Pricing of National Park Visits in Kenya: The Case of Lake Nakuru National Park

By

Peter Chacha Wankuru
X50/77908/2009

UNIVERSITY OF NAIROBI
SCHOOL OF ECONOMICS

A Research Paper Submitted in Partial Fulfillment of the Requirements of the Degree of Master of Arts in Economics of the University of Nairobi

September 2011
Declaration

I certify that this research paper is my original work and has not already been presented for a degree award in any other university.

Signature: _______________________________  
Peter Chacha Wankuru  
Date: _______________________________  
28-09-2011
Approval

This research paper has been submitted for examination with our approval as University Supervisors.

Signature: 

Dr. Anthony Wambugu 

Date 

Signature: 

Dr. Daniel Abala 

Date
Dedication

To my late sister, Sussy Ghati, who never lived to enjoy the fruit of her ingenuity and to my parents Mr. James Wankuru Ngocho and Mrs. Pauline Nyamohanga Wankuru for their unwavering love and for encouraging me to always work to achieve my dreams.
I would like to appreciate my creator, the almighty God who empowered and gifted me unconditionally. I am not better than others to deserve His Mercy and Grace.

I would like to thank everyone who contributed in every little way to the finalisation of this research work. This research paper befitted from the able support of my supervisors, Dr. Anthony Wambugu and Dr. Daniel Abala. The two dons worked around the clock to provide invaluable insights, suggestions and guidance to every sentence constructed in this paper. I am entirely humbled by their commitment, support and sacrifice.

I am indebted to the management of Kenya Wildlife Service for their support of the study without reservation. Special thanks to the director, Dr. Julius Kipngetich, for his warm reception and willingness to allow me to conduct research at Lake Nakuru National Park. He had many extraordinary colleagues who went an extra mile to support this course, including Race Tavasi Musumba, Phyllis Nyakiba, Vincent Ogwae and Joseph Muturi among others. Race and Phyllis provided very useful inputs to refinement of the survey instruments while Vincent and Muturi provided great support during the administration of the questionnaires to tourists. I encourage you to continue the good stewardship for the wildlife assets endowed to the people of Kenya.

My sincere gratitude goes to the office of the deputy Prime Minister and Ministry of Finance for granting me an opportunity to study and providing the resources to finance the same. Specifically I would like to thank the director economic affairs, Mr. Justus Nyamunga for his vision for the department and drive to build staff capacity. To Mr. Henry K. Rotich and Mr. George Omino, thank you for your encouragement and mentorship to my professional path.

Finally, am grateful to my family, fellow students and friends who gave their support, prayers and encouragement throughout the course. Your support and prayers did not go to waste. They were the emotional deposits that fuelled my drive.
# Table of Contents

Title Page..................................................................................................................................................... i
Declaration.................................................................................................................................................... ii
Approval....................................................................................................................................................... iii
Dedication..................................................................................................................................................... iv
Acknowledgements...................................................................................................................................... v
ABSTRACT................................................................................................................................................. ix
List of Tables ................................................................................................................................................ x
List of Figures .............................................................................................................................................. xi
List of Abbreviations and Acronyms ........................................................................................................ xii

CHAPTER ONE ...........................................................................................................................................1
1.0 INTRODUCTION..................................................................................................................................1
1.1 Background.............................................................................................................................................1
1.2 Pricing National Parks in Kenya...........................................................................................................3
1.3 Problem Statement.................................................................................................................................8
1.4 Objective of the Study............................................................ 8
1.5 Justification of the Study......................................................................................................................9
1.6 Scope of the study................................................................................................................................H
1.7 Organisation of the Paper.....................................................................................................................12

CHAPTER TWO....................................................................................................................................... 13
2.0 LITERATURE REVIEW.....................................................................................................................13
2.1 Introduction..........................................................................................................................................13
2.2 Theoretical Literature Review.............................................................................................................13
2.3 Empirical Literature Review...............................................................................................................16
2.4 Overview of the Literature..................................................................................................................28

CHAPTER THREE ................................................................................. 30
3.0 METHODOLOGY............................................................................................................................ 30
3.1 Introduction ......................................................................................................................................30
3.2 Theoretical Framework ....................................................................................................................30
3.3 Empirical Application .......................................................................................................................34
  3.3.1 Specification of the Model ...........................................................................................................34
  3.3.2 Travel Cost Model .......................................................................................................................35
  3.3.3 Description of the Study Area .....................................................................................................38
  3.3.4 Estimation Procedure ..................................................................................................................39
  3.3.5 The data .....................................................................................................................................40
CHAPTER FOUR ......................................................................................................................................42
4.0 PRESENTATION AND DISCUSSION OF RESULTS ........................................................................42
  4.1 Introduction ....................................................................................................................................42
  4.2 Definition of Variables and Summary Statistics ..............................................................................42
  4.3 Regression Results ..........................................................................................................................49
    4.3.1 Presentation of results ................................................................................................................49
    4.3.2 Discussion of results ..................................................................................................................56
    4.3.3 Consumer Surplus Estimates for LNNP ....................................................................................61
    4.3.4 Pricing Mechanism .....................................................................................................................62
CHAPTER FIVE .......................................................................................................................................67
5.0 CONCLUSION AND POLICY RECOMMENDATION .....................................................................67
  5.1 Summary and Conclusion ................................................................................................................67
  5.2 Policy Recommendation ................................................................................................................68
  5.3 Limitations of the study ..................................................................................................................69
  5.4 Areas for further research .................................................................................................................69
APPENDICES .........................................................................................................................................70
  APPENDIX I: RELEVANT SECONDARY DATA ON PRICING OF PARKS IN KENYA ..................70
  APPENDIX II: DEMAND FUNCTIONS AND THE RAMSEY PRICING RULE ..............................72
  APPENDIX III: SURVEY INSTRUMENT ..........................................................................................77
This study undertook an analysis of factors determining recreational demand for Kenya’s National Parks with Lake Nakuru National Park (LNNP) as a case study. This was conducted through a two step regression process culminating into development of a pricing strategy for the park. In the first step, count data models were used to estimate the demand function to LNNP for international and domestic visitors. The main factors determining international visitation included: travel costs, age of respondent, education level, nature of the trip (either as a package or individual) and the size of the tour party accompanying the visitor. For the domestic visitors, visitation was determined by travel costs, personal income, age of the visitor, and occupation of the respondent.

In the second part, the count data models were used to predict the number of visitation as travel cost was varied with increase in the gate fee. This simulated data was used to obtain a second step regression and estimation of demand curves for LNNP by both the international and domestic visitors. The demand curves were inverted and used for a pricing strategy that could ensure that the prices are set in a way that fully recovers the cost of supplying the tourism product by LNNP.

The findings indicate that the current price set-up at LNNP of Ksh. 7,050 for international visitors and Ksh. 500 for domestic visitors was in fact cost recovery. However, there is greater scope to raise more revenue from an increase in entry fees. For international visitors, the study recommends that KWS could experiment with a price increase of between Ksh. 10,000 to Ksh. 50,000 per visitation. This price increase will yield total revenue of Ksh. 5.8 billion and still maintain high level of international visitation days (124,000). For domestic visitors, the revenue maximizing price is Ksh. 4,000.00 that yields total revenue of Ksh.350 million. However, KWS could experiment with prices of between Ksh. 1,000 and Ksh. 2,000 for domestic visitors and yield total revenue of between Ksh. 182 million and Ksh.293 million from this group. A price increase to Ksh. 2,000 would reduce visitation from the current 87,294 to an estimated 65,000 which remains high for domestic visitation.
List of Tables

Table 1  : Relative impact of increase in adult park fee on visitation.........................7
Table 2a : Definition of variables and summary statistics for international visitors......43
Table 2b : Definition of variables and summary statistics for domestic visitors............44
Table 3a : Regression results for international visitors....................................................50
Table 3b : Regression results for domestic visitors..........................................................54
Table 4a : Marginal effects after Poisson for international visitors......................................57
Table 4b : Marginal effects after Negative binomial for domestic visitors........................59
Table A1 : Annual visitation days to LNNP in 2010..............................................................71
Table A2 : Simulated visitation days for second step regression.........................................71
List of Figures

