, and more quickly, about the role that biodiversity plays in the working of ecosystems. Gaps in our present knowledge of these connections now limit our assessments of the risks imposed when biodiversity declines, and preclude more complete economic valuations.

It is important to note that this research shall concentrate on comparing two variations or models of travel cost method that is zonal travel cost model and individual travel cost model in order to determine which one of them produces a more optimal result or value than the other. Random utility model has been left out because it is costly, sophisticated and time consuming hence does not fit within the time frame for carrying out the research.

1.2 PROBLEM STATEMENT

Urbanization in developing countries is growing at an alarming rate. This comes with the concomitant urban problems and stresses such as high' rate of crime and insecurity, inadequate shelter, lack of gainful employment, high cost of living, urban poverty amongst others.

The urban population needs much of recreation due to the numerous problems associated with urbanization. Recreation sites help reduce stress levels which may also lead to higher productivity at work places.

With the scarcity of available spaces near or within urban areas, there is often stiff competition for such spaces amongst many land uses such as residential, commercial, industrial, educational e.t.c.

Regional physical development plans may be prepared for recreational areas as per section 16 of the Physical Planning Act of 1996 (PPA) in which case the plan will be required to contain a relevant study and report concerning physical development of the area in accordance with section 17 (d) of the Act. Further, the Act provides that no development can be carried out within a local authority without their permission (sec. 30 of PPA, 1996) and the factors they consider before granting development permission include health, amenities and conveniences of the community generally and to the proper planning and density of development and land use in the area.

Section 58 of the Environmental Management and Coordination Act, 1999, (EMCA) provides that projects specified in second schedule of the Act must be subjected to environmental impact assessment (EIA). PPA also provides for the same in section

36. One of the areas where EIA is required as per the said schedule is under urban development which includes; establishment or expansion of recreational areas; establishment or expansion of recreational townships in mountain areas, national parks and game reserves.

The issue of valuation of natural resources has been receiving considerable attention in light of the enactment of Environmental Management and Coordination Act, 1999, (EMCA) and Physical Planning Act, 1996.This is because of provisions in the said statutes and the change in world perspective with regard to the environmental conservation and sustainable development. However, only limited effort if any has been devoted to valuation of recreational sites in the country yet these could really help in supporting Environmental Impact Assessments submitted under these Acts of Parliament. These legislations should thus provide the much needed impetus for development of better recreation valuation techniques. The central problem addressed in this research effort is to compare two travel cost models in valuation of recreation sites and finding out which one offers better and optimal valuation.

Appropriate economic valuation of recreational sites is therefore important to convince the government of the need to allocate, keep and conserve recreation sites. One method of carrying out such valuation is travel cost method which has various models or variations such as individual travel cost model, zonal travel cost model and random utility models.

There is need to find out which variation or model offers the most inclusive and better valuation. Most previous researches, for example, Kinuthia (1996) and Syagga (2002) have been concerned with either determining the applicability of travel cost method or comparison with other methods of natural resource valuation. Further, these researches have been employing zonal travel cost model in the said comparative studies.

It is therefore critical that this research is conducted to enable our professionals come up with better and efficient recreation valuation techniques that result in optimal values which will prompt and convince our governments to invest in, guard and

maintain the existing recreational sites in addition to allocating more sites or spaces for recreational purposes.

1.3 OBJECTIVES OF THE RESEARCH

The overall objective of this research project is to conduct a comparative study of Zonal Travel Cost Model (ZTCM) and Individual Travel Cost Model (ITCM) in valuation of recreational property.

To this end the research project will:

1. Examine application of two travel cost models (Individual and Zonal).
2. Calculate recreational value of the case study using the two models so examined
3. Compare the resultant recreational values to determine whether there is any difference in the values.
4. Compare the resultant recreational values with the market based appraised value of the case study area assuming residential use in order to find out the most optimal resultant recreational value.
5. Recommend use of the model which gives rise to the most optimal recreational value

Residential use is the next best use of the arboretum since it is within Zone 4 as per the City Council of Nairobi zoning. The permitted plot ratio and ground coverage for the zone is 1.50 and 0.50 respectively while the allowed minimum plot size is 0.20 of an acre

The most optimal recreational value will be that which equals or greater than the market based appraised value of the site for the next best alternative use to the site.

1.4 RESEARCH HYPOTHESIS

Null hypothesis: There is no difference in recreational values arrived at when zonal and individual travel cost models are applied on the same data set for purposes of valuing recreational property.

1.5 SCOPE OF THE RESEARCH

The scope of the research is dependent on the available financial, equipment and time resources. Consequently, the research will be conducted within the context of the case study namely Nairobi Arboretum which is located within Riverside in the City of Nairobi. The study will involve primary data about the site and on -site visitors found when administering the questionnaire and interviews.

The case study was chosen because of its location and variety of amenities that it offers. Most individuals who go there really and sincerely go for recreation purposes unlike other parks or sites near city center which may be full of idlers or job seekers. In addition, many visitors to recreation sites near major city centers come from same zones hence preventing estimation of reliable demand functions. This is because enough difference between the distances travelled is necessary in order to affect travel costs which eventually determine the number of trips to the site.

1.6 RESEARCH METHODOLOGY

The approach and methods employed in undertaking this research project was varied and integrated, depending on the nature of required data. Basically, data was obtained from both primary and secondary sources.

Primary data included origin of the visitors, whether the visitors use private or public means of transport to the site, whether they are self employed or not, size of their household, frequency of visits, transport costs, age, earnings, purpose of visits and cost of food eaten on site or refreshments. The data was collected on site through administration of questionnaires to the visitors to the case study (recreational property).

Secondary data included administrative units, mileage rates, wage rates. The secondary data were collected through key informants including local authorities such as the City Council of Nairobi, and central government such as Ministry of Lands and Housing, Ministry of Environment, Ministry of Planning..

Throughout the research period, maximum use was made of secondary data which were obtained mainly from published works available in the libraries, institutional departments, websites, books, previous researches, graduate projects and master theses, articles in journals, government documents, and local authority reports.

All data from both secondary and primary sources were analyzed and assessed quantitatively using arithmetic and statistics. The calculations and findings were presented in text, tables, figures and graphs.

In particular, the research methodology involved using two models of travel cost method for purposes of valuing the case study –Nairobi Arboretum. The two models were Individual travel cost model (ITCM) and Zonal travel cost model (ZTCM)

The third model of travel cost method that is Random Utility Model (RUM) was not used in the said valuation because of the following reasons:-

i)   It is more expensive to carry out in terms of equipment, tools and sites
ii)   It requires more time to carry out as many substitute sites are needed
iii)   It is the most complicated and sophisticated model

The methodology of the research in this regard involved:-

- Making physical count of visitors entering the Nairobi Arboretum during weekends and weekdays (three days of weekdays Monday, Wednesday and Friday)
- Asking visitors to the arboretum their ages and eliciting from visitors (16 years and above) various information as contained in the annexed questionnaires. The initial questionnaire (Appendix 1) was later revised (Appendix 2) to enhance gathering of more accurate information from respondents based on the extent and clarity of responses to the initial questionnaire. The elicited information included but was not limited to the following:-
    1) Their residence/division of origin

2) Reasons for visiting the site

3) Level of education

4) Means of transport to the site

5) Frequency of visits to the site in the previous year

6) Distance of travel to the site by the visitors

7) Time taken to travel to the site by the visitors

- The study administered questionnaires randomly to visitors above 16 years on the following days:-

  i.   Twice (Saturdays and Sundays) during the weekends which are peak days with high traffic just like holidays(there are approximately 104 weekends in a year and 11 public holidays in Kenya)

  ii. Thrice (Monday, Wednesday and Fridays) during week days which are off peak days with light traffic (there are approximately 250 such days in a year)

- Zones of origin of visitors were based on the eight (8) administrative divisions in Nairobi. This is because information relating to such criterion of zoning was more readily available as compared to any other criteria

- Population of each zone was obtained from the Ministry of Planning and based on the last (1999) census

- The total sample size of the study was two thousand four hundred and sixty (2,460) visitors. The sample size was initially calculated to be two thousand one hundred and seventy two assuming that 80% of the target population had the characteristics of interest to the researcher. Confidence level was taken at 98% and the formula proposed by Mugenda (1999) for calculating size of desired sample in social sciences. However, since a higher sample was chosen after visit to the site by the researcher revealed that less of the characteristics of interest in the target population were less than the hitherto presumed 80%. The visitors were randomly selected and the researcher presumes to be large enough to enable better statistical analysis.

- Transport costs were based on estimated costs from various zones or residences as given by the respondents for individual travel cost model and based on Automobile Association (AA) running costs per kilometer (Km) for visitors who used private means and average bus fare per person per kilometer (in Nairobi) for those who used public means with regard to zonal travel cost model.

- Time cost was based on average wages for low, middle and high income groups as provided in the Economic Survey of May 2005
- Distances from the various divisions /zones were calculated based on Nairobi Parliamentary Constituencies Map (6th Edition, 2002) which is on a scale of 1:50,000. The distances were calculated from the center of each division to the park in order to simplify computation.
- The most optimal recreational value will be that which equals or greater than the market based appraised value of the site for the next best alternative use to the site.

1.7 SIGNIFICANCE OF THE RESEARCH

There is a significant benefit that appropriate valuation techniques for valuing recreational sites holds the key to strategic allocation and conservation of recreation sites leave alone guiding allocation of financial resources for such purposes.

The environmental valuers shall also be aware of the need to employ appropriate valuation models in order to arrive at optimal and convincing recreational values which helps in conservation of existing recreation sites.

The demand for research on better methods of valuing recreation sites in the country is still critical, given the existing pressure on urban land and competition over the same by various users.

Further given the latest developments in establishment of environment friendly legislations such as EMCA and PPA, research on valuation of natural resources particularly recreational resources will be highly welcomed by all and sundry. In addition, the studies or valuations can also be used to reinforce the EIAs.

Considering the researcher's both academic and professional interest in environmental valuation, this research project will offer the researcher the opportunity to actively research on the issues that are pertinent to environmental or natural resource valuation; particularly on valuation of recreational sites.

Result of the research will ensure appropriate and better valuation of recreational properties in such away as to convince the policy and decision makers on the need to conserve, protect and expand recreational facilities.

1.8 ORGANIZATION OF THE RESEARCH

The research shall be organized in several chapters as follows:-

Chapter One :   Introduces the study, state the problem, indicate research objectives; research hypothesis; scope of the study; significance of the study; research methodology; organization of the study; assumptions of the study; research work plan; and definition of key terms.

Chapter Two: Reviews various literature and research related to the study.

Chapter Three: Discusses the case study, analysis of data collected from the case study and discussion of the findings from the analyses.

Chapter Four: Conclusion is drawn from the findings, recommendations are made and areas for further research are suggested.

1.9 ASSUMPTIONS OF THE RESEARCH

The assumptions apply to travel cost method of valuation in order to provide a simplified model for purposes of this research. This is in line with the available time and financial resources under which the research shall be carried out.

The assumptions include the following:-

i.   Visitors to the recreation sites take trips for single purpose of visiting the sites.- this is to avoid difficulty in apportioning travel cost in cases of multi purpose trips

ii.   Visitors to the sites perceive and respond to changes in travel costs in the same way they would respond to changes in site admission or entry fee .

iii.   Visitors to the recreation sites take trips for single destination which is to the sites- this is also to avoid difficulty in apportioning travel cost in cases of multi destination trips

iv.   The opportunity cost or value of time spent traveling is on the basis of single destination and purpose trips

v.   Cost of distance travelled to the site is a component of value an individual attaches to the site i.e. the longer the distance the higher the value and vice versa while same distance mean same value

vi.   Total visit costs is an indication of recreational value of a given site

vii.   Interviewing visitors on site does not create sampling biases to the analysis of the findings

1.10 DEFINITION OF KEY TERMS

The terms which will be frequently used in the research and thus need definition include the following:-

Consumer surplus-area under demand curve derived from behaviour of visitors to changes in travel cost. Used to estimate the total economic benefit of the site to visitors

Demand - the desire for a good or service supported by the means to purchase it

Economic value -is measured by the summation of many individuals' willingness to either pay or be compensated for a good or service

Ecosystem -is the dynamic complex of interaction among living organisms and their associated non living environment.

Individual travel cost model- travel cost model based on survey data relating to individual visiting a recreation site

Opportunity cost – the value of that which must be given up to acquire or achieve something

Recreation	-person's activities outside those in which he/she engages for his/her livelihood or activity (inactivity) undertaken because one wants to do it
Recreation site	- the place where outdoor recreation takes place
Supply	-the quantity of goods or services available for purchase
Travel cost	-cost of traveling to recreation site including opportunity cost of time
Travel cost method- an ecosystem valuation method that estimates economic values of recreation sites	
Valuation	-estimation or quantification of the values of a property, good or service
Value	-the worth of a property, good or service, generally measured in terms of what we are willing to pay for it, less what it costs to supply it
Zones	- areas surrounding a recreation site which are defined using any of the many parameters
Zonal travel cost model- travel cost model based on data relating to the zones of origin of visitors to a recreation site	

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 ECOSYSTEM

Ecosystem is defined by EMCA (1999) and the Convention on Biodiversity (CBD) as a dynamic complex of interaction among plants, animals, other organisms and their non living environment as a functional unit. An ecosystem has four attributes which are systematically related and important for understating its functionality (King, 2003). The attributes are as follows:-

    2.1.1 Ecosystem features.

    2.1.2 Ecosystem functions

    2.1.3 Ecosystem services

    2.1.4 Ecosystem values

2.1.1 Ecosystem features

These are site specific characteristics of a natural resource system that establishes or determines its capacity to support various ecosystem functions.