Figure 1 : Trends in revenue and expenditure over the last 5 financial years.................4
Figure 2 : Trends in adult park entry fee, 1990 – 2011.....................................................5
Figure 3 : Solutions for pricing use of National parks for recreation..................................14
Figure 4 : Distribution of international visitation.............................................................45
Figure 5 : Distribution of domestic visitation.................................................................46
Figure 6a : Relationship between entry fee, total revenue and domestic visitation...........64
Figure 6b : Relationship between entry fee, total revenue and international visitation.....65
Figure A1 : Visitation to six major parks, 2007-2010.........................................................70
Figure A2 : Trends in foreign adult entry fee (US$)...........................................................70
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVM</td>
<td>Contingent Valuation Method</td>
<td></td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
<td></td>
</tr>
<tr>
<td>GoK</td>
<td>Government of Kenya</td>
<td></td>
</tr>
<tr>
<td>ITCM</td>
<td>Individual Travel Cost Method</td>
<td></td>
</tr>
<tr>
<td>KWS</td>
<td>Kenya Wildlife Service</td>
<td></td>
</tr>
<tr>
<td>LNNP</td>
<td>Lake Nakuru National Park</td>
<td></td>
</tr>
<tr>
<td>NBT</td>
<td>Nature Based Tourism</td>
<td></td>
</tr>
<tr>
<td>PAWS</td>
<td>Protected Areas Wildlife Service</td>
<td></td>
</tr>
<tr>
<td>TCM</td>
<td>Travel Cost Method</td>
<td></td>
</tr>
<tr>
<td>TGF</td>
<td>Trip Generating Function</td>
<td></td>
</tr>
<tr>
<td>WTP</td>
<td>Willingness to Pay</td>
<td></td>
</tr>
<tr>
<td>ZTCM</td>
<td>Zonal Travel Cost Method</td>
<td></td>
</tr>
</tbody>
</table>
CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Tourism occupies a special and important position in Kenya’s National Development Strategy as anchored in the Vision 2030 and the first Medium Term Plan for 2008-2012. It is one of the six key sectors identified in the economic pillar that will catapult the growth rate in Kenya’s Gross Domestic Product (GDP) from 5.6 percent in 2010 to 10 per cent for the period between 2012 and 2030 to attain the Vision’s goal. The contribution from tourism is contingent to “polishing of the Gem” through new products development and preservation of wildlife and nature resources (World Bank, 2010).

Currently, tourism generates approximately 21 percent of Kenya’s total foreign exchange earnings. It accounts for about 12 percent of Kenya’s GDP and employs at least 9 percent of Kenya’s formal sector workforce (GoK, 2007; GoK, 2010). Vision 2030 aims to increase tourism’s contribution to GDP to more than Ksh. 200 billion and increase international arrivals to 3 million by 2012 while expanding hotel beds capacity from 40,000 to at least 65,000 (GOK, 2007).

Kenya’s protected areas are the backbone of Kenya’s tourism industry. They account for up to 90 per cent of nature based tourism and about 75 per cent of total tourism earnings (KWS, 2008c). Most protected areas were established after the 1933 resolutions of the second international Conference on Wildlife Conservation held in London (Nyeki, 1993). During that Conference, it was found necessary to establish and maintain permanent system of national parks to manage declining wildlife numbers. Nairobi and Tsavo National Parks were established in 1946 and 1948 as the first protected areas under the National Park Ordinance of 1945. This Act

---

1 The Kenya Vision 2030 aims to transform Kenya into a newly industrialising “middle-income country providing high quality life to its citizens by 2030” (GoK, 2007)

2 A protected area is “an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means” (World Resources 2000-2001, Technical notes, p 3)

The above nature resources and wildlife assets are under the stewardship of the Kenya wildlife Service (KWS). The agency was legally established in 1989 through an Act of Parliament, CAP 376 as an autonomous institution with the core mandate of conserving and managing all of Kenya’s protected areas. It also controls over 125 game stations outside protected areas (KWS, 2008c). However, the quality and quantity of these endowments is being threatened by general environmental degradation from increasing human population and settlement, invasive cultivation, low funding from Government and insufficient investment in tourism product development (World Bank, 2010).

In many countries, the increasing demand for land, alternative commercial exploitation and in general the decline in government subvention has forced decision makers to explore financial and economic rationale to preserve nature resources and wildlife (Becker, 2007; Alpizar, 2006; Walpole et al., 2001; Emerton, 1998; Moran, 1994). In Kenya, pressure on wildlife and their habitats are rising rapidly due to encroaching human population and intensified resource extraction, changes in land tenure, land fragmentation, agricultural expansion, and greater awareness of property rights (GoK, 2005).

Consequently, managers of protected areas in Kenya are under obligation to translate the economic benefits of those areas into financial benefits, especially to the communities neighbouring those areas. This is critical because these communities incur the most sacrifice in foregone opportunities for alternative land use by giving up their land for conservation (Walpole et al., 2001). In addition, since agents respond to incentives, gains from conservation should
provide real benefits to the local community for them to value and protect the wildlife heritage as a sustainable source of income. Receipts from nature based tourism should act as stimulus to stakeholders in choosing between desires to pursue alternative commercial exploitation of land and preservation of some carrying capacity for wildlife (Mendes, 2003).

Literature in this area indicates that visitors to protected areas are not only willing to pay for the enjoyment of parks (use value) but also for non-use values such as bequest, option and existence values (Walpole et al., 2001; Moran, 1994). Economic valuation of recreational parks has granted decision makers a clear picture on both direct and indirect values of protected areas (Walpole et al., 2001; Chase et al., 1998; Moran, 1994). However, economic valuation alone does not deal with the challenge of cost recovery and in particular, budgetary constraints faced by park managers in their operations (Becker, 2007). The solution to this critical policy issue is the development of an optimal pricing mechanism that ensures that at least cost for the supply of tourism product is fully recovered.

1.2 Pricing National Parks in Kenya

The importance of park pricing in Kenya has been recognized for some time. For example, Moran (1994) noted that pricing was a major impediment to growth of the tourism sector in Kenya (Moran, 1994). The pricing strategy used by KWS does not necessarily reflect the cost of supplying the tourism product and revenue maximization is not the primary objective of conservation. It is not surprising therefore, that Moran (1994) concluded that the park entry revenue generated was not even enough to off-set costs related to the supply of the tourism product.

Although Kenya has the best tourist products and infrastructure in East Africa to deserve the tag the true safari destination of the ‘Big Five’, it remains the cheapest destination (KWS, 2008b). For instance, until recently, foreign tourists were paying US$100 to climb Mt. Kilimanjaro, in Tanzania compared to US$20 paid for climbing Mt. Kenya yet the latter is more challenging. On the other hand, Rwanda charges US$1,000 per foreign visitor for an hour’s viewing of gorillas, while Kenya charges a flat rate of US$ 60 as gate fee to her major National Parks during

---

9 In 2011 the price paid to climb Mt. Kenya was increased to US$ 50 per day for international visitors
normal season and US$75 during peak season to Lake Nakuru National Park and Amboseli. The recent trend in revenues and expenditures of KWS suggest that the institution is financially constrained in its attempts to “polish the Gem” i.e. developing the main product of tourism in Kenya.

Figure 1 shows that internally generated revenue increased from Ksh. 1,423.90 million in 2004/05 to Ksh. 2,553.80 million in 2006/07 before plummeting to Ksh. 1,930 million in 2007/08 on account of both internal and external shocks experienced in 2008. Over the same horizon, operating expenses grew faster from Ksh. 2,181 million in 2004/05 to Ksh. 3,417 million in 2006/07 and increased to Ksh. 3,699.70 million in 2007/08. Government (GoK) and donor grants have stabilized at approximately Ksh. 1,000 million for the last five years. The net deficit for the financial year 2007/08 and 2008/09 stood at Ksh. 782 million and Ksh. 517.60 million, respectively.

A financially constrained KWS finds it difficult to improve personnel welfare and to boost their morale and vigour for service delivery. Upgrading of infrastructure in the parks is delayed and the replenishment of the park rangers has been weak. The latter, jeopardizes both the security of visitors at the parks and policing against poaching of wildlife. These shortcomings have major

---

Source: KWS Audited Accounts (2007; 2010)

Internal shocks include post election violence while external shocks pertain to global financial and economic crisis
impact on conservation and tourism industry as a whole. It is believed that optimal pricing of parks will bridge this revenue shortfall and strengthen the park manager’s financial position.

KWS administers a tariff system established largely through consultations and bargaining with the industry stakeholders. The current tariff has provision for park entry, special activities within the park such as game drive, mountain climbing and hiring of guides. Park entry fee accounts for over 90 percent of internally generated revenue (KWS, 2009). The prices are structured to take into account park categorization, as well as visitor differentiation. However, the prices were developed without a formal methodology and they have been reviewed four times since 1996 through stakeholder consultations and in comparison with prices charged for similar products elsewhere (KWS, 2009). Figure 2 shows changes in adult visitor’s park entry fees for the period, April 1990 to July 2011 for international (foreign) visitors, residents (Non-Kenyan) and Citizens (Kenyan Nationals). From April 1995, the entry fees for resident category were revised to double that of citizens.