Examples of ecosystem features include soil, vegetation cover, hydrology e.t.c.

2.1.2 Ecosystem functions

Ecosystem functions are the physical, chemical and biological processes of an ecosystem that contribute to the self maintenance of the same i.e. it is what the ecosystem does. The level of ecosystem function depends on the capacity of an ecosystem (on site features or ecosystem features).

Examples of ecosystem functions include carbon recycling, trapping of nutrients, provision of wildlife habitat e.t.c.

2.1.3 Ecosystem services

These are the beneficial outcomes resulting from ecosystem functions to either the natural environment or humans or both. Some interaction with, or at least some appreciation by humans of an ecosystem function is required in order for an ecosystem to provide services to them (humans)

Examples of ecosystem services include harvesting of animals or plants, provision of clean water, support of the food chain, provision of scenic views e.t.c.

It can therefore be logically deduced that ecosystem functions are value neutral while ecosystem services have value to the society (humans).

2.1.4 Ecosystem values

These are measures of how important ecosystem services are to the people i.e. what ecosystem services are worth. Generally, economists measure the value of ecosystem services to people by estimating the amount people are willing to pay to either preserve or enhance the services.

Some ecosystem services are transacted in the market place, for example, fish while many services are not traded in the market such as the view of the ocean or watching wildlife. Thus people do not pay directly for many ecosystem services. The values for such ecosystem services are determined by measuring how much purchasing power (in monetary terms) people are willing to pay (WTP) to get the services of the ecosystem or how much people would be wiling to accept (WTA) to be paid in order to give up the service, if they were asked to make a choice similar to one they would make in the market (Syagga, 2002).

2.2 ECOSYSTEM VALUES

King (2003) describes two main categories of ecosystem values as follows:-

    2.2.1 Use Values

    2.2.2 Non –Use Values

2.2.1 Use Values

These are values derived from the actual use of an environmental good or service such as fishing, hunting, wildlife watching e.t.c. The use values can be sub categorized further into three as hereunder:-

- Direct use values
- Indirect use values
- Option values

a) Direct use value

These are use values derived from the actual use of the resource (Omunga, 2001). It involves first hand or real interaction with an ecosystem service or environmental good/service.

For example, national park provides direct use value to those people who visit the park, fish pond gives direct use value to a person who fishes from it, likewise a recreation site provides a direct use value to people who visit the site.

b) Indirect use value

It refers to the benefits derived from ecosystem functions, such as forest's function in protecting a watershed, or as a carbon sink against global warming (Omunga, 2001)

Actual uses are derived from indirect uses. We may view indirect uses as the foundation stones of actual uses of environmental goods and services. An indirect use may be in form of an input that helps to produce something else (good or service) that people use directly (King, 2003).

Other examples of indirect uses include, watching and enjoying wildlife of a given national park through a television show, prevention of soil erosion by vegetation or ground cover, lower organisms on the aquatic food chain provides indirect use value to fishermen who catch fish that eat them, forest providing habitat for wildlife e.t.c.

c) Option value

King (2003) defines it as the value that people place on having the option to enjoy something in the future, although they may not currently use it. Omunga (2001) views it as a value approximating an individual's willingness to pay to safeguard an asset for the option of using it at a future date.

For example, a person may hope to visit a given lake such as Lake Nakuru sometime in the future and thus would be willing to pay for preserving the lake in order to maintain that option.

2.2.2 Non use value

They are also called " passive use" values and are not associated with actual use or even the option to use an environmental good or service.

There are two sub types of non use values namely:-

a) Existence value

b) Bequest value

a) Existence value

Omunga (2001) explains that they derive essentially from the simple fact of the existence of the resources. King (2003) concurs with Omunga by explaining that it is the non use value that people place on simply knowing that something exist, even if they will never see it or use it.

For example, a person might be willing to pay to protect Mt Kenya area, even though the person never expects or even wants to go there, but simply because he/she values the fact that it exists.

b) Bequest value

This is the value that people place on knowing that future generations will have the option to enjoy something (King, 2003). It is measured by people's willingness to pay to preserve the natural environment for future generations.

For example, a person may be willing to pay to protect Lake Nakuru so that future generations will have the opportunity to visit and enjoy viewing the lake with the habiting flamingoes.

In light of the discussion on the various types of ecosystem values, it is clear that one person may benefit in more than one way from a given ecosystem. Thus, the total economic value (TEV) of an ecosystem service is the sum total of all the relevant use and non use values for the service.

For illustration purposes and better grasp of what would constitute total economic value, Wass (1995) summarizes Total Economic Value of an indigenous forest as tabulated below:-

Table 2.2.1 Summary of Total Economic Value of Indigenous Forests

USE VALUES			NON USE VALUES
DIRECT VALUES	INDIRECT VALUES	OPTION VALUES	EXISTENCE VALUES
DIRECT FOREST USE	*ENVIROMENTAL FUNCTIONS*	*PREMIUM TO ENSURE FUTURE USE*	*INTRINSIC VALUES*
Recreation	Carbon store	Future direct use	Cultural
Education	Air pollution reduction	Future indirect use	Aesthetic
Timber products	Watershed catchment protection		Heritage
Non wood products	Nutrient cycling		Bequest
Habitat	Regulation of micro climate		
Plant & Animal Genetics			

Source: Wass, P (Ed) (1995)

2.3 ECONOMIC VALUE OF AN ECOSYSTEM

In order to fully understand the total economic value of an ecosystem, we need to find out what factors determine economic value and what are the approaches which can be employed to arrive at the value.

2.3.1 What determines economic value?

After a brief look at the various types of ecosystem values which definitely translates into economic value either solely or as a combination, we need to find out which factors determine these values.

In conventional economics, the economic value that an individual places on a particular ecosystem service is presumed to be reflected by that individual's willingness to either pay or be compensated for it. The willingness to either pay for retention or be compensated for removal of an ecosystem service though often

immeasurable, is generally understood to depend on five factors as listed below (Bromley, 1995):-

1) Taste and preferences of the individual
2) Income level
3) Cost in terms of time and money of gaining access to the service
4) Availability of perfect substitute of the service, and
5) Availability of near perfect or at least acceptable substitute for the service

For example, King (2003) indicates that an individual's willingness to pay for improved recreational fishing at a particular lake may possibly depend on the following factors:-

1) How much the individual enjoys fishing
2) How much discretionary time and money the individual has to spend
3) How much it costs to get to and participate in fishing at that lake
4) The quality, cost and accessibility of fishing at other nearby lakes
5) The availability of other similar types of fishing opportunities in rivers, streams, and
6) Other forms of outdoor and indoor recreational opportunities

2.3.2. Approaches for estimating economic value

There are three accepted approaches for estimating the economic value of an ecosystem service as follows:-

1) Revealed willingness to pay (RWTP)
2) Expressed willingness to pay (EWTP)
3) Derived willingness to pay (DWTP)

1) Revealed willingness to pay

This occurs when people either purchase something such as a home near wetland or spend time and money to get somewhere such as bird watching near a wetland. They reveal that they are willing to pay at least what they actually spent although they may even be willing to pay more for the same.

Such willingness is revealed through market prices and the method under study (travel cost method) employs this approach of revealed willingness to pay in order to estimate economic value.

2) *Expressed willingness to pay*

When ecosystem services are not traded in the market (e.g. scenic views) people may never reveal what they are willing to pay for them. However, when asked what they would be willing to pay, they can sometimes give useful results.

Such willingness to pay is usually expressed through survey results.

3) *Derived willingness to pay*

This particular approach involves tracing and measuring the services provided by an ecosystem, and estimating what people would be willing to pay to avoid the adverse effects of losing them.

For instance, the monetary value of flood and siltation damage avoided because of a wetland is a derived willingness to pay for wetland services.

2.4 NATURAL RESOURCE VALUATION TECHNIQUES

This section describes methods used in the valuation of natural and environmental resources and resource services. The key is to estimate the demand for the beneficial uses or services that natural resources provide individuals and communities.

When markets for the resources or its services exist, it is relatively easy to apply market based techniques to measure value. Otherwise, when market data is not available, valuation requires the use of non-market techniques to derive information on individual willingness to pay or to be compensated. There have also been cross-cutting methods which are used as a way to combine market-based and non-market methods of valuation (Ullibarri, 1997). Consequently, there are broadly three techniques for valuing natural resources as follows:-

2.4.1 Market - based valuation techniques
2.4.2 Non-market valuation techniques
2.4.3 Cross-cutting valuation techniques

2.4.1 MARKET- BASED VALUATION TECHNIQUES

Ullibarri (1997) observes that the pioneers of natural and environmental resource valuation relied on the "law of demand" as a way to measure the market values for natural resources and environmental amenities.

The market based techniques that have recorded a significant history of natural and environmental resource valuations are generally three namely:-

1) Market price approach
2) Appraisal method
3) Replacement cost method

1) Market Price Approach

Demand for natural resources is measured on the assumption that many factors that might influence demand, such as personal income, the prices of related goods and services, and individual tastes and preferences, remain unchanged during the study period. Under these assumptions, the estimated demand curve is a systematic measure of how people value the resource

2) Appraisal Method

It is well suited to cases involving natural resources that have been damaged. In the case of land, for example, the appraiser identifies the fair market value for comparable properties in both the uninjured and injured conditions. The fair market value of the resource (land) is roughly defined as the amount a knowledgeable buyer would pay a knowledgeable seller for the resources. This value should reflect, as closely as possible, the price at which the resource would actually sell in the market place at the time of the injury.

The method is quite dependent on the appraiser's judgment, for example, it may be difficult to identify comparable sales, particularly for properties that are "comparably" injured.

The types of natural resources to which this method can be applied are limited since many natural and environmental resources are not traded in the markets.

3) Resource Replacement Cost Method

It can also be referred to as cost based methods which are three namely; damage cost avoided, replacement cost, and substitute cost. The methods estimate economic values based on the costs of avoided damages resulting from lost ecosystem services, costs of replacing ecosystem services, or costs of providing substitute ecosystem services.

The costs of replacing natural and environmental resources are sometimes a useful way of approximating resource values under specific conditions. The resource replacement cost method determines damages for natural resources based on the cost to restore, rehabilitate, or replace the resource or resource services without injury to the level of the resource stock or service flow.

In instances where the underlying resource is not unique and substitutes are readily available, the application of the replacement cost method is relatively straightforward. The investigator proceeds by gathering a sample of values for the substitutes from primary or secondary source information. Based on this sample of cost information, the analyst then prepares an estimate of the most likely range of expected replacement costs for the underlying resource or service

This process may be far more difficult to implement in instances where resources possess unique characteristics. In these cases, little information exists to assemble a sample upon which to estimate the expected value of the underlying resource.

2.4.2 NON-MARKET VALUATION TECHNIQUES

Using market based techniques to measure the monetary value of natural resources is feasible provided there is sufficient market data. In many cases, however, market information relating to prices and quantities is not available to estimate the value of the resource or resource service. In these cases, researchers must employ what are referred to as nonmarket valuation methods

The non market valuation techniques may be broadly categorized into two as follows"-

- a)   Indirect valuation techniques
- b)   Direct valuation techniques

A) INDIRECT VALUATION TECHNIQUES

The techniques rely on observable behaviour in order to deduce how much something is worth to individuals (Hanley, 1997). Value estimates obtained using indirect nonmarket valuation techniques are conceptually identical to the otherwise unobservable market value.

The indirect nonmarKet valuation techniques include the following:-

1) Travel cost method
2) Hedonic pricing method
3) Factor income method
4) Random utility method

1) Travel cost method

The method is popular for describing the demand for the natural resource service (s) and environmental attributes of specific recreational sites. People visit such sites from diverse distances or points of origin. This observed "travel behaviour" is then used to evaluate the willingness to pay to visit the site. Essentially, the different travel costs from these diverse points of origin serve as proxies for willingness to pay to visit the site

By gathering information on the number of visits to a particular site, the analyst can estimate a demand function for the site that relates the number of site visitations to the amount of travel costs incurred per visit, taking into consideration a set of independent household variables. If first hand information on individual visitation rates is not available to the analyst, users of the site can often be grouped into travel zones around a site. Variation in visitation rates across zones can then be used to estimate the site demand function

The technique is generally not perceived as being particularly controversial, partly because of its long history in forestry economics, but mostly because it mimics common empirical techniques used elsewhere in economics. Analysts have tended to look favourably on the travel cost approach to natural resource valuation because it is based on actual behaviour rather than verbal responses to hypothetical scenarios. Individuals are actually observed spending money and time, and their economic values are deduced from their behaviour.

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2) Hedonic pricing method

The hedonic pricing approach derives from the characteristics theory of value first proposed by Lancaster (1966) and Rosen (1974). This seeks to explain the value of a commodity as a bundle of valuable characteristics (Hanley, 1997). Hedonic pricing is a useful tool in the assessment of amenity value. Early analysis related residential property values to neighborhood amenities. These models provide an inferential measure of people's willingness to pay for the amenity under study. The method is used mainly to estimate the willingness to pay for variations in property values due to the presence or absence of specific environmental attribute, such as air quality, noise, and panoramic vistas.

By comparing the market value of two properties having different degrees of a specific attribute, analysts extract the implicit value of the attribute to property buyers and sellers. A variation on the approach is to compare the price of a single piece of property over successive sales. By correcting for other factors that might have influenced the value of the property, the analyst can isolate the implicit price of an amenity or bundle of amenities that have changed over time.

Resource values that are obtained directly from the estimated hedonic price function are subject to fairly restrictive assumptions. it may be necessary to employ additional information from multiple commodity markets relating to the resource under consideration. Overall, the resulting hedonic price will depend on the availability of market information pertaining to the resource, and the revelation of buyer and seller preferences through market behaviour.

3) Factor Income Method

It is also referred to as productivity method or net factor income or derived value method. It estimates economic values for ecosystem services or products that contribute to the production of commercially marketed goods (King, 2003). It is used as method of valuation in applications where natural resources are used as inputs in the production of other goods and services (Ullibirr, 1997). Accordingly, the resulting economic costs of production are an important source of information in applying the factor income approach.

There are several types of resources for which the factor income approach is potentially well suited, including surface water and ground water resources, forests,

and commercial fisheries. Surface and ground water resources may be inputs to irrigated agriculture, to manufacturing, or to privately owned municipal water systems. The products in these cases (agricultural crops, saw logs, manufactured goods, and municipal water) may all have market prices.

There are, however, potential problems in applying the factor income approach. First, a particular treatment option might not be the least cost or optimal response on the part of the water-using entity

4) Random utility models

Random utility models are conceptually linked with the travel cost models in that they seek the same sorts of values and use the same sort of logic (Ullibirr, 1997). However, random utility models provide a different structure in which to model recreational demand, one which focuses attention on choices among substitute sites for any given recreational trip instead of the number of trips taken to a given site.

These models are especially suitable when substitution among quality-differentiated sites is a pre-dominant characteristic problem. The model is appropriate when there are many substitutes available to the individual and when the change being valued is a change in the quality characteristics of one or more site alternatives.

Random utility models originated in the transportation literature and only recently have been applied to recreation issues. It has been used chiefly to value changes in the specific characteristics of a site such as catch rates or water quality. It can also be used to value the losses from eliminating a site as well as the value of introducing a new site, something beyond the scope of travel cost models. However, unlike travel cost models, random utility models cannot explain the total number of trips an individual takes to a given site in a season

B) DIRECT VALUATION TECHNIQUES

Given the potential shortcomings in applying indirect nonmarket valuation techniques, researchers have advanced the use of a more direct approach, namely contingent techniques. Contingent market analysis has estimated a wide variety of use and nonuse values.

The most obvious way to measure nonmarket values is to ask people how much they would be willing to pay for the resource or avoid any damages that might be sustained by the resource. Alternatively, one could ask how much people would be willing to accept as compensation for damages to the resource. Measures obtained using these techniques rely on people's hypothetical willingness to pay rather than actual market information on their behaviour, hence the term contingent. The two contingent methods are:-

1) Contingent valuation method
2) Contingent choice method

1) Contingent valuation method

The contingent valuation method is a survey based approach to the valuation of nonmarket goods and services. It uses questionnaires to elicit information about the preference related value of the natural resource in question. The value is said to be contingent upon the existence of a hypothetical market as described in the survey put to respondents. In principle, contingent valuation could be used to estimate the economic value of almost anything. By default, it is the only method that holds the promise of measuring nonuse values since all other methods depend on observing actual behaviour associated with the natural resource.

2) Contingent choice method

The method is similar to contingent valuation method in that it can be used to estimate both use and non use economic values for virtually any ecosystem service. It is also a hypothetical method like contingent valuation method in that it asks people to make choices contingent (based) on a hypothetical scenario.

However, it differs from contingent valuation method because it does not directly ask people to state the values in monetary terms (shilling), instead values are inferred from the hypothetical choices or trade offs that people make.

2.4.3 CROSS-CUTTING VALUATION TECHNIQUES

These valuation techniques combine elements from market-based methods with pre-existing estimates of natural resource values based on either direct or indirect nonmarket valuation techniques. The interest in applying cross-cutting techniques is motivated by the relative simplicity of using a pre-existing study based on an

accepted method, as well as the cost considerations in undertaking a fresh natural resource valuation study.

The two cross-cutting resource valuation techniques that have gained increased professional attention due to their simplicity and economy of application are as follows:-

1)   Benefit transfer method
2)   Unit day value method

1) Benefit transfer method

Benefit transfer is the use of the estimated values or demand relationship in existing studies to evaluate a site or event for which no site specific study is available. Given the expense and time associated with the estimation of values of nonmarket natural resources and services, benefit transfer may be a reasonable method by which to determine such values under well defined conditions.

The analyst should consider all available estimates at the onset of the study. Each estimate should be evaluated by comparing the methodology and results of the original studies that may have been undertaken in selecting one that best matches the policy study under consideration.

Once a final set of values has been chosen, consideration should be given to the general magnitudes of the values. If the existing value estimates differ significantly, or if values generated using alternative models differ significantly from one another, consideration should be given to whether they differ in a predictable and consistent manner. In many cases, the defensibility of the transferred economic benefit estimate will depend on the quality of the underlying research.

There are no globally accepted, standard criteria by which the quality of existing studies can be judged. Decision makers should, therefore, seek guidance of the professional and academic economics community concerning the current minimum conditions for accurate use of the benefit transfer method.

2) Unit Day Value Method

The unit day value method is similar to the benefit transfer method, except that an average value is derived based on multiple value estimates from existing studies.

Consequently, the unit day value of the underlying resource reflects a resource having average preference – related attributes, amenities, or qualities. Any of the valuation approaches described above can potentially serve as underlying studies from which unit day values are drawn.

The application of the unit day value method may also involve groups of experts attempting to interpret from the existing set of estimates (regardless of method used in the original study) a best estimate for each of a set of generic types of environmental resource activities. The unit day value approach then combines and converts these estimates into a standardized unit of measure that reflects the average value of one unit of the resource on a per day basis.

However, due to the contextual scope of this research, the paper shall only consider in detail the travel cost method of ecosystem valuation. This is also because the method's primary purpose is to value recreation sites, it is cheaper to carry out and it takes less time to execute; consequently, it easily fits into the tight schedule of carrying out the research. Meanwhile, it is important to first and fore most explain the meaning of the term "recreation".

2.5 RECREATION

Devani (1970) has defined recreation as man's activities outside those in which he engages for his livelihood, for example, a businessman who becomes a fisherman during a weekend. Smith (1971) defines recreation as activity (or inactivity) undertaken because one wants to do it. Syagga (2002) also defines recreation as an activity/planned activity undertaken because one wants to since it invokes human emotional and inspirational experience.

Syagga (2002) further clarifies that when an activity is undertaken with little or no feeling of compulsion or "ought to", the activity is recreation. Smith (1971) agrees with Syagga (2002) by explaining that recreation is distinguished from other activities by attitude with which the activity (or inactivity) is undertaken, but not by the specific nature of the activity or inactivity i.e. if undertaken because one wants to do it, with no feeling of compulsion then it is almost surely recreation.

Recreation is closely related to leisure .Smith (1971) and Syagga (2002) explain that leisure is time in which activity (or inactivity) consciously decided on are undertaken (hence idleness is neither leisure nor recreation) while recreation is the activity undertaken during this time. Recreation may be indoor such as playing table tennis or outdoor such as picnics. However, for the purposes of this study we shall be valuing both recreation and leisure because the activity or inactivity (recreation) has to be carried out over a time period and not in a vacuum..

Recreation contrasts with work done primarily to earn money or otherwise to provide the "necessities "of life or for one's self and one's family. It also contrasts with the mechanics of life such as eating, sleeping, and operations to keep house, dishes, clothing, and person clean for one's self or family. However, Smith (1971) argues that there is no sharp line between recreation and all other activities because same activity may sometimes be work and sometimes recreation, for example, cooking, dressmaking e.t.c. Devani (1970) also confirmed this in his research on Public Outdoor Recreational Resources in Mombasa and its Peripheral Areas. In the research, Devani found out that most of the shopkeepers and some of the housewives did not see their lives being divided into work and leisure. For them, the working day lasts from morning till late in the evening, the remaining time being spent on either listening to the wireless or chatting with neighbours.

Smith (1971) and Syagga (2002) explain that recreation as a commodity to be consumed is an experience which consists of five rather clearly identifiable systematic phases. However, Oates (1992) and Garrod (1999) explain that recreational experience comprise of four and three phases respectively. The phases are as follows:-

1) **Anticipation phase**- The phase is essentially a planning phase and Oates (1992) views it as a preparation stage. The phase takes place before person or family or group leaves home and involves making decision on where to go, when to go, how long to stay, what equipments to buy, how much to spend. The planning phase is critical and may be careful or careless, informed or uninformed.

2) **Travel to site phase**-some people regard this phase as enjoyable because some people travel for the pleasure of traveling itself though others regard it with less enthusiasm. The length of trip and distance traveled depends with the

location of the chosen site. Much money may be spent here than on site itself. This phase has been excluded by Garrod (1999)

3) **On site experience phase**- most people think of this phase whenever recreation is mentioned. It is usually the chief reason for the whole experience and the chief user of natural resource.

4) **Travel from site phase**- it is the opposite of phase two of traveling to site. However, the route and length of time to home may change. This phase has also been excluded by Garrod (1999)

5) **Recollection phase**- This is the last phase and involves sharing of experience by those who went to the trip with those who stayed at home, neighbours, friends, co-workers and others. More satisfaction may be achieved in this phase as "fish gets bigger", mosquitoes more fierce", "camping more primitive" in a conversation. Oates (1992) has excluded this phase.

The researcher believes all the five phases of recreation experience are conceptually plausible, however, only three of the phase can clearly reveal the willingness to buy recreation hence the "price" of a recreation site. The three phases are: - travel to site from residence or place of origin; on site experience; and travel from site to the residence or place of origin. The researcher believes that monetary expenditure is incurred at these phases which constitute the total travel cost or price of the recreation. The total cost constitute transport cost to and from site, time cost to, on and from site; and any expenditure on site say on food, snacks, photos e.t.c.

The study will not factor in both the first (planning) and last phase (recollection) of recreation experience in computing the total travel cost. In other words the research will involve valuation of direct use value of an arboretum particularly recreation. Factoring in the two phases may call for employing express willingness to pay approach which is beyond travel cost method –a revealed willingness approach-.

2.6 TRAVEL COST METHOD

The method has been widely used to measure the demand and benefits of recreation site, facilities and characteristics. Travel cost method studies demand for, and value of natural resources, which serve as input services in ' producing' outdoor recreation activities and related amenities (King, 2003). These services are consumed in situ, individuals must travel to the site in order to experience and enjoy them. Travel is

used to infer the demand for recreation by virtue of the fact that it is a complement to recreation.

Travel cost recreation demand model (TCRDM) relies on observing quantities and imputing prices (Smith, 1996). Travel cost method is employed to estimate the demand or marginal valuation curve for recreation sites (Garrod, 1999).According to Pearce (1990), travel cost models are based on an extension of the theory of consumer demand in which special attention is paid to the value of time.

The logic behind this approach was first suggested by Harold Hotelling in 1947 and the methodology was subsequently developed in the late 1950s 'and 1960s by among others; Trice and Wood (1958); Clawson (1959); and Clawson and Knetsch (1966).Since then, numerous studies have adopted a methodology based on this approach

The method or model recognizes that visitors to a recreation site pay an implicit price-the cost of traveling to the site (including the opportunity costs of their time). Smith (1993) explains that one can obtain information comparable to market transactions by observing an appropriate quantity measure and the costs for individuals at different distances to and from the site (along with any entry fees and related charges). According to Folmer (2000),travel cost method assumes that the benefit that individuals derive from their pursuits within a recreation area are directly related to the distance that they are prepared to travel in order to visit it, and hence, to their (money and time) cost of travel and other related expenditures.

Travel cost method imputes price of recreation as the full cost of using the recreational facility (Smith, 1996) including the following:-
   1) vehicle related travel costs
   2) access charges
   3) on site time costs
   4) incremental costs of equipment
   5) supplies e.t.c directly related to activity

According to Syagga (2002) consuming recreation by an individual involves three main cost elements as follows:-
   1) Travel cost-transport cost to and from the recreation site

2) Time cost- money value of the hours spent on recreation experience
3) Entry and Meal cost-expense incurred in gate fees (if any) and extra food costs over and above what would have been spent on the same at home.

However, apart from these costs, there are several other factors which determine the frequency of recreational visits by an individual (Syagga, 2002). These other factors vary in magnitude from one site to another and from one period to another.

They can be broadly categorized into two as here under:-

a) Pull or site factors

The factors may include the following:-

1) Comfort or discomfort of travel
2) Climatic and weather characteristics of the area
3) Quality of site management
4) Extent to which the site has been advertised
5) Capacity of the area to accommodate recreations
6) Availability of alternative sites
7) Time taken to travel to and from site
8) Innate attractiveness as judged by average users

b) Push or individual (population) related factors-

Such factors include but are not limited to the following:-

1) Average income and distribution of the same among population
2) Population's past experiences and present knowledge of the recreation site
3) Population's taste for the site
4) Total population surrounding the tributary of the site
5) Socio economic characteristics (education, age, family size e.t.c) of the population within the recreation area
6) Monetary costs involved in visiting the recreation site
7) Population's average leisure and distribution of the same
8) Geographic distribution of the population within the site

The visitors to a recreation site have been categorized into three types by Cheshire and Stabler (1976) in Garrod (1999) as follows:-

a) Site oriented pure visitors
b) Multi site transit visitors

c) Meanderers who gain most utility from the journey itself rather than from recreation sites

According to a study conducted by Garrod (1999) he observed that there is an inverse relationship between the cost of visiting a recreation site and the number of visits. Devani (1970) concurs with Garrod (1999) because he observed that leisure preferences are conditioned by the time and distance required reaching the location where one can engage in the desired activity. In his research, nearly 60% of those interviewed expressed the desire of going to the beach but were unable to go due to lack of transport and the sites being far away from home. People living greater distances from the site and incurring higher transport cost makes fewer visits per year than those living nearer to the site, providing the characteristic downward sloping demand curve.