Figure 2: Trends in adult park entry fee, 1990 - 2011

![Graph showing trends in adult park entry fee](image)

Source: GoK, Kenya Subsidiary Legislations on park prices (1990-2011)

Park entry fee since April 1990 do not exhibit significant variation. It can be seen that international (foreign) park entry fees remained unaltered for the period between 1996 and 2003 (a total of seven years) and when it finally varied it was by a small margin of Ksh. 227. Various
forms of differentiation of park entry fee have been applied. These include: differentiation by individual visitors, differentiation by volume of visitors, and differentiation by sites with some parks being designated premium parks\textsuperscript{5}. Differentiation by individuals is the earliest form of pricing structure applied by KWS. Since 1990, residents and non-residents visitors have been charged different entry fee. Students and children have also been paying relatively lower entry fee.

In December 1990, the entry fee for international (foreign) visitors increased by 10% from Ksh.200 to Ksh. 220, while for residents and citizens, the prices increased from Ksh. 40 to Ksh. 45 (12.5%). The prices were again raised in December 1991 following recommendation of the Policy Framework and Development Programme (KWS, 1990). As a result, the foreign adult fees more than doubled while the resident adult fees increased by 22 percent. In December 1992, all fees increased by about 20 percent, resulting in foreign and resident fees of Ksh. 540 and Ksh. 65 respectively.

A mid-year fee adjustment for international visitors was instituted in May 1993 increasing the foreign adult fees by 67 percent from Ksh. 540 to Ksh. 900. In December 1993, entry fees for adult residents and citizens were again adjusted upwards by about 54 percent from Ksh. 65 to Ksh. 100. This was also the first time that KWS announced its entry fees for foreign visitors in US dollars, i.e. US$ 20 for adults and US$ 2 for children (GoK, 1993). This step was taken primarily as a result of deteriorating Kenya shilling exchange rate against the US dollar. Park entry fees remained unchanged for 1994 and 1995.

In 1995 Hoff and Overgaards developed the Tourism Development Policy and Pricing (KWS, 1995) under a donor funded project for Protected Areas Wildlife Service (PAWS). The report indicated that in general, KWS self generated revenue had increased from Ksh. 159 million in the financial year 1990/91 to Ksh. 730 million in 1993/1994 as a result of increased entry fees. Revenue from park entry fees accounted for about 90 per cent of total self-generated revenue, while revenue from other user charges such as fees for vehicles, camping site, and hire of park guides accounted for approximately 4 per cent of internally generated revenue.

\textsuperscript{5} Currently, Amboseli National Park, and Lake Nakuru National Park are designated premium parks.
Furthermore, up to 85 per cent of park entry revenues were only from six of KWS’ total managed national parks and national reserves. These are: Lake Nakuru National Park, Tsavo East, Amboseli, Tsavo West, Nairobi and Aberdare (Salient). The recommendations in the report led to implementation of differential pricing system based on categorization of national parks in respect of their attributes such as: development potential, encouraging high volume of visitors, quality of game viewing, and environmental consideration.

As a result, in January 1996, the prices were revised upward by 35 percent for foreign visitors to US$ 27 and up to 150 percent for citizens, i.e. from Ksh. 100 to Ksh. 250. Parks were categorized depending on their attributes and assigned different prices (GoK, 1996). These fees were maintained for the subsequent seven years until 2003 when new prices came into force. Table 1 shows the relative impact of price changes to park visitation:

Table 1: Relative impact of increases in adult park fees on park visitation
1993-2009

<table>
<thead>
<tr>
<th>Visitors</th>
<th></th>
<th>% increase in price</th>
<th>% change in visitation</th>
<th>% increase in price</th>
<th>% change in visitation</th>
<th>% increase in price</th>
<th>% change in visitation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreigners</td>
<td>20</td>
<td>14.7</td>
<td>104</td>
<td>6.8</td>
<td>35</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td>Citizens</td>
<td>18</td>
<td>2.7</td>
<td>54</td>
<td>11</td>
<td>150</td>
<td>100</td>
<td>47</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>17.4</td>
<td>-4.2</td>
<td>-1.9</td>
<td>73</td>
<td>8</td>
<td>109</td>
</tr>
</tbody>
</table>

Notes:
(a) Data on visitation is available from KWS annual publications and the Economic Survey
(b) Data on park fees is published in the Kenya subsidiary legislation gazette every year

The relative impact of increases in park prices on park visitation to six of KWS’ major parks for the period 1992 to 2009 appears mixed. It can be noted that in 1997 park visitations by international (foreign) visitors declined by 2 percent while that of citizens declined by 17 percent following a price increase. However, these declines were related to general decline in international visitation as a result of the general election held in that year and not on the price increase undertaken in 1996 (GoK, 1998). Similarly, park visitation by citizens greatly suffered
from the internal anxiety related to the general elections in 1997. The year 2009 may be viewed as a recovery year following the near collapse of the tourism sector in 2008 as a result of post election violence and the global financial and economic crisis.

From table 1, the relationship between prices increase and visitation to premium parks is not clear. Furthermore, there is no significant variation in the park entry prices. Changes in actual prices are not sufficient to allow estimation of direct demand function for park visitation in Kenya. The price adjustments have been gradual and stepwise, while visitation has been seasonal and fluctuating depending on various factors, both external and internal (see figure A3 in the Appendix I).

An understanding of the revenue generation capacity of Kenya’s national parks through park entry fees is important as the park manager seeks to mobilize revenue effort that at least covers the cost of supplying the tourism product. Financial self sufficiency remains a key strategic objective for KWS as enshrined in its Strategic Plan for 2008 – 2012 (KWS, 2008c). With sufficient revenue, KWS will expand its product offering and investment in park infrastructure to guarantee better tourism experience to current and future visitors. The strategic importance of tourism sector in the delivery of the vision 2030 is waning unless measures to mobilize sufficient revenue for the park manager are identified. This will enable continued investment into park development and passing on the benefits to the local communities, who are the owners of land in which wildlife resides.

1.3 Problem Statement

KWS faces financial constraints (i.e. there is a substantial gap between revenue and expenditures) in execution of its mandate of protecting and conserving of Kenya’s wildlife assets. The operational costs are rising and so is the cost to financing programmes that are beneficial to the land owners who incur the most sacrifice in terms of foregone opportunities in alternative land use. There is also a need to develop new recreational facilities to enhance recreation in both the developed and undeveloped parks if tourism sector is to attain the target it set itself in the context of the Kenya Vision 2030 (World Bank, 2010).

Park entry fees to National Parks accounts for up to 90 percent of internally generated revenue (KWS, 2009) while user charges and lodge leases accounts for the balance. Park entry fee
remains the most significant revenue handle that KWS can exploit to attain financial self sufficiency. There may be scope for this under optimal pricing strategy by KWS.

To operationalise optimal pricing, KWS requires information on demand from the various category of visitors to her parks, estimates of consumer surplus, information on cost of supplying recreational service and the carrying capacity of the parks (since congestion is undesirable for both the visitors and for conservation goals). Information on the cost of supply recreation services is partly available. However, the other pieces of information are lacking for most of KWS parks, including Lake Nakuru National Park (LNNP).

LNNP is currently the most visited National Park by both local and international visitors. It registered a total of 198,474 foreign visits out of 839,587 visits registered in the six major parks for the year ending 2010, which was a slight increase of 1.2 percent from 196,066 visits recorded in 2009 (see Appendix I). As such, the entry fee to LNNP matter in terms of revenue mobilization for the KWS. Charging an appropriate price for LNNP that at least ensures cost for the supply of wildlife product is recovered is an important policy objective (KWS, 2008c).

1.4 Objective of the Study

The broad objective of this study was to determine the appropriate park prices for Lake Nakuru National Park by examining the demand schedules of the various visitor categories to the park. Specifically, the study sought to:

1. examine the factors determining park demand for international (foreign) and domestic (national) visitors;
2. derive the demand schedules for the two category of visitors to Lake Nakuru National Park;
3. determine the appropriate price to be charged to each category of visitors to at least yield cost recovery revenue level for the park manager; and
4. provide policy recommendation for park pricing.

---

Social costs are not easily quantifiable and are therefore not available
1.5 Justification of the Study

Knowledge of the factors determining demand for recreational services is important for purpose of setting park entry fee that at least ensures full recovery of the cost of supplying the tourism product in parks. It is also important for effective management of visitation to ensure that the carrying capacity of the parks is not exceeded and for tourism product development for better recreational experience.

Recreational parks such as Lake Nakuru National Park are under intense pressure from critics and governments to justify their economic and financial benefits to all stakeholders and especially for communities living around parks. In addition, lack of sufficient funding from the government leaves the operations of the park managers constrained and development of recreational sites lagging. This state of affairs has led to deterioration of tourism product with the Kenyan tourism product being described as tired and outdated by a recent World Bank Report (World Bank, 2010).

The results of this study can be used by park managers in setting fees that yield sufficient revenue for their operation of LNNP. Such a fee can also send a positive signal for conservation of wildlife and nature resources at LNNP to all stakeholders.