Travel cost model is an example of a Household Production Function (HPF) approach. The conventional HPF models investigate changes in the consumption of commodities that are substitutes or complements for each other. The HPF framework can be extended to derive indirect mechanisms for evaluating individual preferences for and consumption of non market goods.

Travel cost model uses cost of traveling to a non priced recreation site as a means of inferring the recreational benefits which that site provides. Travel cost studies have consistently shown that as the price of access (cost of travel) increases, the visit rate to the site decreases.

Travel cost model is usually estimated as a trip generating function such as the following:-

$$V = f(P, S)$$

Where   V   -   Visit rate

            P   -   Cost of travel to the site

            S   -   Vector of travel costs to substitute sites (of similar nature or any other recreational attraction)

Various travel cost models appearing in literature are similar to the above example with variations arising from the manner in which the variables are defined and measured; and from the estimation procedure employed.

There are various aspects of a recreation site which this method can help in calculating their economic benefits and costs as follows:-

1) Changes in environmental quality of a recreational site
2) Changes in access costs for a recreational site
3) Addition of a new recreational site
4) Elimination of an existing recreational site

2.7 VARIATIONS OF TRAVEL COST METHOD.

There are three different variations or models to travel cost method namely:-

2.7.1   Zonal Travel Cost Model (ZTCM)

2.7.2   Individual Travel Cost Model (ITCM)

2.7.3   Random Utility Model (RUM)

2.7.1 ZONAL TRAVEL COST MODEL

Clawson and Knetsch (1966) estimated a travel cost model based on data relating to the zones of origin of site visitors

The approach defines the trip generating function as follows:-

$$V_{hj}/N_h = f(P_{hj}, S_h, T_h)$$

Where V_{hj}/N_h - participation rate for zone h (visits per capita to the site j)

    P_{hj} - Cost of travel from zone h to site j

    S_h -Vector of the socio economic characteristics of zone h

    T_h - Vector of substitute recreational site characteristics for individuals in zone h

The approach has been applied to estimate the demand and consumer surplus for wildlife and nature conservation at specific sites since the 1960s.

Procedure for applying Zonal Travel Cost Model

1) Identify site and collect data from visitors relating to their points of origin and the number of visits to the site in the specified time period ,for example, a year
2) Define zones of origin and allocate visitors to the appropriate zone

Area surrounding the site is divided into various zones of origin each of which has an associated average travel cost to the site.

The said zones can be defined using the following:-

    i)   straight line distance away from the site, with zones defined as a series of concentric rings radiating away from the site

    ii)   geographic units

    iii)   areas of population

    iv)   administrative units

    v)   income per capita

Consumer surplus estimates are sensitive to zonal definition. The assumptions underlying definition of zones seriously impact on the resultant consumer surplus estimates. Garrod (1999) therefore foresees that there is merit in future researchers re-examining zonal definition by population characteristics rather than distance

3) Calculate zonal visits per household to the site and average travel costs from each zone to the site
4) Use census data to derive variables relating to zonal socio economic characteristics
5) Use data from (3) and (4) to estimate the trip generating function
6) Derive demand curve and obtain household consumer surplus estimates through integrating under demand curve.
7) Calculate aggregate zonal consumer surplus
8) Aggregate zonal consumer surplus estimates to obtain an estimate of total consumer surplus

The approach is best suited for estimating consumer surplus for recreation at sites where visitor origins are relatively evenly distributed.

However, zonal travel cost approach is not suitable under the following circumstances:-

i)   Where visitor origins are distributed asymmetrically

ii)   Where there are a few important points of origin to a single site, for example, ski resort which services the populations of the three nearest cities

iii)   Where sites are linear rather than circular in topology because of the following reasons:-

1) The ability of visitors in same distance zone to travel a variety of distances to gain access to different points of the same linear feature

2) Where there are few visitors along the linear feature and with each access point along the feature requiring visitors to be assigned zones in relation to that point, visit rates form a stochastic rather than regular pattern for each zone, undermining the underlying logic of the zonal approach

Attributes of Zonal Travel Cost Model

1) The approach adequately accounts for participation rate changes as distances changes

2) The approach assumes that estimated demand is generated by a "representative consumer" whose behaviour reflects the average behaviour in the population.

2.7.2 INDIVIDUAL TRAVEL COST MODEL

Garrod (1999) observes that the approach has been successfully applied to a variety of recreational sites since mid 1980s

The number of visits under this approach may be estimated as follows:-

$$V_{ij} = f(P_{ij}, T_{ij}, Q_i, S_j, Y_i)$$

Where V_{ij} -   Number of visits made by individual i to site j

P_{ij} -   Travel cost incurred by individual i when visiting site j

T_{ij} -   Time cost incurred by individual i when visiting site j

Q_i -   Vector of the perceived qualities of the recreation site i

S_j -   Vector of the characteristics of available substitute sites

Y_i -   Household income of individual i

Procedure of applying Individual Travel Cost Models

1) Identify site and use a questionnaire survey to collect data from visitors relating to cost of travel to the site, number of visits to the site, recreational preferences, socio-economic characteristics e.t.c

2) Specify trip generating function and estimate travel cost model taking account of truncation

3) Derive demand curve and obtain household consumer surplus estimates through integrating under the demand curve

4) Calculate aggregate consumer surplus from the site.

Attributes of Individual Travel Cost Model

1) It takes account of inherent variations in the data

2) The produced estimation is statistically more efficient

3) Its trip generating function can be estimated using a smaller number of observations

4) It requires more information about individual visitors in terms of characteristics, preferences and behaviours

5) It is more flexible and applicable at a wider range of sites

6) It makes it possible to value each particular recreational activity undertaken by an individual at a site , for example, fishing

Garrod (1999) noted that when the above two approaches are used on the same data set, considerable differences have been observed in estimated consumer surplus

2.7.3 RANDOM UTILITY MODELS

This is the best approach for estimating benefits for specific characteristics or quality changes of sites rather than the whole site (King; 2003). It is the most complicated and expensive approach but the most appropriate approach when there are many substitute site. The model regards the visitor's problem as one of choosing between several substitute sites for any particular recreational trip, rather than as the number of trips to take to one site over the course of a year. The approach allows for much more flexibility in calculating benefits.

RUM assumes that individuals will pick the site that they prefer, out of all possible sites . Individuals make trade offs between site quality, and the price of travel to the

site. Hence, this model requires information on all possible sites that a visitor might select their quality characteristics, and the travel costs to each site.

The econometric model work by positing an indirect utility function that measures the utility that a visitor would get from visiting a site with certain characteristics and different access costs. However, the researcher can not take account of two things namely:-

➢ That the posited indirect utility function contains all the factors influencing choice that are in the true indirect utility function; and

➢ That the particular functional form chosen to represent the indirect utility function is an exact reproduction of the true functional form of the indirect utility function.

Hence random element is added to the researcher's specification of the indirect utility function, representing that part of utility that the researcher fails to include in the model. This explains the origin of the name Random Utility Model.

By observing how different visitors choose between sites with different qualities and different costs of access, it is possible to use econometric techniques to estimate how each of the quality variables and the cost variable contribute to the utility of a visit. In simple models, the parameter estimated on each quality variable gives the marginal utility of more of that quality. At the same time, the parameter on cost shows the marginal disutility of expenditure (the opposite of the marginal utility of income)

Using the estimated indirect utility function, the researcher can calculate how a visitor's utility would change if the quality at a particular site changes. Dividing this calculated change in utility by the marginal utility of income (the opposite of the parameter on the cost variable) expresses the utility change in units of money; it places monetary value on the utility change

RUM is extremely flexible as they can be used to estimate the welfare changes associated with; quality changes at one (or many) site (s); the loss of one (or many) recreational site (s); the creation of one (or many) new site (s). They also explicitly account for the ability of individuals to substitute between sites. For example, the loss of access to one fishing area may not inflict that great a welfare cost on a fisherman if

a very similar site can be found a little further down the river. RUM is much more readily amenable to dealing with welfare measurement in such situations

RUM has thus become an increasingly popular approach to estimating the welfare benefits derived by visitors to recreational sites. They function best when visitors choose between a variety of different sites that differ in both their location and the qualities of the site.

However, their main drawback is that it only estimates the welfare changes associated with each particular trip. If we believed that, in response to changes in site quality or in changes in site availability, visitors would change the number of visits they took to parks, we would have to augment the Random Utility Model. In fact in recent work, researchers have been attempting to combine continuous travel cost models (number of trips in a year) with random utility models (choice of site for each trip) to provide a unified model of recreational behaviour that can be used for welfare evaluation.

2.8 ADVANTAGES OF TRAVEL COST METHOD

Travel cost method has a number of advantages as follows:-
1) The results are relatively easy to interpret and explain
2) The method is relatively inexpensive to apply
3) The method is closely similar to the conventional empirical techniques for estimating economic values based on market prices
4) The on site surveys provide opportunities for large sample sizes, as most visitors are interested in participating
5) The method is based on actual behavior i.e. what people actually do in contrast to "stated willingness to pay" based on hypothetical situation.

2.9 LIMITATIONS OF TRAVEL COST METHOD

As the saying goes" whatever has advantages must have disadvantages for nothing is perfect", this method no doubt has some limitations as explained here below:-
1) The simplest models assume that individuals take trips for single purposes - to visit specific recreational sites. However, trips may be taken for more than one purpose and in such cases, value for site may be overestimated and it can be quite difficult to apportion the travel costs among the purposes.

2) The method is limited in scope of application because it requires user participation. In this respect, it cannot be used to assign economic values to on site environmental features and functions that users do not find valuable. In addition, it can not be used to value off site values supported by the site. It can therefore not be used to measure non use values and thus may undervalue sites with unique characteristic that are valued by non users.

3) Travel cost method assumes that people perceive and respond to changes in travel costs the same way that they would respond to changes in admission price or fee.

4) It may be problematic to define and measure the opportunity cost or value of time spent traveling. Just like multi purpose and multi destination trips, time spent traveling could have been used in other ways-it has an opportunity cost. This should be added to the travel cost, or the value of the site will be underestimated.

5) There is also no strong consensus on the appropriate measure, whether to use the person's wage rate or a fraction of the wage rate. If individuals can choose the number of hours they spend working then they will choose to work up to the point at which an extra hour spent at work is worth the same to them as an hour spent at leisure. At the margin, therefore, leisure time will be valued at the wage rate. In the real world, individuals can only infrequently choose the number of hours they work and the equality between the value of time in leisure and the wage rate is unlikely to hold. Empirical work has been undertaken that has revealed that travel time is valued at somewhere between a third and a half of the wage rate.

6) Traveling may also be a benefit and not a cost if those traveling enjoy the same as a hobby, and the value of the site will be overestimated.

7) Those who have high value for certain sites may chose to live nearby resulting in failure to capture such values due to negligible or no travel costs.

8) It is difficult to measure recreational quality and relate the same to environmental quality because any changes may be the same for all households visiting the site.

9) Interviewing visitors on site can introduce sampling biases to the analysis. As in all statistical methods, certain statistical problems can affect the results. These include choice of the functional form used to estimate the demand curve, choice of the estimating method, and choice of variables included in the model

10) If two people travel the same distance, this method assumes that they have the same value. However, it should be plausible that the number of visits that a household takes to the recreation area will depend not only on its implicit price but also on the cost of traveling to any substitute sites in the region. If the travel costs of substitute sites are omitted from the estimated demand equation, its parameters will generally be biased.

11) Standard travel cost approaches provides information about current conditions but not about gains or losses from anticipated changes in resource conditions.

12) The method is not suited for sites near major population centers where many visitations may be from "origin zones" that are quite close to one another. This is because in order to estimate the demand function, enough difference between distances traveled is needed to affect travel costs and for differences in travel costs to affect the number of trips to the site.

2.10 CONCLUSION

The Travel Cost Method (TCM) is a technique that has been developed over the years to value the use of natural resources for recreational purposes. Natural areas are frequently the focus of recreational trips (e.g. parks, garden, lakes e.t.c.) but seldom command a price in the market.

Travel cost method employs revealed willingness to pay approaches for estimating economic value of a recreational property. The willingness to pay is revealed through travel cost, time cost and visit related expenditure incurred by the individuals to visit a recreation site.

Recreation is a voluntary activity undertaken because one wants to and not to earn any income. Syagga (2002) and Smith (1971) argue that recreation and leisure are different concepts with being the activity carried out while leisure is the time over which the activity is carried. The researcher believes that leisure is just but a component of recreation and recreation is not confined to activity only but is a function of activity, time and other variables. This study shall consider recreation to include leisure because the so called voluntary activity or inactivity (recreation) can not be carried out in a vacuum but has to be function of time both within and without the recreation site.

The basic premise of the travel cost method is that the time and travel cost expenses that people incur to visit a site represent the price of access to the site. The method also assumes that people perceive and respond to changes in travel costs the same way that they would respond to changes in admission price. Thus people's willingness to pay to visit a site can be estimated based on the number of trips that they make at different travel costs. This is analogous to estimating peoples' willingness to pay for a marketed good based on the quantity demanded at different prices.

The study shall also include on site expenses which is part of the total travel cost. This has been left behind in computation by most literature yet it forms or reveals part of the overall "price" for visiting a site.

There are several ways to approach the problem of valuing a recreation site by using any of the three variations of the travel cost method i.e. a simple zonal travel cost model (ZTCM) using mostly secondary data, with some simple data collected from visitors; an individual travel cost model (ITCM) using a more detailed survey of visitors; and a random utility model (RUM) using survey, other data, and more complicated statistical techniques.

However, for the purposes of this study only application of Zonal and Individual Travel Cost Models shall be considered while Random Utility Model shall be excluded because of the following reasons:-
1. Since it is costly to administer, it can not be accommodated within the shoe string budget of this research
2. Since it takes time to carry out, the available time period can not permit its study as well.
3. The model is also both complicated and sophisticated there by requiring better but unavailable statistical tools

Zonal travel cost model (ZTCM) is the simplest and least expensive model of all the three models and estimates the value for recreational services of the whole site. It is applied by collecting information on the number of visits to the site from different distances or zones. Because the travel and time costs increases with distance, the information allows the researcher to calculate the number of visits "bought" at different "prices". The information is used to construct the demand function for the

site, and estimate the consumer surplus, or economic benefits, for the recreational services of the site.

The model involves a number of steps as follows:-

- Defining a set of zones surrounding the site. These may be defined by concentric circles around the site, or by geographic divisions that make sense such as metropolitan areas or counties surrounding the site at different distances.
- Collecting information on the number of visitors from each zone, and the number of visits made in the last year.
- Calculating the visitation rates per 1000 population in each zone. This is simply the total visits per year from the zone, divided by the zone's population in thousands.
- Calculating the average round trip travel distance and travel time to the site for each zone. Assume that people in zone 0 have zero travel distance and time. Each other zone will have an increasing travel time and distance. Next using average cost per kilometer and per hour of travel time, the researcher can calculate the travel cost per trip. A standard cost per kilometer for operating a vehicle can be readily available from automobile associations. One possible value for the price of time to an individual is their wage rate.
- Estimate using regression analysis the equation that relates visits per capita to travel costs and other important variables (which might include demographic variables such as age, income, gender, and education levels) using the average values for each zone.. From this, the researcher can estimate the demand function for the average visitor.
- Construct the demand function for visits to the site, using the results of the regression analysis. The first point on the demand curve is the total visitors to the site at current access costs (assuming there is no entry fee for the site). The other points are found by estimating the number of visitors with different hypothetical entrance fees (crucially assuming that an entrance fee is viewed in the same way as travel costs).
- Finally, estimate the total economic benefit of the site to visitors by calculating the consumer surplus, or the area under the demand curve.

The individual travel cost model is more or less similar to the zonal model save for the fact that it uses survey data from individual visitors in the statistical analysis, rather

than data from each zone. Consequently, the model requires more data collection and slightly more complicated analysis, but gives more precise results. The model goes beyond just collecting information on the number of visitors to involve conducting survey of visitors to a recreation site.

The procedure under individual travel cost model is as follows:-

- Conduct a survey of the visitors which might ask for the following information; location of the visitor's home- how far they traveled to the site; how many times they visited the site in the past year, the length of the trip or time spent traveling to the site, the amount of time spent at the site, travel expenses; the person's income or other information on the value of their time; other socio economic characteristics of the visitor; other locations visited during the trip, and the amount of time spent at each; other reasons for the trip (is the trip only to visit the site, or for several purposes); substitute sites that the person might visit instead of the site.
- Using the survey data, the researcher estimates the relationship between the number of visits, the travel costs and all other relevant variables. This time however, the researcher would use individual data, rather than data for each zone.
- The regression equation gives the demand function for the average visitor to the site
- The area below the demand curve gives the average consumer surplus.
- Multiplying the average consumer surplus by the frequency of visits gives the total consumer surplus for the recreation site.

Some of the weakness or limitations of travel cost method will be addressed in this research by designing the questionnaires in such a way as to take care of the pitfalls. The questionnaire will be designed in the following manner:-

- The visitors will be asked whether they passed through some places before visiting the site, approximately how long in kilometer and hours they took to the place and from the place to the site. These will then be deducted from the overall cost in order to avoid overestimation due to multi-purpose and multi-destination trips..
- The models shall be used to estimate one of the Direct Use Value (DUV) of the site and that is recreational services of the arboretum

- Since the model requires much user participation, a large sample shall be chosen in order to obtain a more representative result. The sample size shall not be chosen up front but after administering questionnaire to as many visitors as possible during the week and weekend.

- The opportunity cost of time will be taken at either wage or expenditure level (for the unemployed). Again time spent on other purposes and destinations before reaching the site will be removed from the total travel cost just like the travel cost attributed to other destination and purposes. This is achieved by good design of the questionnaires as was indicated in the first bulletin. However, the study will not factor in the recollection phase of recreation experience.

- The time cost shall be measured using full wage or expenditure level though some studies have revealed that it should be taken at a third or half of the wage rate. This is to simplify the computation since the objective of the study is to compare the optimality of either of the models hence using same constants will reveal whether there is any difference.

CHAPTER THREE

3.0 CASE STUDY: NAIROBI ARBORETUM

3.1 Background

Nairobi Arboretum is a recreation park cum arboretum located within Westlands Division particularly Kilimani Location. It is bordered to the North by Arboretum Drive, to the East by Arboretum and State House Road, to the South by State House and to the West by Kirichwa Kubwa River as indicated in its location map (Appendix 3). The arboretum is provided with main gate on the side of State House Road through Arboretum Road and a minor gate on the side of Arboretum Drive.

Nairobi Arboretum was established in 1907 to try out exotic forestry trees in Kenya and a sanctuary for rare indigenous trees. It was later converted into a park stretching over an estimated thirty (30) hectares parcel of land and gazetted as a forest.

Nairobi arboretum is today a home to more than three hundred and fifty (350) species of both indigenous and exotic trees of various maturity levels and an estimated one hundred (100) bird species. The park also has wide variety of wild flower species, shrubs, insects, butterflies as well as other wildlife. There are also picnic lawns, scenic nature and hogging trails.

The arboretum is currently managed by the Department of Forestry and a Non Governmental Organization (NGO) called Friends of Nairobi Arboretum (FONA). FONA is a project of Nature Kenya, which was established in 1993 and has been actively involved in improving and up grading the facility.

The amenities provided by the arboretum are quite a number and include but not limited to the following:-

a) Tree shaded walkways
b) Jogging trails
c) Extensive grass lawns
d) Monkeys
e) Variety of birds
f) Serene shades

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3.2. Methodology

For purposes of valuing the arboretum two models of travel cost shall be used namely:-

- Individual travel cost model (ITCM) and,
- Zonal travel cost model (ZTCM)

It is worth remembering that Random Utility Model (RUM) was not used because of the following reasons:-

- It is more expensive to carry out in terms of equipment, tools and sites
- It requires more time to carry out as many substitute sites are needed
- It is the most complicated and sophisticated model

The purpose of the research in this regard was:-

- To make a physical count of visitors entering Arboretum during weekends and weekdays (three days in a week)
- To ask visitors their ages and elicit from visitors (16 years and above) various information as contained in the annexed questionnaires (the initial questionnaire (Appendix 1) was later revised (Appendix 2) to enhance gathering of more accurate information from respondents based on degree and clarity of responses to the initial questionnaire) which included but was not limited to the following:-
  - ➢ Their residence/division of origin
  - ➢ Reasons for visiting the site
  - ➢ Level of education
  - ➢ Means of transport to the site
  - ➢ Frequency of visits to the site in the previous year
  - ➢ Distance of travel to the site by the visitors
  - ➢ Time taken to travel to the site by the visitors
- The study administered questionnaires randomly to visitors above 16 years on the following days:-
  - ➢ Twice (Saturdays and Sundays) during the weekends which are peak days with high traffic just like holidays(there are approximately 104 weekends in a year and 11 public holidays in Kenya)
  - ➢ Thrice (Monday, Wednesday and Fridays) during week days which are off peak days with light traffic (there are approximately 250 such days in a year)

- Zones of origin of visitors were based on the eight (8) administrative divisions in Nairobi (see appendix 4) since information relating to such criterion of zoning was readily available as compared to any other criteria

- Population of each zone was obtained from the Ministry of Planning and based on the last (1999) census

- The total sample size of the study was two thousand four hundred and sixty (2,460) visitors which the researcher presumes to be large enough to enable better statistical analysis. The sample size was initially calculated to be two thousand one hundred and seventy two assuming that 80% of the target population had the characteristics of interest to the researcher. Confidence level was taken at 98% and the formula proposed by Mugenda (1999) for calculating size of desired sample in social sciences. However, since a higher sample was chosen after visit to the site by the researcher revealed that less of the characteristics of interest in the target population were less than the hitherto presumed 80%

- Transport costs were based on estimated costs from various zones or residences as given by the respondents for individual travel cost model and based on Automobile Association (AA) running costs per kilometer (Km) for visitors who used private means and average bus fare per person per kilometer (in Nairobi) for those who used public means with regard to zonal travel cost model. Transport cost thus averaged Kshs.19.50/Km for private and Kshs.2.00/person /Km for public)

- Time cost was based on average wages for low, middle and high income groups as provided in the Economic Survey of May 2005(average of Kshs.19.2/hr)

- Distances from the various divisions /zones were calculated based on Nairobi Parliamentary Constituencies Map (6th Edition, 2002) which is on a scale of 1:50,000. The distances were calculated from the center of each division to the park in order to simplify computation.

- The most optimal recreational value will be that which equals or greater than the market based appraised value of the site for the next best alternative use to the site.

3.3. Survey data

- The following data were obtained from the survey:-

- An average of 1890 visits per day are made to the arboretum during peak days
- An average of 147 visits per day are made during off peak days
- Visitors below 16 years accounted for about 12% during off peak and 17.5% of the peak day visits and were excluded from the computations.
- Annual expenditure incurred by the Department of Forestry and FONA at the arboretum approximates Kshs.1,500,000.00 and covers wages, any repairs, regeneration of trees, clearing and maintenance of lawns and forest, security e.t.c.
- Total visits during peak days are calculated as the sum of 104 weekends in a year and 11 public holidays (in Kenya) when traffic or visits to arboretum is heavy.
- Total visits during off peak days are total of week days (250) in a year when traffic or visits to the arboretum is light.

- Annual visits to the arboretum were 254,100 calculated as follows:-

Visits during peak days	= 1890 * 115	= 217, 350
Visits during off peak days	= 147 * 250	= 36,750
Total		**= 254,100**

- The study also revealed the following information from the respondents:-

a) The number of visitors to the park from the eight administrative divisions in Nairobi was as tabulated below

Table 3.3.1: Number of visitors to Nairobi Arboretum per division/zone

Division/ Zone	Respondents (N=2460)	Frequency of annual visits	Percentage of annual visits	Distance to site (Km)
Embakasi	500	51,646	20.33	23
Kamukunji	440	45,449	17.89	9
Westlands	360	37,185	14.63	7
Makadara	340	35,120	13.82	14
Starehe	335	34,603	13.62	5
Kasarani	220	22,724	8.94	15
Dagoretti	180	18,593	7.32	11
Langata	85	8,780	3.46	13
TOTAL	**2460**	**254,100**	**100**	

Source: Field survey

The highest number of visitors (20.33%) came from Embakasi which is about 23 Km to the site while the least number of visitors (3.46%) came from Langata which is 13Km to the site.

Conventionally, the highest number of visitors should have come from Starehe which is about 5 Km to the site. This is because the nearer the division to the arboretum, the lower the distance traveled and the lower the travel cost incurred leading to higher demand and vice versa. The strange phenomenon could have been caused by several factors which shall be explained later in this chapter.

Distances to the site were calculated from the center of each division to the arboretum.

b) There were various reasons for visiting the park as indicated the table below:-

Table 3.3.2: Reasons for visiting Nairobi Arboretum

Reason	Respondents (N=2460)	Frequency of annual visits	Percentage of annual visits
Praying/Meditation	686	70,859	27.89
Enjoying quiet/fresh air	586	60,530	23.82
Picnicking	579	59,806	23.54
Other reasons	367	37,908	14.92
Bird watching	166	17,147	6.75
Jogging	48	4,958	1.95
Walking/strolling	28	2,892	1.14
TOTAL	**2460**	**254100**	**100**

Source: Field survey

Other reasons for visiting the site were given by the respondents when administering the questio0nnaire and had not be envisaged during design. Interestingly one of the reasons listed in the designed questionnaire (photography) had no respondent during the survey.