A pricing strategy based on the results of this study provides justification for development of recreational parks as viable and invaluable to society. Optimal pricing would generate sufficient revenues to support community development programmes, mainstream their participation in economic development, and by extension the attainment of the Vision 2030. It will also serve as a source of funds for investment and development of tourism product.

In the review of literature on recreational demand in Kenya conducted for this study, it emerged that most studies in this area were on economic valuation of National Parks (Emerton, 1998; Emerton, 1999; Navrud and Mungatana, 1994; Moran, 1994) and were not up to date with the recent developments. Only Abala (1987) addressed the issue of park pricing based on analysis of willingness to pay for recreational services provided by Nairobi National Park. The current

---

7 Given the recent achievements in economic growth and per capita income, we expected an increase in willingness to pay and visitation patterns, especially for domestic visitors
study provided the most comprehensive analysis of factors determining individual demand for recreational services in LNNP by both the international and domestic visitors.

This study extends the literature on park pricing in Kenya through adoption of the individual travel cost method and use of count data models in the estimation of the trip generating function. To our knowledge, this is the first application of count data models to the analysis of demand for recreation in Kenya.

1.6 Scope of the study

The study examined the factors determining demand for recreational services provided by Lake Nakuru National Park, derived the various demand schedules and interacted the same with the cost of supplying the wildlife product to derive an optimal pricing for the park. Actual cost information related to the supply of tourism services over the last two years was obtained from KWS. However, quantification of positive and negative spillover effects of visitation was not considered in this study.

The study restricted itself to revenue mobilization through park entry fees paid by adult international (foreign) and Kenyan citizens (nationals) visitors. Park entry fees constitute almost 90 per cent of KWS internally generated revenue (KWS, 2008c). Revenue mobilization through other methods such as user charges for services inside parks, accommodation, car parking, game drive, guides lodges and others that accounts for the balance of KWS internally generated revenue were not considered. Non- Kenyan resident visitors were also not considered in this study because they account for a small portion of visitors to Kenya’s National Parks. For example, in 2006, out of 990,678 visitation days to Kenya’s six major parks, non- Kenyan residents registered 40,973 visits (or 4.1 percent), while in 2010, the category recorded 52,801 visits out of 83,9587 (or 6.2 percent) visitation days recorded. Thus, the current trend of having this category of visitors pay twice what the Kenyan (nationals) visitors are paying was upheld.

In the absence of sufficient price variations to enable estimation of a direct demand function, this study adopted a valuation method known as travel cost method (TCM) to derive individual demand functions for LNNP. In those cases where direct demand information is not available,
the most common method for estimating the demand for recreation sites is the TCM (Alpizar, 2006).

1.7 Organisation of the Paper

The remainder of the research paper is organized as follows: The review of theoretical and empirical literature on park pricing is presented in chapter two. The theoretical model and the empirical approach (specification of the model, valuation method, estimation procedure, and data requirements) are presented in chapter three. Chapter four presents and discusses the econometric results. Estimates of consumer surplus and park prices are also presented. Finally, chapter five concludes and offers policy recommendations on park pricing.
2.1 Introduction

This chapter presents a review of theoretical and empirical literature on recreational demand both from a global perspective and narrowing down into country specific studies. Recreation is an ordinary good and the laws of demand are found to hold. In the empirical literature most research work has chosen among the linear, log-linear, semi-log and double log models to estimate the demand function for recreation. More recently, count data models have become popular.

2.2 Theoretical Literature Review

From a theoretical perspective, efficiency in pricing of a good including nature reserve requires equality between marginal cost and marginal benefit (Musgrave and Musgrave, 1984). However, since marginal cost is often less than the average cost in such public goods, it creates a problem of cost recovery. Thus the pricing of public goods such as parks will tend to deviate from the first best equilibrium conditions\(^8\) achievable within the Paretian context (Wilman, 1988).

The Pareto optimal conditions are attained when it is not possible to satisfy one person without hurting the welfare of another. The first best equilibrium results, when all the Pareto conditions are satisfied. However, once there is added a constraint that makes at least one of the Pareto conditions not to be fulfilled, such as a cost recovery constraint, then a second best equilibrium is achievable only by deviating away from the first best equilibrium (Lipsey and Lancaster, 1956).

The difference between a first best and the second best equilibrium is as follows: in a first best world the government can ensure by an appropriate policy choice that all the Pareto conditions are satisfied. A second best world is one in which this is not possible and some distortions are irremovable and only a sub-set of the Pareto conditions can, by the very nature of the situation,\(^8\) The first best equilibrium conditions occurs when Marginal cost = marginal revenue =price (i.e. consumer surplus =producer surplus =zero)
be satisfied through an appropriately chosen government intervention. An irremovable distortion in this study was the cost recovery requirement by the park manager.

According to Laarman and Gregersen (1996) pricing entrance fees to parks is dependent upon what one wants to achieve. While allowing free entrance may appear to maximize social benefit (or may be most appealing to society at large), it ignores the issue of cost recovery. However, maximization of revenue at the other end of the spectrum is unjustifiable as a sole target. The gap and alternatives between these two extremes can be significant.

Provision of park services by the private sector would naturally evolve into a monopoly pricing that sets prices greater than the marginal cost and only supply (or allow visitation) to the point where marginal cost equals marginal revenue. However, in the case of a state owned agency such as KWS, this is not the only consideration. Even if perfect competition ruled the market, KWS would still need to finance the fixed costs for the supply of the wildlife product. This may require distorted prices, which is an additional constraint that makes the first best equilibrium not viable (Wilman, 1988). An illustration of the pricing of a public good, such as national park is provided in figure 3 as adopted from Mendes (2003).

**Figure 3: Solutions for pricing the use of National Parks for recreation**

![Diagram](https://example.com/diagram.png)

Source: Mendes (2003) (p.15)
Figure 3 depicts a recreation site with rising recreation supply marginal costs (MgC) and whose average total cost (ATC) (i.e. total cost divided by the number of visits) is declining under the demand curve. The solution that corresponds to the optimum from the efficiency point of view is given when recreation price $P_c$ is set equal to the MgC and the quantity $V_c$ is sold. Hence, net economic benefit (consumer/producer surpluses) will be maximised because the price of purchasing the right of using the national park is set equal to the cost society bears with its production, at the margin. However, the national park will experience a loss equal to the area $\text{dbcp}_c$. This means that some additional financial resources have to be collected from another source to subsidise the loss and this may penalise non-users of the national park (Mendes, 2003).

A second-best pricing policy may be an efficient alternative to first-best policy. Price will be set equal to the average total costs and $V_a$ units sold at price $p_a$, so that total revenue will be equal to the total cost i.e. area $0p_aV_a$. With this second-best solution the national park requires no subsidy because it able to break-even. However this is not an efficient solution because the visitation level $V_a$, is too little relative to the efficient level $V_c$, and the entry fees (price) of transaction is higher than the efficient one. The total loss incurred by society from adopting the inefficient solution is equal to the area $\text{iac}$ and corresponds to the deadweight loss borne by society.

Ramsey (1927) provided a solution to this problem. Ramsey pricing is a theory of pricing for goods provided by the public sector, or by natural monopolies regulated by the public sector, under a budget constraint. In the case where the long run average cost curve for the supply of a good is decreasing over the range of supply levels demanded, marginal pricing will be incompatible with the budget constraint (Wilman, 1988). The general proposition of Ramsey pricing is that prices should be raised above marginal cost to satisfy the budget constraint, and that the prices of goods (or category of visitors) with the most inelastic demands should be raised the most above marginal costs. Ramsey demonstrated a second best pricing rule that achieves cost recovery at a minimum deadweight loss. This requires setting the prices of the two categories of visitors to a National Park in an inverse relation to their price elasticity.
Ramsey pricing is applicable in a number of pricing alternatives found in the literature such as average cost pricing, differential pricing and profit maximization pricing. It is also applicable in form of a two part pricing. The latter means marginal cost pricing for units of the good purchased, combined with a one-time fee for the right to purchase units of the good at marginal cost (Wilman, 1988). In the case of national parks, it means a fee for the right to visit a national park and a marginal cost price per visit. Finally, Ramsey pricing can allow cost sharing across a multiple user groups as well as maximization of revenue from parks that is sufficient to cater for costs of improving other parks that may be undeveloped-cross subsidization (Becker, 2007).

The challenge to application of the Ramsey rule is its dependence on the consumer preferences revealed through the market. An analyst requires enough information from the market on prices and visitation levels to be able to estimate the demand elasticities. However, only a few of the benefits of protected areas to society, including ecological processes, biodiversity, and ethical, cultural, and future existence values, can be exchanged in the market (Walpole et al., 2001). In the absence of enough information on variation of prices to enable estimation of direct demand curves for park visitation to Lake Nakuru National Park, the empirical application of this study relies on travel cost approach, where cost of visitation is used as a proxy for the park entry fee variations. Literature supports this approach as the best input to estimation of demand curves and associated price elasticities (Alpizar, 2006).