The other reasons included the following:
- Reading/studies,
- Shooting videos for music albums,
- Surveying wildlife and trees,
- Education,

- Counseling,
- Meeting for associations,
- Games,
- Dating/courting

c) Means of transport to the recreation site were as varied as indicated in the table below:-

Table 3.3.3: Means of transport by the visitors to Nairobi Arboretum

Means	Respondents (N=2460)	Frequency of annual visits	Percentage of annual visits
Private	124	12,808	5.04
Public	621	64,145	25.24
Foot	396	40,904	16.10
Public then foot	1319	136,243	53.62
TOTAL	**2460**	**254,100**	100.00

Source: Field Survey

- Private implies those respondents who used their own vehicles to the site from their residences and they constitute only 5% of the visitors..
- Public means visitors who used public service vehicles (matatu) from their residence to the site
- Foot means respondents who trekked all the way to the site from where they stay
- Public then foot means the respondents who used public service vehicles for part of the trip and trekked for the other part. Most of these respondents were passing through church on their way to the site.
- Public, on foot and public then on foot means of transport combined forms about 85% of visitors to the site which means that a large number of visitors do not incur traveling cost. This could probably explain why a large number of visitors come from the farthest distance (Embakasi) and with the lowest income levels.

d) Gender of visitors to the park was as follows:-

Table 3.3.4: Gender of visitors to Nairobi Arboretum

Gender	Respondents (N=2460)	Frequency of annual visits	Percentage of annual visits
Female	1243	128393	50.53
Male	1217	125707	49.47
TOTAL	**2460**	**254100**	**100.00**

Source: Field Survey

It appears from the table that slightly over 50% of visitors to the arboretum are females

e) Age of the site visitors were as follows:-

Table 3.3.5: Age of visitors at Nairobi Arboretum

Age bracket (Years)	Respondents (N=2460)	Frequency of annual visits	Percentage of annual visits
16-24	1238	127876	50.33
25-35	1043	107734	42.40
35-55	179	18489	7.28
TOTAL	**2460**	**254100**	**100.00**

Source: Field Survey

- Mode of age of the respondents was 19 years
- Minimum age was 16 years
- Maximum age was 46 year
- Mean of the ages was 25.61 year.
- In overall, most of visitors to the site are between the ages of 16 to 24 at 50.33% followed by those between 25 to 35 years who form 42.40% of the visitors. It therefore means that most visitors to the site are teenagers and youths from 16 to 35 years old.

f) Income level of visitors to the arboretum were as tabulated below:-

Table 3.3.6 Income level of visitors to Nairobi Arboretum

Income bracket per month (Kshs)	Respondents (N=2460)	Frequency of annual visits	Percentage of annual visits
Under 12,000	1577	162,893	64.11
12,000 - 30,000	662	68,380	26.91
31,000 - 50,000	159	16,424	6.46
Above 50,000	62	6,404	2.52
TOTAL	**2460**	**254,100**	**100.00**

Source: Field Survey

- For those in regular employment, responses on their monthly salaries were obtained.
- For respondents not in regular employment (casuals), the daily wages was multiplied by thirty days to obtain what they would earn per month were they to be contracted for a whole month.
- For those in self employment, responses on their average profit/earnings per month were obtained.
- The minimum monthly income was Kshs.3, 870/= while the maximum was Kshs.60, 000/=
- The mean income level was calculated at Kshs.14, 071.99 per month
- The mode of the income levels was Kshs.6, 000.00 per month
- It therefore appears that the largest number of visitors to the site is low income earners.

Generally it is also important to note the following about the survey:-
- Some visitors were passing either through church, work place, visiting friends, shopping or school on the way to the site
- Most of the respondents were neither conversant with their division of origin nor the approximate distance in kilometers which they covered to various places. The researcher was thus estimating the distances using the map.

3.4. Application of ZTCM

Visitation rates per 1,000 populations per year for the respective zones were obtained using the following formula

Annual visits per zone $\qquad$ = (Visits per zone/sample size)*Annual Visits

Visits/1000/zone $\qquad$ = $\dfrac{\text{Annual Visits per zone} \times 1,000}{\text{Population of the zone}}$

- The calculated visitation rates per thousand populations were as tabulated here under:-

Table 3.4.1: Visitation rates for Nairobi Arboretum

Zone	Zone Population	Observed Visits	Annual visits	Annual Visits/1000
Dagoretti	229,330	180	18,593	81
Langata	355,526	85	8,780	25
Starehe	88,152	335	34,603	393
Westlands	193,061	360	37,185	193
Kamukunji	232,401	440	45,449	196
Kasarani	247,552	220	22,724	92
Makadara	254,964	340	35,120	138
Embakasi	467,118	500	51,646	111
TOTAL	**2,100,000**	**2460**	**254,100**	**121**

Source: Field Survey

Populations for the zones were based on the 1999 census

Table 3.4.2: Total travel cost for Nairobi Arboretum

Zone	Visits/1000	Time cost	Travel cost	Total travel cost
Langata	25	6,010	8,515	14,525
Dagoretti	81	13,824	7,920	21,744
Kasarani	92	16,896	13,200	30,096
Makadara	138	18,797	39,130	57,927
Westlands	193	7,296	14,980	22,276
Starehe	393	6,432	9,325	15,757
Embakasi	111	46,848	62,100	108,948
Kamukunji	196	16,896	22,140	39,036
TOTAL	**121**	**132,999**	**177,310**	**310,309**

Source: Field Survey

The time costs were calculated by obtaining the product of the average time in hours taken to travel to and from the site from each zone plus time taken on site by the average wage/ income per hour (Kshs.15.20/hr).

The travel costs were calculated by obtaining the product of the average distance in kilometer taken to travel to and from the site from each zone by the average travel cost per kilometer (Kshs.15.50/km for private means, Kshs.2.00/km for PSV).

Consequently, the average annual travel cost (AATC) was calculated by using the following formula:-

AATC = transport cost + time cost
            Sample Size

   =Kshs.126.10

Annual Total Travel Cost (ATTC) = AATC X Annual Visits

Therefore ATTC = Kshs.126.10 x 254,100 = Kshs.32, 052, 649.15

But the Consumer Surplus (CS)   = ATTC - Site Maintenance Cost (SMC)

$$= \text{Kshs.32, 052, 649.15} - \text{Kshs.1, 500,000}$$

Net Consumer surplus   **=Kshs. 30,552,649.15**

Recreation Value (RV) for the site may be obtained by capitalizing the Consumer Surplus in perpetuity at a discount rate equal to Treasury Bills plus inflation rate.

Treasury bill and Inflation rates can be obtained from the Monthly Economic Review as follows:-

91-day Treasury bill rate	= 8.564
Average Annual Underlying inflation rate	= 4.780
Discount rate	**=13.344**

YP in perp @13.344%   = 7.494

Recreation Value of Nairobi Arboretum is thus = Kshs. 30,552,649.15 x 7.494

                                                    =Kshs. 228,961,552.70

3.5 Application of ITCM

It is important to appreciate the following information for purposes of calculating recreation value of Nairobi Arboretum using Individual Travel Cost Model.

Table 3.5.1 Visit costs under ITCM

Zone	Visits/1000	Time cost	Travel cost	Site cost	Total travel cost
Langata	25	17,760	11,180	3,500	32,440
Dagoretti	81	36,557	14,870	13,800	65,227
Kasarani	92	40,934	4,800	53,600	99,334
Makadara	138	67,584	24,140	26,200	117,924
Westlands	193	48,403	10,984	68,700	128,087
Starehe	393	72,710	27,350	56,200	156,260
Embakasi	111	111,110	59,380	66,000	236,490
Kamukunji	196	63,706	28,200	191,050	282,956
TOTAL	**121**	**458,764**	**180,904**	**479,050**	**1,118,718**

Source: Field Survey

Time costs were obtained from the product of total time in hours taken to travel to and from site including time taken on site as given by each respondent by the average wage/income per hour. The average wage/income per hour was calculated and based on income level of each respondent as given during administration of the questionnaires.

Travel costs were based on the actual cost incurred and given by each respondent for travel to and from the arboretum.

Site costs were also based on the cost incurred on meals, refreshments and other site related items as given by each of the respondent during administration of the questionnaire.

Consequently, the average annual travel cost (AATC) was calculated by using the following formula:-

AATC = $\frac{\text{transport cost + time cost + on-site expenses}}{\text{Sample Size}}$

   = Kshs.454.80

Annual Total Travel Cost (ATTC) = AATC X Annual Visits
                            = 254,100 X 454.80
                         =Kshs. 115,564,680.00

But the Consumer Surplus (CS) = ATTC - Site Maintenance Cost (SMC)

                                =Kshs. 115,564,680.00 – Kshs.1, 500,000

Net Consumer Surplus   =Kshs. 114,064,680.00

Recreation Value (RV) for the site using this model can also be obtained by capitalizing the Consumer Surplus in perpetuity using the same discount rate of 13.344% in other words Year's Purchase (YP) in perpetuity of 7.494

Hence the Recreation Value is = Kshs. 114,064,680.00 x 7.494

= Kshs. 854,800,711.92

3.6. Comparison of Zonal and Individual Travel Cost derived values

Table 3.6.1: Recreation values under ZTCM and ITCM

Travel Cost Model	Net Consumer Surplus (Kshs)	YP in perpetuity @ 13.344%	Recreation Value (Kshs)
ITCM	114,064,680.00	7.494	854,800,711.92
ZTCM	30,552,649.00	7.494	228,961,551.61
Variance	**83,512,031.00**		**625,839,160.31**

Source: Calculations

The possible explanation for the variance could be as follows:-

➢ The zonal travel cost model does not take into account the actual cost of travel unlike ITCM but relies on estimation based on average distance from each zone at a standard rate/km

➢ Zonal travel cost does not consider actual time taken to travel to and from site which ITCM does.

➢ ZTCM does not cover on site expenses yet ITCM captures such expenditure as well

➢ ZTCM only estimates reliable consumer surplus where visitor origins are evenly distributed and many important points of origin to a single site are present which did not occur in this case.

➢ ITCM tends to capture other inherent socioeconomic variables which ZTCM may not capture.

➢ ZTCM does not factor in leisure as part of the total travel cost unlike ITCM

3.7 What is the optimal value and model?

The arboretum is about 30 Ha in size which translates to approximately 74.13 acres. Residential use is the next best use of the arboretum since it is within Zone 4 as per appended City Council of Nairobi zoning (Appendix 5). The permitted plot ratio and ground coverage for the zone is 1.50 and 0.50 respectively while the allowed minimum plot size is 0.20 of an acre

An acre of land in the neighbourhood presently trade at Kshs.10M which implies that the whole land parcel would go for say Kshs.740,130,000/= using comparative approach to valuation of the site.

Table 3.7.1 Comparison of MBAV with both ITCM and ZTCM values

Valuation Model	Type of value	Value (Kshs)	Variance from MBAV
Individual Travel Cost	Recreation	854,800,712	
			114,670,712
Appraisal method	Market Based Appraisal Value	740,130,000	'
			-511,168,448
Zonal Travel Cost	Recreation	228,961,552	

Source: Calculations

The comparison reveals that recreation value arrived at using the Individual Travel Cost Model (ITCM) is nearer to the Market Based Appraisal Value (MBAV) calculated using sales comparison model.

It therefore appears that zonal travel cost model grossly underestimates the value assigned to a recreation site resulting in a suboptimal value. Individual Travel Cost Model should therefore be recommended as the most optimal travel cost model and it could be due to the reasons explaining the variance in valuation outcome between ZTCM and ITCM.

3.8 Correlation

A correlation technique was used to analyze the relationship between the frequency of visits to the site and other variables such as level of education; level of income; means of transport; age; gender; travel cost and reason (s) for visit. This was based on actual data gathered from each of the 2,460 respondents.

The result was as indicated below:-

Table 3.8.1 Correlation of frequency of visits and other variables

	Freq vsts	Division	Acdmc lvl	Income	Age	Gender	Travel cost	Rsns Visit	Transport
Freq vsts	1								
Division	-0.00512	1							
Acdmc lvl	-0.05349	-0.012	1						
Income	0.003924	-0.0084	0.387499	1					
Age	-0.0515	-0.0042	0.11255	0.58008	1				
Gender	-0.1032	-0.0078	0.008298	-0.0522	-0.0949	1			
Travel cost	-0.01924	0.04646	-0.00745	-0.0071	-0.0118	-0.0313	1		
Rsns Visit	-0.00849	0.0224	-0.1385	0.02712	-0.1519	0.05435	0.0112197	1	
Transport	-0.00487	0.00828	-0.2606	-0.2013	0.03887	-0.0649	-0.007138	0.1077138	1

Source: Analysis of field data

The following inferences can be made from the table.

- There was an inverse relationship between frequency of visits and other variables except for level of income where there was a direct relationship though a weak one with a correlation co-efficient of 0.003924.
- The strongest inverse relationship was with the means of transport at a correlation co-efficient of - 0.00487, followed by reason(s) for visit at - 0.00849 and travel cost at -0.01924

3.9 Multiple Regressions

3.9.1 Regression - ITCM

A multiple regression (MR) analysis was done (at 95% confidence level) on the frequency of visits and the other variables and gave rise to the following multiple regression model:-

$$V = 84.0343 - 6.0832D + 0.0004N - 0.9736A - 11.7902G - 0.0048C - 1.0209R - 0.2556T + 9.8187$$

Where V – Frequency of visits

D – Education level

N – Income level

A – Age

G – Gender

C – Travel cost

R – Reason for visit

T – Means of transport

While the constant is 84.0343 and the standard error 9.8187

However, while the significance F was 1.004E-09 and F- statistic 8.0641, the R square was 0.0225 meaning that less of variations in the dependent variable was explained by the independent variables..

3.9.2 Regression - ZTCM

Regression equation relating visits per thousand to total travel cost was obtained at 95% level of confidence as indicated below:-

$V \quad = \quad 178.660 -0.001C + 69.409$

Where   V   = Frequency of visit

             C   = Total Travel Cost

While the constant or intercept is 178.660 and the standard error is 69.409

However, while the significance F was 0.667 and F- statistic 0.206, the R square was 0.033 meaning that less of variations in the dependent variable was explained by the independent variables.

In order to find out how the inverse relationship between frequency of visits and travel costs would behave in a hypothetical scenario, the frequency of visits at different assumed entry fee for accessing the site was calculated using the regression equation and taking the annual visits of 254,100 as at zero entry fees. The multiple regression equation of ZTCM was used because it had only one variable hence the illustration would be simpler and easier to understand the inverse relationship.