2.3 Empirical Literature Review

There is a growing body of literature concerning pricing of parks and other nature sites both in the developed and developing countries. We focused more on studies done in the developing countries before zeroing into those specific to Kenya.

In the developed countries, research in this area is well advanced. Herath (2004), examined issues surrounding entrance fees as a sustainable mechanism for financing natural areas in Australia. He found that the value of visiting 5 parks in Australia was significantly larger than the allocated budget: a value of Aus$. 1.3 billion. This was contrasted with an allocated budget of Aus$ 48.7 million of which revenues from entrance fees were only Aus$ 4.1 million.
The study noted that the government encouraged user fees primarily to generate revenue, yet they covered only a small percentage of management expenses. The study criticizes the way in which user fees were being determined without the application of market mechanisms and bore no relationship to either supply or demand. According to the study, user fees raise unresolved equity concerns, but equity is a matter of personal and philosophical values. The study argues that economists can suggest ways of achieving efficiency and describe equity considerations, but ultimately what is fair must be determined by a political process.

Laarman and Gregersen (1996) undertook a study on pricing policy in nature-based tourism. The authors argue that pricing and revenue allocation in nature-based tourism (NBT) are seriously neglected in public policy, especially for the many governments around the world struggling with fiscal problems. They sought to address three key objectives: to review the economist’s concept of willingness to pay as a basis for NBT pricing; to examine administrative criteria in NBT pricing from the perspective of a government agency; and to discuss the elements of success in NBT pricing at policy and project levels. The issues of multiple pricing objectives, visitor categories, visitor activities, fee instruments, and philosophical positions were examined in relation to improving pricing practices.

Glassman and Rao (2011) in their study on Maine Island Trail Association, sought to evaluate the economic impact that Maine Island Trail provides to its various stakeholders. The study used individual travel cost method to model demand for trail using visitors travel costs to the trail as a surrogate admission price.

Using a negative binomial functional form, the study estimated a demand function containing the number of trips in 2010 against travel costs, income level, trip duration and year of birth as regressors. The coefficient on travel cost is negative (-0.00353) demonstrating that users visit fewer times as the travel cost increases and this is significant at 5 percent. The constant alpha is highly significant; indicating that over-dispersion in the sample was significant and concluded that the negative binomial model was appropriate.
The regression result was used to estimate the consumer surplus, by taking negative reciprocal of the regression coefficient on travel cost. The authors calculated a consumer surplus per person per trip of $283.29. To calculate the aggregate annual consumer surplus, the authors used 2002-2010 season logbook data, which provided the number of group trips and average group size to estimate the annual visitation rate of 11,385 person’s trips. The annual consumer surplus is calculated as $3.23 million.

Within the developing countries, Alpizar (2006) proposed an optimal pricing model of recreation in protected areas. The objective of the study was to obtain optimal prices for foreign and national visitors to the Costa Rican System of Protected areas. The empirical application entailed estimation of the demand of foreign visitors for recreation day visits as a function of the entrance fees using actual prices and monthly visitation days to the parks. According to the author,

“...given the reduced availability of public funds, user fees for recreation in protected areas are an increasingly relevant source of funds to a park agency. A well designed system of fees can make these areas more financially self-sufficient...” (p. 295).

Using a log-linear demand function, the study estimated the demand of foreign visitors for recreational day park visitation as a function of the entrance fee. It is noted in the study that Costa Rica is one of the few countries where entrance fees had changed several times, which provided enough information to estimate the demand for protected areas. In those cases where direct demand information on price variations is not available, like was the case in our study, the author advises analysts to use indirect methods of estimating demand for recreational services as a function of visitation costs (or the travel cost method). Additional variables to capture monthly international arrivals to Costa Rica and seasonal dummies were included as explanatory variables to the model. Information on marginal cost and fixed cost is also required to derive an optimal price. Finally, to account for distributional fairness, the study assigned different welfare weights to the consumer surplus of different groups of visitors.

The findings indicated that the optimal price for foreign visitors ranged from US$10 per day visit for the case of zero marginal costs to US$15 for the case of marginal cost equal to US$4.
The study had hypothesized that only if the profits from the foreign tourists group did not cover the fixed costs, will the price to nationals deviate from the marginal cost pricing. It was found that the price for nationals should follow the first best optimal marginal cost pricing rule.

The issue that remained unaddressed in this study is the quantification of external costs and the social benefits attributed to tourism. The study assumes that the external costs and the social benefits exactly offset each other for a positive spill over from tourism activities. This aspect remains a challenge in many empirical applications. The study did not also account for substitution effects of demand for park visitation. Also, the assumption of all parks as a single composite product may not be relevant to a system of parks with different attributes and attractions as is the case in Kenya. These simplifying assumptions may require further inquiry.

Finally, the study emphasises the importance of the foreign visitors and the need to set an appropriate price for this category and accords the domestic category low priority. As noted by Walpole et al. (2001) tourism is unstable source of revenue, particularly when it is wholly dependent on foreign tourists. Foreign tourism is vulnerable to health scare, political development, terrorism threat, business cycles among others. A policy to enhance domestic visitation and an appropriate price for this category is also important.

Chase et al. (1998) developed a framework for analyzing the impact of increasing entrance fees on visitation of three popular national parks in Costa Rica, namely: Manuel Antonio, Volcan Poas and Volcan Irazu. Primary data was collected using contingent behaviour analysis\textsuperscript{9} to generate experimental data to assess the effects of differential pricing on visitation. The data provided information to allow estimation of own and cross price elasticities of demand. The author argued that these represented improvement of methodology since now prices of complement and substitute parks were able to be incorporated in the estimation of demand functions, solving one of the biggest weaknesses of contingent valuation method (CVM) studies.

\textsuperscript{9} Similar to Contingent Valuation Method (CVM) but is modified to capture how a change in entrance fees to one park affects the visitation pattern to that park and substitute parks
The visitation demand elasticities estimated at the three parks were found to be quite different, demonstrating the heterogeneity characterizing both tourist behaviour and park attraction and amenities. Alpizar (2006) had assumed that all park systems form a composite product and charges similar price. The estimated cross price elasticity showed that substitutability in visitation demand existed between parks with similar attributes. In such cases, differential pricing could effectively push tourists from one park to another, which may be desirable in cases where there is need to decongest a crowded park.

The study findings indicated that the willingness to pay high prices for the three most popular parks in Costa Rica ranged between US$21 and US$ 25. In addition the study calculated a revenue maximizing fee that ranged between US$7 and US$13 for the three parks. Other important findings of the study were on the effect of income to visitation demand. The study had apriori, judged the variable’s effect as uncertain. This is because foreign tourists had already arrived in Costa Rica after incurring high travel costs to get there and at the point of deciding on which park to visit, they were simply deciding based on price margin. However, it was found that income influenced the length of stay in a park.

Mendes (2003) investigated the extent to which one could affirm that pricing the visitors of a protected area is or is not efficient and equitable way of generating income and of improving nature conservation. Using the travel cost method approach; the study estimated the maximum willingness to pay for a day’s visit by an adult Portuguese to Peneda Geres National Park (a local national park) at 1.33 Euros. According to the study, there are two preconditions to efficient pricing of recreation parks. These are: the marginal costs (usually operational costs strictly related to recreation demand, congestion and environmental depletion costs) must be positive and decreasing over the relevant range of the demand schedule and the cost of price administration should not be high. However, the study could not ascertain the recreation supply cost. Information from park managers and visitors to the park had indicated that recreation demand at the park sometimes exceeded its carrying capacity. This was used to imply the presence of both congestion and environmental depletion costs associated with recreation visits.
The study estimated a Marshallian demand curve for the park as a function of entrance fee, visitor’s per capita income, time available for recreation, visitor’s age, and visitor’s education level and the degree of perception of the quality and environmental amenities of the park. Entry fee contained two recreation costs, namely: travel costs (plus opportunity cost of time spent travelling), onsite recreation costs, including opportunity cost of time spent during on site stay. The opportunity cost was captured through assumption of percentage of per capita income lost as a result of foregone time for labour. This ranged between 0 and 50 percent.

After various specifications and model tests, the semi-log model was picked as the best to explain the behaviour of visitation—measured in the number of days stayed in the park. The regression results found that a unit increase in entrance fee reduced the number of days spent on a site recreation by 0.243 (minimum) to 0.496 (maximum), assuming a 33 and 50 percent level of opportunity cost of time, respectively. The demand for visitation is not sensitive to increase in income variation (not statistically significant). The latter results seem to contradict the findings by Chase et al. (1998) who found that although income did not influence choice of park to visit, it influenced the duration of stay in the three popular parks in Costa Rica.