Entry fee was then introduced at Kshs.1, 000 and progressed arithmetically by Kshs.1, 000/= to Kshs.10, 000/=. An arithmetic constant of 1,000 was chosen so that the changes in annual visits at different entry fees could be easily and clearly observed.

The results are tabulated here under:-

Table 3.9.1 Number of annual visits at different park entry fees.

Entry Fee	Annual Visits
-	254,100
1,000	422,824
2,000	424,168
3,000	425,512
4,000	426,857
5,000	428,201
6,000	429,545
7,000	430,889
8,000	432,234
9,000	433,578
10,000	434,922

Source: Calculation

A graph was plotted based on the corresponding values in the table and the presentation appeared as shown below:-

Graph 3.9.1 Visits to Nairobi Arboretums at different entry fees
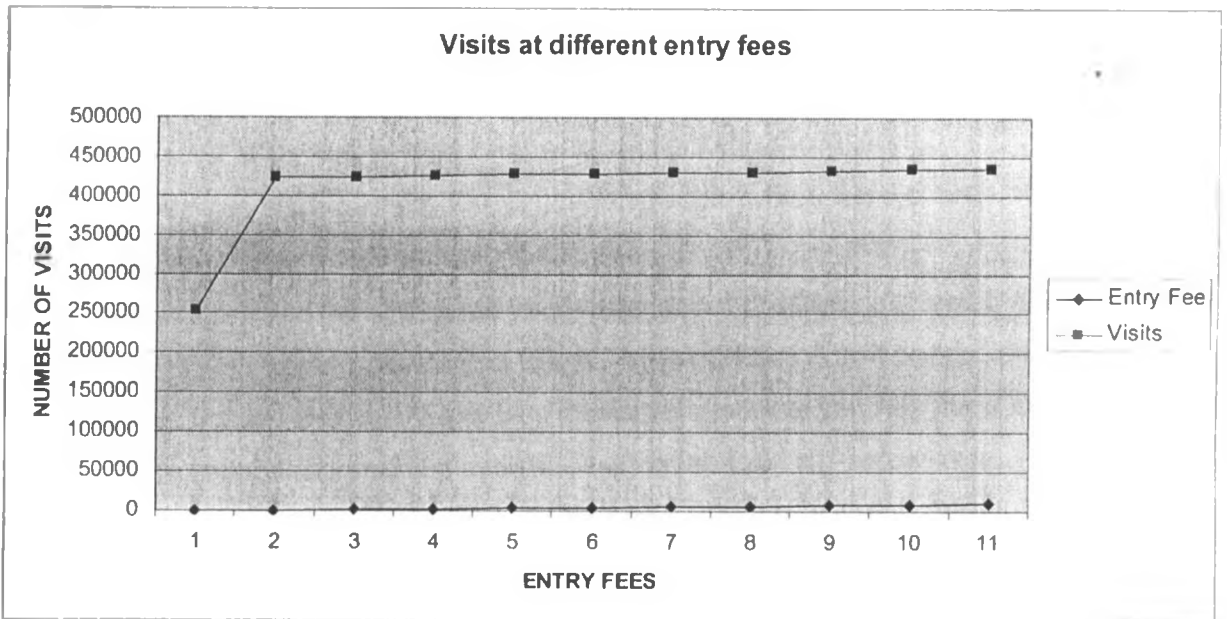
The research reveals a direct visitation-travel cost relationship of the surveyed data resulting in a unique upward sloping demand curve and implying that an increase in travel cost results in an increase in the number of visits to the site. In fact, most

visitors to the site were from distant zones such as Embakasi division as compared to visitors from Westlands division/ zone where the recreation site is located.

This is in contrast to the conventional theory of an inverse relationship between the cost of visiting a recreation site and the number of visits as was observed by Garrod(1999), Devani (1970) who also observed that leisure preferences are conditioned by the time and distance required reaching the location where one can engage in the desired activity. Conventionally, people living greater distances from the recreation site incur higher transport cost there by making fewer visits per year than those living nearer to the site, providing the characteristic downward sloping demand curve.

It appears that the conventional theory of inverse relationship between number of visits and total travel cost may not apply to less developed countries like ours due to the following reasons:-

- The concept of recreation is still not well appreciated in the country as compared to developed countries.
- Purchasing power is low and thus most visitors to a recreation site seldom use a lot of money to access it as it may be noted that about 95% of visitors to our case study were not using private vehicles. In fact the bulk were either trekking to the site all through or augmenting with boarding of public service vehicles for a smaller part of the journey. Traveling long distances on foot implied that cost of travel (bus fares and vehicle fuel) was negligible to the visitors.
- Most visitors were passing through other places (which were church, work place or visiting friends) before going to the site.
- Most visitors had lower income levels with about 65% earning less than Kshs.12,000 while most visitors (mode) earning Kshs.6,000 per month. Lower income implies that they have less disposable income yet they need to attend the site for various recreational activities hence the trekking percentage..
- Most visitors to the site were going for prayers and meditation (about 28%) which is more related to conviction and faith than economics or cost of travel. In fact those going for prayers had higher frequency of visits than any other visitors.

CHAPTER FOUR

4.0 CONCLUSION OF THE RESEARCH AND RECOMMENDATIONS

4.1 CONCLUSION

Objectives and research hypothesis

Two models of travel cost method for valuing recreational properties were examined – that is Individual and Zonal Travel Cost Models. Randomly utility model was excluded because it is more sophisticated, complicated and needs more time to execute as compared to the other models yet there was time constraint.

Recreational values were calculated for the case study (Nairobi Arboretum) using the two variations of travel cost that is Individual Travel Cots Model (ITCM) and Zonal Travel Cost Model (ZTCM) and the resultant values were approximately Kshs.855 Million and Kshs.229 Million respectively. A comparison of the two values indicates a variance of approximately Kshs. 626 Million.

The variance of approximately Kshs.626 Million reveals that recreation values arrived at by using the two travel cost models differ substantially even though applied on same data set. This does not confirm the null hypothesis which stated that "There is no difference in recreational values arrived at when zonal and individual travel cost models are applied on the same data set for purposes of valuing recreational property".

The difference in values arrived at by using the two variations of travel cost could be due to the following reasons:-

- The zonal travel cost model does not take into account the actual cost of travel unlike ITCM but relies on estimation based on average distance from each zone at a standard rate/km
- Zonal travel cost does not consider actual time taken to travel to and from site which ITCM does.
- ZTCM does not cover on site expenses yet ITCM captures such expenditure as well

- ZTCM only estimates reliable consumer surplus where visitor origins are evenly distributed and many important points of origin to a single site are present which did not occur in this case.
- ITCM tends to capture other inherent socioeconomic variables which ZTCM may not capture.
- ZTCM does not factor in leisure as part of the total travel cost unlike ITCM

The market based appraised value (MBAV) of the case study based on the next best alternative user which is residential was approximately Kshs.740 Million. Residential user was the next best alternative highest and best user because the case study falls within zone 4 as per the City Council of Nairobi zoning regulations. Zone 4 is for residential use with permitted plot ratio and ground coverage of 1.50 and 0.50 respectively while the allowed minimum plot size is 0.20 of an acre

Comparison of the market based appraised value (MBAV) with the two recreational values revealed that ITCM produced the highest value over and above the MBAV by approximately Kshs.115 Million. ZTCM produced a value which was less than the MBAV by approximately Kshs.511 Million. Consequently, ITCM produced the most optimal recreational value. In fact, the difference between ITCM-Value and MBAV indicates that recreation is the highest and best use for the particular land parcel where Nairobi Arboretum is situated.

Other findings

There are about one thousand eight hundred visitors at the arboretum during peak days i.e weekends and holidays while those visiting during week days i.e. off peak days are as few as an average of one hundred and forty only.

The highest number of visitors to the arboretum –that is about 23% comes from Embakasi division which ironically is the farthest division to or from the park. In addition the highest number of these visitors (64%) earn less than Kshs.12, 000/= per month with 28% going for either prayers or mediation. Picnicking and enjoying quiet/fresh air follow with about 24% each.

About 85% of the site visitors use either public means of transport; public means then completes the trip on foot or takes the full trip on foot. Females form 51% of the visitors with 83% of all visitors being between the ages of 16 to 35 years old.

In the case of ZTCM, travel cost forms about 57% of the total travel cost. Costs captured under ITCM are higher with the time cost being Kshs.458, 764/= and Kshs.132, 999 for ITCM and ZTCM respectively. However, travel costs were nearly at par with ITCM indicating Kshs.180, 904/= while ZTCM indicated Kshs.177,310/=.Site costs which was only captured by ZTCM was at Kshs.479, 050/=.

There was a negative correlation or inverse relationship between the frequency of visits to the park and the total travel costs. This is rather a strange phenomenon because conventionally, the relationship should be direct or positively correlated. The inverse relationship could possibly be explained by the following reasons:-

- The concept of recreation is still not well appreciated in the country as compared to developed countries.
- Purchasing power is low and thus most visitors to a recreation site seldom use a lot of money to access it as it may be noted that about 95% of visitors to our case study were not using private vehicles. In fact the bulk were either trekking to the site all through or augmenting with boarding of public service vehicles for a smaller part of the journey. Traveling long distances on foot implied that cost of travel (bus fares and vehicle fuel) was negligible to the visitors.
- Most visitors were passing through other places (which were church, work place or visiting friends) before going to the site.
- Most visitors had lower income levels with about 65% earning less than Kshs.12,000 while most visitors (mode) earning Kshs.6,000 per month. Lower income implies that they have less disposable income yet they need to attend the site for various recreational activities hence the trekking percentage..
- Most visitors to the site were going for prayers and meditation (about 28%) which is more related to conviction and faith than economics or cost of travel. In fact those going for prayers had higher frequency of visits than any other visitors.

However, there was a positive correlation between frequency of visits and income level of visitors even though it was a weak direct relationship with a correlation co-efficient of 0.003924.

4.2 RECOMMENDATIONS

- Since Individual Travel Cost Model (ITCM) provides a more optimal value that the Zonal Travel Cost Model (ZTCM), it would be advisable that it be employed whenever one is valuing recreation site even though it is more tedious, time consuming and expensive than ZTCM.

- The Zonal Travel Cost Model should also be improved on, in order to capture more actual and extensive data related to visit to recreation sites including on site costs so as to produce more reliable values.

- The Nairobi Arboretum should be preserved and well taken care of since it appears from the valuations during the research that recreational use is the highest and best use of the land parcel on which the arboretum is situated.

- The government or City Council of Nairobi (CCN) should establish another such recreation site in the Eastern side of the city so that most residents from that side can use the same instead of traveling all the way to Nairobi Arboretum.

- A lot of funds should be set aside by the Council or sought from donors and other possible financiers for purposes of both improvement and maintenance of the arboretum given the value (recreational) that the society places on it. For instance, some of the toilets are run down and have actually been closed for a long time yet a large number of people visit the site especially during weekends and holidays..

- Most of the visitors also decried the problem of accessibility since there are no public service vehicles passing near the site, one has to use the public service vehicles to Kileleshwa or walk all the way from town or arrange for special means to the site. In this respect, the City Council of Nairobi needs to allow or permit some public service vehicles to pass nearer to the site.

- No health facilities or first aid arrangement have been made at the site in cases of emergency sickness or injuries yet there is possibility of injury or sickness given the large number of people visiting the site. The Council needs to make urgent arrangement for provision of such facilities.

- The City Council of Nairobi should either improve on any lacking aspects of recreation desired by the high income earners at the arboretum or establish another arboretum to suit their needs, after conducting a research on why most visitors to the site are neither middle nor high income earners. This is because of the important role that recreation plays in the well being of a society.

- Further research needs to be done to explain the negative correlation between frequency of visits to the site and most of the variables such as education, reasons for visits and particularly total travel cost. This is because the upward sloping demand curve as found out in this research is in stark contrast to the conventional downward sloping demand curve for such relationships. Probably, other case studies could be used to find out if the phenomenon is replicated in other parks in the city.
- Since most of the visitors to the arboretum are low income earners even though it is situated in one of the high income divisions (Westlands), further research needs to be done to find out the reasons behind such happening.
- Research could also be done in re-examining the impact of other zonal definition parameters (other than administrative units and distance) on the resultant consumer surplus.
- Further research may also be done on the positive though weak correlation between frequency of visit and level of income of the visitors.
- Research may also be conducted to find out why most of the site visitors are the "youth" between the ages 16 to 35 years old.

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Appendix 1

INITIAL QUESTIONNAIRE- CASE STUDY: NAIROBI ARBORETUM

Interviewee No.............................. Sex of interviewee...............................

Day and date of interview......................Age of interviewee......................

1. Your residence is in which division?
    - [1]   Dagoretti
    - [2]   Langata
    - [3]   Starehe
    - [4]   Westlands
    - [5]   Kamukunji
    - [6]   Kasarani
    - [7]   Makadara
    - [8]   Embakasi

2. What is your reason (s) for visiting the recreation site?
    - [1]   Walking/strolling
    - [2]   Jogging
    - [3]   Picnicking
    - [4]   Praying/Meditating
    - [5]   Enjoying peace, quiet, fresh air
    - [6]   Photography
    - [7]   Bird watching
    - [8]   Any other reason (please specify)...

3. What is your level of education?
    - [1]   Primary level
    - [2]   Secondary level
    - [3]   College level
    - [4]   University level

4. What means of transport did you use to travel to the site?
    - [1]   Private vehicle
    - [2]   Public service vehicle
    - [3]   Public service vehicle then on foot
    - [4]   Bicycle
    - [5]   Motor cycle
    - [6]   On foot

5. How many times did you visit the site during the last?
    - [1]   Month
    - [2]   Year

6. How long do you stay at the recreation site during each visit?
    - [1]   Less than 1 hour
    - [2]   Between 1 – 2 hours
    - [3]   Between 2 – 3 hours

[3]   Between 2 – 3 hours
    [4]   Between 3 – 4 hours
    [5]   Between 4 – 5 hours
    [6]   More than 5 hours (Please specify)...

7. What is your approximate monthly income?
    [1]   Below Kshs.10, 000
    [2]   Between Kshs.11, 000 – 30,000
    [3]   Between Kshs.31, 000 – 50,000
    [4]   Above Kshs.50, 000

8. How much do you spend at the site?
    [1]   Less than Kshs.100
    [2]   Between Kshs.100 – 200
    [3]   Between Kshs.200- 300
    [4]   Between Kshs.300 – 400
    [5]   Between Kshs.400- 500
    [6]   More than Kshs.500 (please specify)..

9. When you left home, did you travel directly to the site? Yes/ No....................
    [1] If yes, go to number 10
    [2] If No, go to number 13

10. How long did it take you to travel from your residence to the site?
    [1]   Less than 1 hour
    [2]   Between 1 hour – 2 hours
    [3]   Between 2 – 3 hours
    [4]   More than 3 hours (please specify)...

11. How much did it cost you to travel to the site from your residence?
    [1]   Nothing
    [2]   Up to Kshs.10
    [3]   Between Kshs.10- 30
    [4]   Between Kshs.30- 50
    [5]   Between Kshs.50-70
    [6]   Between Kshs.70-90
    [7]   Between Kshs.90- 110
    [8]   More than Kshs.110 (please specify).......................................

12. How far in kilometers is your residence from the site?
    [1]   Less than 1km
    [2]   Between 1 -3 km
    [3]   Between 3 – 5 km
    [4]   Between 5 – 7 km
    [5]   Between 7 – 9 km
    [6]   Between 9 – 11km
    [7]   Between 11 – 13 km
    [8]   More than 13 km (Please specify)

13. Which place (s) did you pass through before coming to the site?
    [1]   Church
    [2]   Work place
    [3]   Visiting a friend

[4]   Shopping
[5]   Other reasons (please specify)

14. How long did it take you to travel from your residence to the place (or last place you visited)?
[1]   Less than 1 hour
[2]   Between 1 hour – 2 hours
[3]   Between 2 – 3 hours
[4]   More than 3 hours (please specify)....................................

15. How much did it cost you to travel to from your residence to the place (or last place you visited)?
[1]   Nothing
[2]   Up to Kshs.10
[3]   Between Kshs.10- 30
[4]   Between Kshs.30- 50
[5]   Between Kshs.50-70
[6]   Between Kshs.70-90
[7]   Between Kshs.90- 110
[8]   More than Kshs.110 (please specify)....................................

16. How far in kilometers is your residence to the place (or last place you visited)?
[1]   Less than 1km
[2]   Between 1 -3 km
[3]   Between 3 – 5 km
[4]   Between 5 – 7 km
[5]   Between 7 – 9 km
[6]   Between 9 – 11km
[7]   Between 11 – 13 km
[8]   More than 13 km (Please specify)....................................

17. How long did it take you to travel from the place (or last place you visited) to the site?
[1]   Less than 1 hour
[2]   Between 1 hour – 2 hours
[3]   Between 2 – 3 hours
[4]   More than 3 hours (please specify)....................................

18. How much did it cost you to travel to the site from the place (or last place you visited)?
[1]   Nothing
[2]   Up to Kshs.10
[3]   Between Kshs.10- 30
[4]   Between Kshs.30- 50
[5]   Between Kshs.50-70
[6]   Between Kshs.70-90
[7]   More than Kshs.90 (please specify)....................................

19. How far in kilometers is the place (or last place you visited) from the site?
[1]   Less than 1km
[2]   Between 1 -3 km
[3]   Between 3 – 5 km
[4]   Between 5 – 7 km

[5]   Between 7 – 9 km
[6]   More than 9 km (Please specify)......................................

20. Any other comment

....
....
....
....
....
....

Thank you for your time

MODIFIED QUESTIONNAIRE- CASE STUDY: NAIROBI ARBORETUM

Interviewee No.............................. Sex of interviewee...............................

Day and date of interview..................Age of interviewee...............................

1. Where (in which division) do you stay?
    - [1]   Dagoretti
    - [2]   Langata
    - [3]   Starehe
    - [4]   Westlands
    - [5]   Kamukunji
    - [6]   Kasarani
    - [7]   Makadara
    - [8]   Embakasi

2. What is/are your reason (s) for visiting the site?
    - [1]   Walking/strolling
    - [2]   Jogging
    - [3]   Picnicking
    - [4]   Praying/Meditating
    - [5]   Enjoying peace, quiet, fresh air
    - [6]   Photography
    - [7]   Bird watching
    - [8]   Any other reason (please specify)...

3. What is your level of education?
    - [1]   Did not go to school
    - [2]   Primary level
    - [3]   Secondary level
    - [4]   College level
    - [5]   University level

4. What means of transport did you use to travel to the site?
    - [1]   Private vehicle
    - [2]   Public service vehicle
    - [3]   Public service vehicle then on foot
    - [4]   Bicycle
    - [5]   Motor cycle
    - [6]   On foot

5. How many times did you visit the site during the last month/ year?

6. How long (in hours) do you stay at the recreation site during each visit?
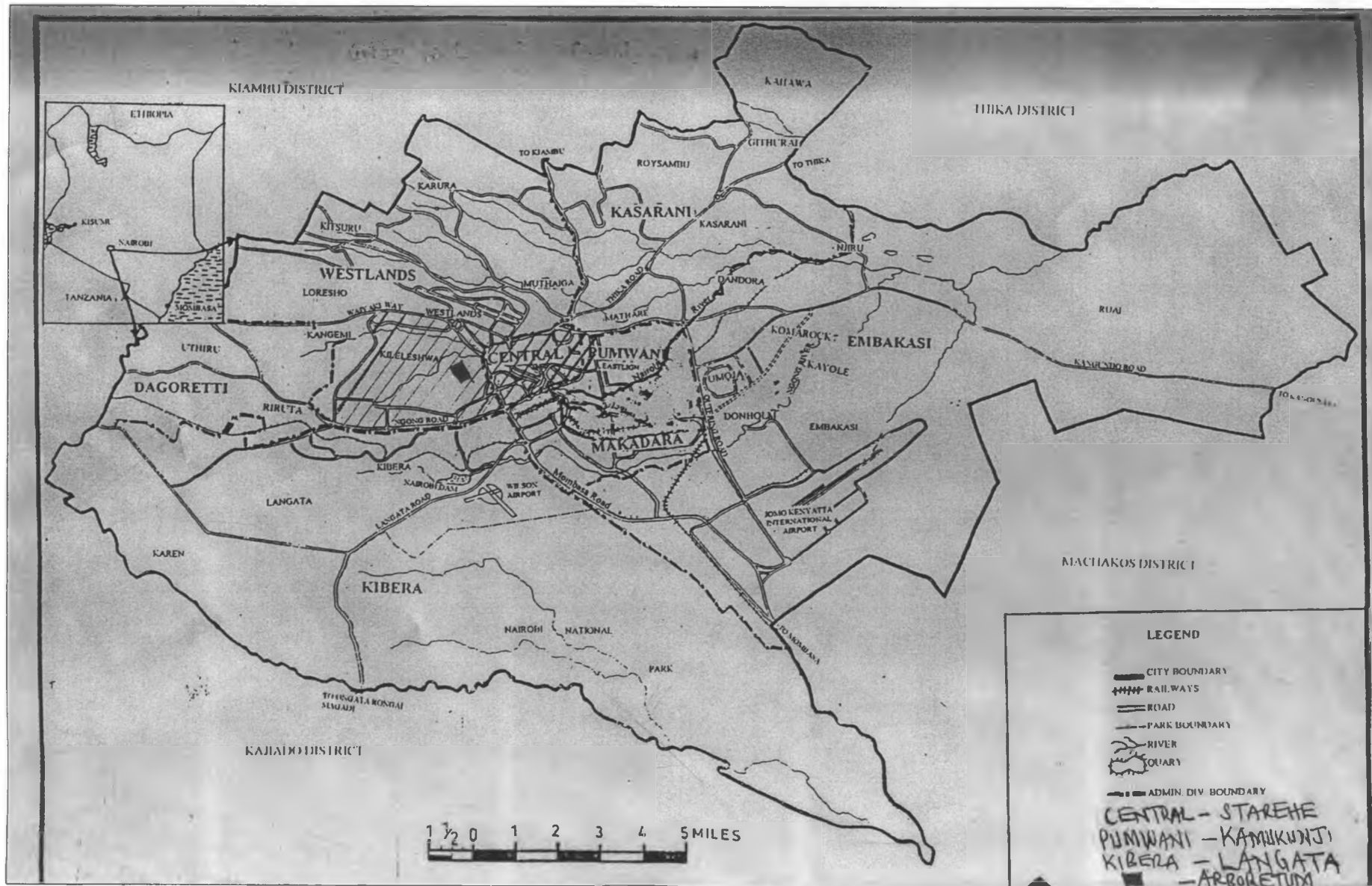
7. What is your approximate daily/weekly /monthly income?

8. How much do you spend at the site during each visit?
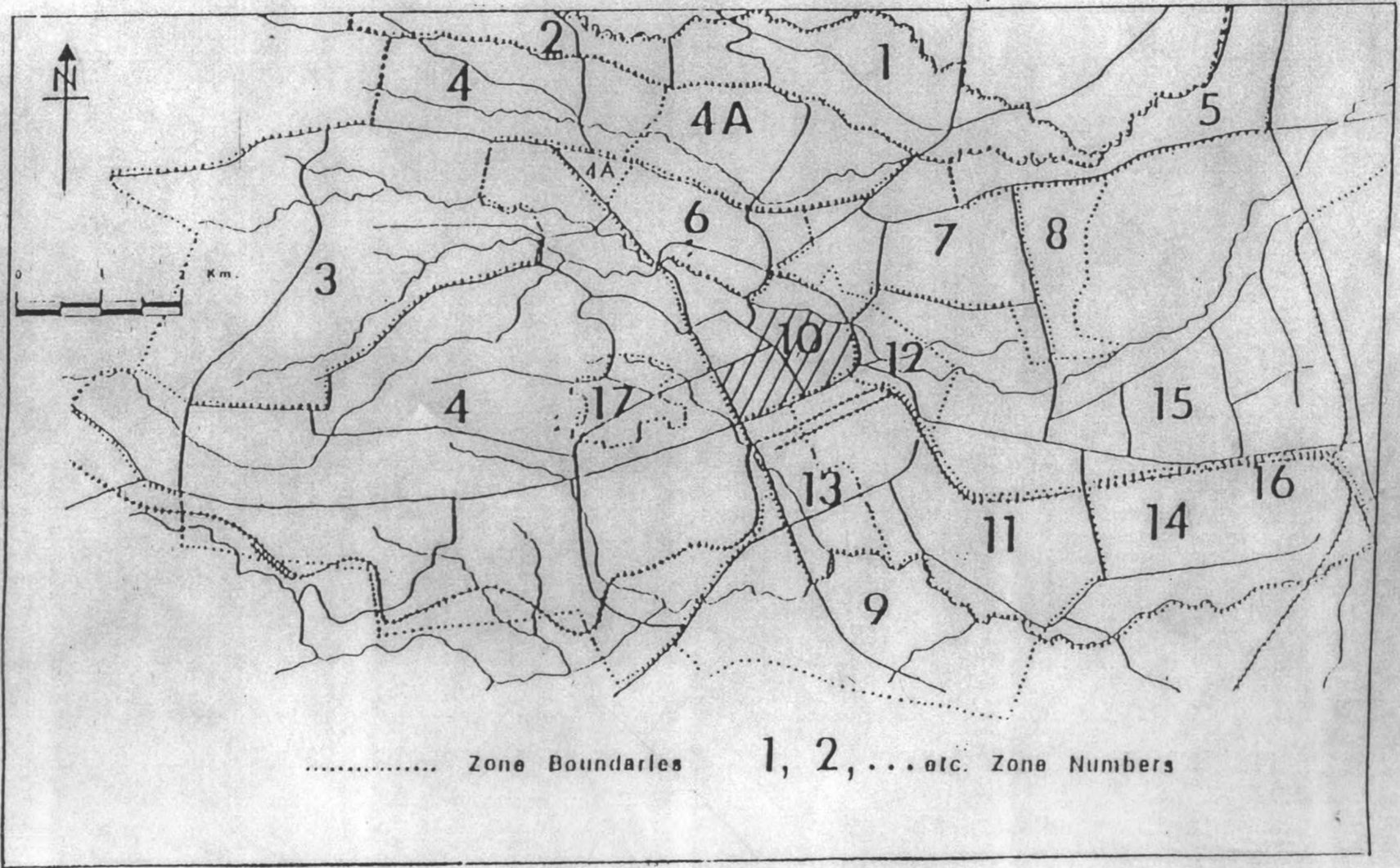9. When you left home, did you travel directly to the site? Yes/ No....................
    - [1] If yes, go to number 10
    - [2] If No, go to number 14

Appendix 4: Administrative divisions in Nairobi

Source: Karuku 2001

Appendix 5: City Council of Nairobi zoning

Zone Boundaries   1, 2, ...etc. Zone Numbers