The other variables also had the expected sign. Time available to spend in recreation had a positive and significant relationship with visitation demand. The visitor’s age in years had a negative and significant relationship with visitation. The younger the visitor, the greater is his preference of staying longer in the park. Finally, education in years had positive relationship with visitation.

On pricing, the study adopted setting of entrance fee equal to the visitor’s reservation price per day of visit. This price, however, did not guarantee that visitors will fully pay for costs of supplying recreation services. What it guaranteed, was that visitors will pay a fee equal to their maximum willingness to pay for the right of visiting the park. This could be taken to imply that the author advocates for retention of crucial second source of financing for the recreation supply, perhaps through government subvention. In the words of the author,
"...since the park manager did not define the limit over which a marginal visitor will turn positive marginal recreation costs, under these circumstances the only way to estimate a fee is to set it equal to the marginal net benefit of a recreation visit. This fee may not be economically efficient and revenue may not cover entirely the cost strictly related with the visits but it will be fair from the social point of view..." (p. 23).

Finally, prices are a powerful rationing tool that policy makers should be aware of. The park analysed by the author faced uneven recreational demand with extremely high numbers over summer and almost none in the rest of the year. It is suspected that over peak periods the level of congestion and environmental depletion costs is very high. The study called for differentiation pricing based on peaks, with entry price being charged during the peak period and no price in the rest of the year.

Walpole et al. (2001) investigated the pricing policy for tourism in protected areas in Indonesia. Using a case study of Komodo National Park, the study sought to examine the extent to which ecotourism offset the costs of protected areas. In addition, the study examined the likely negative impact of a large fees increase on visitor numbers and the resultant impact on the local economy of the population living around the park.

The authors used a dichotomous choice contingent valuation approach\textsuperscript{10} to examine the effect of a hypothetical rises in entrance fees on visitation and revenue generation from visitors to Komodo National Park. A hypothetical demand curve was constructed from willingness to pay results. A log-linear demand curve was fitted for the observed data. Results from the study indicated a high willingness to pay, some of which could be captured with higher entrance fees. Based on available cost data the study found that although only 6.9 percent of park management costs were recovered from tourism receipts, visitors were willing to pay over ten times the entrance fee, which indicated a substantial potential for increasing revenue mobilization.

\textsuperscript{10} Respondents were first asked how a specific increase in entrance fee would affect their decision to visit the park. Depending on their answer, they were then asked how higher or lower increases would affect them.
A hypothetical raise in the entry fee to US$ 4 would result in a proportionate decrease in visitation by 20 percent. The revealed median (50%) willingness to pay was estimated at US$ 9.73, while the average willingness to pay was found to be US$11.70. Revenue maximization entrance fee was found to be US$13.54, which was 15 times the fee of 1996. It was also found that at the average entrance fee of US$11.70, revenue mobilization increased by 587 percent. This revenue level would cater for up to 40.6 percent of total cost of park management but will result into a serious decline in visitation levels by over 62.2 percent. A fall on visitation will negatively affect the livelihood of the surrounding community.

The extent to which increase in revenue can be pursued with an adjustment in entry fees upward is limited by visitors’ response to increase in fees. This meant, therefore, that total cost recovery through internally generated revenue was unlikely for Komodo National Park. This conclusion, although discouraging was arrived based on the policy objective the authors set to achieve. They aimed for a pricing strategy that will increase internally generated revenue, without at the same time resulting into a large fall in visitation, since a large fall in visitation would negatively impact the economy of the local community surrounding the park.

Tourism related costs were estimated as a proportion of total recurrent expenditure and the findings indicated that the costs were fully offset by the tourist revenue. This is quite insightful, in cases where it is not possible to isolate the marginal cost from the fixed cost, as is the case in our study. The study argues that tourism receipts should not necessarily offset the total cost of park management but only the tourism related costs.

A number of valuation studies and park pricing have also been conducted in Kenya (Abala, 1987; Moran, 1994; Navrud and Mungatana, 1994; Emerton, 1998; and Emerton, 1999). Abala (1987) examined the factors that influence willingness to pay for Nairobi National Park services with a view to suggesting appropriate pricing policies for national parks and services.

Using a contingent valuation approach, the study elicited information on willingness to pay from a sample of 333 citizens and non-Kenyan resident visitors to Nairobi National Park. Willingness to pay was estimated as a function of both socio-economic characteristics of visitors, as well as
the attributes of the park. Assessment of interaction between quantitative and qualitative variables was also undertaken. A log-linear model was adopted for the estimation purpose, where willingness to pay (WTP) was the dependent variable and was measured through a series of questions on what visitors expected to see and the level of satisfaction expected. Visitors were asked to quote their willingness to pay based on their expectations. The same question was repeated after the visit to gauge whether there was a change in willingness to pay.

The findings indicated that the average park user's willingness to pay for the park services in 1983 based on their expectations (before the visit) was Ksh. 76.30. The maximum willingness to pay stood at Ksh. 500 with the minimum at Ksh. 15. The average willingness to pay over and above what they had actually paid and given that the visit had been successful (after the visit) was estimated at Ksh. 84.40. In order to forgo all future trips to Nairobi National Park, the park users on average wanted Ksh. 28,479 as compensation or willingness to accept change. The maximum willingness to accept (to forgo all future trips) was Ksh. 900,000. In addition, before the visit, park users were on average willing to pay Ksh. 985.75 to prevent the park from being turned into other uses. However, after the visit, the average willingness to pay to prevent the change in use increased to Ksh. 4,168. This indicated the huge value that users accorded Nairobi National Park.

On the regression results, income had a positive and significant impact on willingness to pay. The coefficient on income variable was 0.323 and was statistically significant at 1 percent. Low level of education was found to have a negative effect to willingness to pay, while a high level of education had a positive effect. The cost of travel, distance travelled and travel times were found to have a negative impact on willingness to pay. A dummy variable for congestion (encounter with other persons =1, and 0 otherwise) indicated that congestion had a negative effect on willingness to pay.

Based on the above results, the study recommended a price increase from Ksh. 30 per adult visitor to Ksh. 84. It observed that gate fees could be doubled without decrease in visitation. The study also recommended that the prices for seasonal tickets should be raised to reflect true value of park services. Emerging from the relationship between income and willingness to pay, the
study projected an increase in visitation as per capita income increased and alerted the park
managers to take measures to expand the parks and develop new products to pre-empt
congestion.

Moran (1994) used a contingent valuation survey of expressed preference to estimate the
consumer surplus attached to current non-consumptive use of protected areas by foreign visitors
at $450 million per annum. This sum alone was more than double the best available estimate of
opportunity cost of land and appeared to justify the use of it for conservation and management of
wildlife. The estimate was additional to financial returns from tourism and made no allowance
for other direct and indirect benefits and potential returns from consumptive uses. Measured
consumer surplus contained some margin of willingness to pay that could be captured through
the then fee structure. Moreover, the study noted that park fees represented the most accessible
market mechanism to finance revenue sharing and additional park investment before potential
recourse to emerging global market institutions.

The study used a double bounded dichotomous Contingent Valuation Method with a follow up
lower or higher offers in response to the initial offer. A total of 311 usable responses were
obtained and the dependent variable provided a binary variable modeled in respect of the bid
amount plus other explanatory variables. The maximum likelihood estimator was obtained
through estimation of a logit model. In terms of pricing policy recommendation, the study
suggested that KWS could experiment with a margin of between the then fee of $15 and $85 and
proposed that future research should attempt to determine elasticity of demand.

Navrud and Mungatana (1994), used travel cost and contingent valuation surveys of both
residents (Kenyan) and non-residents visitors to estimate the recreational use value of Lake
Nakuru National Park and flamingo viewing. The survey instrument was administered to a
sample size of 185 visitors, where 127 were non-residents and 58 were residents.

The model used included travel costs to the park, travel costs to the substitute parks, household
income and socio-economic characteristics such as age, number of persons travelling with and
education levels. Separate demand functions for residents and non-residents were estimated
using both the zonal and individual travel cost methods. Zones were defined depending on the travel cost to Kenya. The study also took into account the opportunity cost of time taken to travel to Kenya, whose value was estimated at 30 percent of hourly wage rate (calculated as annual reported personal income divided by 250 eight hour days). Only round trip travel time was used to estimate the opportunity cost. On-site opportunity cost of time was not included.

The finding of the study showed that the travel cost method estimate of annual recreation value were higher than the contingent valuation approach estimates. By taking the estimate from each method to bound the value, they arrived at an annual recreational use value of wildlife estimated at US$ 7.5 to US$ 15 million in 1991. They also found that in both methods, non-residents had a higher recreational value than residents. They concluded that, demand for recreation in Kenya by non-residents was price inelastic. To account for substitute sites, respondents were required to list other sites that could be substituted for Lake Nakuru National Park and the associated travel costs. Travel costs to substitute sites did not have a significant effect on visitation.

This study seemed to have covered comprehensively the demand side of park visitation, including estimation of demand functions and derivation of consumer surplus. The only area that received less attention was the cost of supplying the wildlife product. The need to bring into afore the financial challenges facing the park managers in providing recreational services is critical for sustainable conservation and wildlife management. While it is possible to arrive at a price from the demand side, to know whether such a price is a cost recovery price or revenue maximizing, an analyst must consider the cost information. Like many other studies, the estimation of environmental and ecological costs associated with high visitation to the park remained unaddressed. Furthermore, the per capita income of local visitors has grown over time and we expect to find a change in the visitation patterns and a re-estimation of the elasticities of demand to the park is necessary.

Emerton (1998) sought to describe a range of financial innovations which were being developed in Kenya with the aim of raising and allocating public revenues and private profits in order to ensure that wildlife is better conserved. The study noted that ongoing policy reforms recognised that other groups than the state had the potential and the right to share in the financial benefit of
wildlife. This recognition was manifested in a number of innovations in private sector wildlife management including the formation of landholder wildlife management groups, the establishment of privately and communally run wildlife reserves and the development of wildlife utilisation enterprises.

The study brings out the estimated economic value of wildlife to the Kenyan economy at some US$ 250 million (or Ksh. 20 billion). Above all, the study underscores the fact that wildlife does not only generate a flow of economic benefits to Kenya, but also give rise to significant public and private costs. The costs of wildlife conservation to the Kenyan government are considerable - direct expenditures required to manage the national wildlife estate were in excess of US$ 25 million by the time of the study. The economic costs imposed by wildlife on landholders were even higher and more wide-ranging. In addition, the opportunity costs of wildlife conservation to the Kenyan national economy - the alternative land and resource use opportunities precluded by maintaining wildlife population - were substantial at over US$ 200 million a year.

Emerton (1999) examined the financing and management of Kisite Marine National Park and Mpunguti Marine National Reserve through partnership with stakeholders. The study quantified the direct and indirect benefit of the two protected areas at Ksh. 145 million a year. This amount excluded non-monetary value such as ecosystem, biodiversity support, nutrient cycle and carbon sequestration.

On the economic costs associated with the maintenance of the two parks, annual expenditure in excess of Ksh. 1.23 million were incurred by KWS, to maintain the parks and their associated staff, equipments and infrastructure. In addition, the opportunity costs incurred by the local communities because fishing and marine resources utilization activities were prohibited, were estimated at Ksh. 11 million per year. In general, the two parks gave rise to a net economic benefit at the park level. It also generated national and global environmental benefits, which together, provided a major justification for the marine protected areas. Other issues addressed in the study were the imbalance in the distribution of costs and benefits between different stakeholder groups and inequitable distribution of benefits.
2.4 Overview of the Literature

There exist both economic and social arguments in favour of pricing of parks and against its pricing. The following are the reasons for those in favour of pricing: first, the user pays principle should be applied to protected areas use. According to Mendes (2003), by making those who directly benefit from the use of the protected areas to pay for it, we are applying the user-pays principle that implies that the cost of marketed goods and services should reflect their full social cost.

Second, there is limited government revenue against a myriad of public expenditure needs, which requires prioritization of allocation of resources to those sectors that will yield high social benefits, such as education sector, health sector and infrastructure. As a result, allocation to parks development receives less consideration. Charging entry prices is a fair way to raise needed revenue to meet the operational costs of parks (Alpizar, 2006; Herath, 2004; Walpole et al., 2001; Moran, 1994).

Third, the role of price as a rationing tool is critical. Park managers should ensure that parks carrying capacity is not exceeded by rationing the number of visitors into a park through pricing. Too many visitors can be a burden to the carrying capacity and cripple the park’s ability to regenerate. Congestion can also be a burden to the social carrying capacity of the park and create disturbance to other visitors. Demand for congested parks will eventually drop as non-rivalry in consumption no longer exist (Mendes, 2003; Sibley, 2001; Chase et al., 1998). Hence, some demand rationing is necessary when there is a limit to capacity use, and an admission fee must be charged till the moment visitors are reduced to levels that does not impose congestion costs.

Those against pricing of parks argue that national parks are public goods. Nature belongs to everyone and therefore there is no reason to price it. Theoretically, a public good is a good which is characterized by non excludability and non-rivalry in consumption. Non excludability arises due to inability to exclude one from its consumption because the cost for doing so will be so high if not entirely impossible. Non-rivalry in consumption arises from the fact that one person’s consumption does not reduce the amount available for another person’s consumption. Since
marginal cost for an additional user of a public good is zero, then the use of parks should not bear any price. Further, they argue that pricing will alienate the low income persons from enjoying their God given rights to nature resources (Cockrell and Wellman, 1985).

In absence of direct demand information, the most common method for estimating the demand for recreation sites is the Travel Cost Method (TCM) (Alpizar, 2006; Mendes, 2003; Becker, 2007). However, the application of TCM is limited to local visitors where multiple visits is not possible. This dilemma can be circumvented as follows: by restricting ourselves to individual tourists who are aware of the incurred travel expense and the park-entry fee paid, for multiple visitations, individuals will be required to declare time spent in the park of interest as a proportion of the entire time spent for a vacation in the various parks in Kenya.

Another useful method is the Contingent Valuation Method (CVM) that relies on stated preferences for recreation sites (Walpole et al., 2001). Majority of studies that considers both foreign and domestic visitors to a park have used CVM approach to calculate the willingness to pay (Walpole et al., 2001; Chase et al., 1998; Moran, 1994; Abala, 1987). Throughout the review, the conclusion is that there was a high willingness to pay for parks recreational services which can be potentially captured to increase internally generated revenue through entry fees (Walpole et al., 2001; Moran, 1994; Abala, 1987). The impact of increase in entry fees is a decline in level of visitation in events where the elasticity of demand is elastic and this may have a negative effect on the livelihood of the local community that depend on tourism activities (Walpole et al., 2001). But according to Mitchell and Carson (1989), a CVM study is a valuation study and should not be used for pricing policy decision.

This study used the individual travel cost method to derive the demand curves for park visitation at Lake Nakuru National Park. This information, together with cost information obtained from the park manager enabled us to derive the optimal price to be charged different categories of visitors to Lake Nakuru National park to yield, at least cost recovery revenue for the park manager.
CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

Under this chapter, the economic problem facing the park manager is presented in the theoretical framework. The empirical framework is also outlined. It also discusses the travel cost valuation method, including the challenges involved and suggestions for circumventing them. Finally, the description of the study site, the survey used and estimation procedures for demand functions is presented.

3.2 Theoretical Framework

Following and building on the work by Alpizar (2006), the study defined the problem of a welfare maximizing park manager seeking to determine optimal prices to charge various categories of visitors to her park given a cost recovery constraint, as well as ecological and economic spill over impacts. The distribution of welfare among visitors is exogenous to this study as it involves political and philosophical debate left out for another study. According to Herath (2004) economists can suggest ways of achieving efficiency and describe equity considerations but ultimately what is fair must be determined by a political process. Of importance therefore in this study was the maximization of total welfare from park visitation.

Consider an aggregate demand functions for j categories of visitors to the park. The demand functions are assumed to be independent so that the park manager can exercise price discrimination among the various categories. The inverse aggregate demand function for each visitor category is given by:

\[ P_j = P_j(Q_j) \]

\[ \text{for } j = 1, 2, \ldots, n \text{ category of visitors} \]

and the total revenue to the park manager is given by:

\[ R(Q_1, \ldots, Q_n) = P_1(Q_1)Q_1 + \ldots + P_n(Q_n)Q_n \]

\[ \text{...........................} \]

\[ \text{...........................} \]

\[ \text{(2)} \]

30
Where: \( P_j \) is the park entry price for the \( j = 1, 2, \ldots, n \) categories of visitors

\[ Q_j \] is the quantity of visitation by the \( j = 1, 2, \ldots, n \) category of visitors.

We also assume that the cost of supplying the tourism recreation services is strongly additive and includes variable and fixed costs such that:

\[ C = P_C(Q_1, \ldots, Q_n) + I \]

Where: \( C \) is cost of supplying tourism product and includes variable costs \( P_C(.) \) and a fixed cost \( I \).

The social costs/benefits\(^{11}\) associated with visitation are represented by \( A \). \( A \) is the net of negative ecological costs \( g \) and positive spillover effects of tourism \( T \).

\[ A = -g(Q_1, \ldots, Q_n) + T(Q_1, \ldots, Q_n) \]

The park manager wishes to choose the level of visitation so as to maximize social welfare\(^{12}\) and faces the following constrained maximization problem:

\[ \text{Max} \quad W = \sum_{j=1}^{n} \int P_j(Q_1, \ldots, Q_n) \delta Q + P_j(Q_j)Q_j - P_C(Q_1, \ldots, Q_n) - I + A \]

\[ \text{st:} \]

\[ P_1 Q_1 + \ldots + P_n Q_n = P_C(Q_1, \ldots, Q_n) + I \]

and \( Q_1, \ldots, Q_n > 0 \)

i.e. subject to the constraint that revenue exactly equals costs (or that a profit is a given constant) and that visitation levels remains positive. The study assumed \( Q_j = q_j \) and \( j = 1, 2, \ldots, n \) for ease of manipulation. \( q_j \) just like \( Q_j \) is the quantity of visitation by \( j = 1, 2, \ldots, n \) category of visitors.

---

\(^{11}\) Social costs are not obvious; they include environmental degradation, soil erosion, animal stress and social stress to the communities surrounding parks. Social benefits include creation of jobs, entrepreneurship and better lives to people around the park.

\(^{12}\) Social welfare is defined as the consumer and producer surplus.
The solution to the constrained welfare maximization problem is found by introduction of a Lagrangian multiplier $\lambda$ to equation (5) and solving to derive the optimal pricing rule for each of the category of visitors to the park (detailed derivation in the Appendix II). The lagrangian function becomes:

$$L = SB(q_1, ..., q_n) - SC(q_1, ..., q_n) - \lambda \left[ \sum_{j=1}^{n} P_j q_j - PC(q_1, ..., q_n) - l \right] \cdots (6)$$

Where: $SB(.)$ and $SC(.)$ are respectively social benefit and social variable cost functions, 

$q_j$ are the quantity of visits from the various category of visitors to the park;

$PC(.)$ is the private variable cost function and $l$ is the fixed cost; and

$\lambda$ is the lagrangian multiplier (the shadow price of the budget constraint).

The first-order conditions are in the general form as follows:

$$\frac{\partial L}{\partial P_i} = 0 = \sum_j P_j \frac{\partial q_j}{\partial P_i} - \sum_j \frac{\partial SC}{\partial q_j} \frac{\partial q_j}{\partial P_i} + \lambda \left[ q_j - \sum_j P_j \frac{\partial q_j}{\partial P_i} - \sum_j \frac{\partial PC}{\partial q_j} \frac{\partial q_j}{\partial P_i} \right] \cdots (7)$$

$$\frac{\partial L}{\partial \lambda} = 0 = \sum_{j=1}^{n} P_j q_j - PC(q_1, ..., q_n) - l \cdots \cdots \cdots \cdots \cdots \cdots \cdots (8)$$

i.e. the budget constraint must be maintained and $P_i$ is the individual prices paid by a visitor to the park.

Equation (7) can be re-written as:

$$0 = \sum_j P_j \frac{\partial q_j}{\partial P_i} - \sum_j MSC_j \frac{\partial q_j}{\partial P_i} + \lambda \left[ q_j - \sum_j P_j \frac{\partial q_j}{\partial P_i} - \sum_j MPC_j \frac{\partial q_j}{\partial P_i} \right] \cdots (9)$$

Collecting like terms and rewriting (9) into elasticities form, we obtain:

$$0 = \sum_j (P_j - MSC_j) E_j \frac{q_j}{P_i} + \lambda \left[ \sum_j (P_j - MPC_j) E_j \frac{q_j}{P_i} + q_j \right] \cdots \cdots (10)$$
$E_{ji}$ is the uncompensated cross price elasticity of demand for visitation by the $j=1,2,\ldots,n$ category of visitors with respect to prices of substitute parks. In the case of no externalities; then, $MSC_j = MPC_j$ (this is also assumed in the empirical application of this study\(^{13}\)) and equation (10) is reduced to:

$$\frac{-\lambda}{(1 + \lambda)} q_j = \sum_j (P_j - MPC_j)E_{ji} \frac{q_j}{P_i} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (11)$$

For a specific park, such as LNNP we modified (11) by taking all $j \neq i$ to the LHS to obtain the optimal pricing rule:

$$\frac{-\lambda}{(1 + \lambda)} q_j = \sum_j (P_j - MPC_j)E_{ji} \frac{q_j}{P_i} = \sum_j \frac{P_j - MPC_j}{P_i} E_{ji} \frac{q_j}{P_i} \ldots \ldots \ldots \ldots \ldots \ldots \ldots (12)$$

$$\frac{P_i - MPC_i}{P_i} = \frac{-\lambda}{(1 + \lambda)} E_{ii} - \sum_j \frac{P_j - MPC_j}{P_j} E_{ji} \frac{q_j}{P_i} \ldots \ldots \ldots \ldots \ldots \ldots \ldots (13)$$

Assuming cross price elasticity is zero, then $E_{ji} = 0$ and (13) reduces to:

$$\frac{P_i - MPC_i}{P_i} = \frac{-\lambda}{(1 + \lambda)} E_{ii} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (14)$$

Equation (14) is the inverse elasticity price setting rule proposed by Ramsey (1927). This states that the mark-up over private marginal cost varies inversely with the demand elasticity of the park. $\lambda$ tells us how much social welfare will increase when the revenue constraint is eased by one unit. If we let $k = \frac{\lambda}{(1 - \lambda)} = 1$, this condition is the standard monopoly price-discrimination condition.

Assuming that the park is able to exercise third degree discrimination against the category of visitors received and that each category of visitors has its own demand schedule, equation (14) can be written out for the two main visitor categories (international (foreign (f)) and domestic (d) (national) visitors) as follows:

---

\(^{13}\)This study does not estimate external costs and benefits. We assume that external benefits exceed external costs.

33
Equation (15) and (16) is the Ramsey pricing rule for foreign and domestic visitors, respectively. Dividing equation (15) by equation (16), we obtain the third degree discrimination rule to be pursued by the park manager as follows:

\[
\frac{P_f - MPC_f}{P_f} = \frac{-\lambda}{(1 + \lambda)} \frac{1}{E_f} \quad \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldot
The main input to estimation of the model described above is information on prices and park visitation by both the international (foreign) and domestic visitors for recreational day visits to Lake Nakuru National Park. An estimate of marginal costs and fixed costs is also required to be able to derive the optimal prices for the park as can be seen from equation (17). However, estimation of the demand function is limited by lack of enough variations in the park entry prices overtime, as was indicated earlier. To circumvent this problem, an individual Travel Cost Method (TCM) was used to estimate the demand schedules for foreign and domestic tourists to the park.

3.3.2. Travel Cost Model

Travel Cost Method (TCM) was first developed by Hotelling in 1940s as a valuation tool for recreational parks (Becker et al., 2005). In cases where there is no enough information to enable estimation of direct demand functions, like is the case in this study, the Travel Cost Method (TCM) can be estimated (Alpizar, 2006; Mendes, 2003) as an input to the model above. TCM relies on the assumption that although access to natural recreation attractions such as parks usually has a minimum or non-explicit price, individual travel costs proxy the surrogate price for the tourist experience. Visitors respond to changes in travel cost as they would respond to changes in park entry fees, thus the number of visits to a park is expected to decrease as travel costs increases.

The demand for a park is estimated by determining the change in visits as the cost per visit is changed. Visits are recorded for each cost of visiting and are plotted on a price-quantity space to derive a hypothetical demand curve for the park. The data set can be used to estimate a trip-generating equation such that visits to a recreational park depend on among other things, the costs of using the facility. These costs are the sum of the costs of getting to the recreation site and the costs of using it once there. The estimated marginal response rate of visits to such costs

\[ P = \text{a vector of park entry fees to the park and substitute parks;} \]
\[ M = \text{park visitors personal income} \]
\[ Z = \text{a vector of socio-economic characteristics and park attributes.} \]
is then used, along with hypothetical increases in the direct cost of use, to simulate a demand curve for the recreational park.

There are two forms of TCM: the Zonal Travel Cost Method (ZTCM) and the Individual Travel Cost Method (ITCM). In the ZTCM, concentric zones are defined around a site such that the cost of travel from all points in a given zone is approximately constant. Visitors to the park are grouped according to their zone of origin. By comparing the cost of coming from a zone with the number of people who come from it and the population of that zone, one can plot a point for each zone. A function can then be fitted to generate the distance-visit function $V_h/N_h=f(C_h,X_h)$, where $V_h=$number of visits from zone $h$, $N_h=$population of zone $h$, $C_h=$travel cost from zone $h$, and $X_h=$a vector of socio-economic variables (Becker et al., 2005).

Socio-economic variables such as education and income are used to control for other motivation to visit the site. However, if these characteristics are the same over all zones then a hypothetical price rise will affect visitation only through the cost component and its associated coefficient. This function can be used to calculate the effect of raising the price on the total number of visits. By repeatedly raising the price, the demand function to the site can be obtained.

The ZTCM method is easy to apply, however, it has been criticized for its weak linkage with theory as it does not examine and account for individual behavior. Furthermore, socio-economic variables such as education, age, size of tour party and incomes are aggregated for the region with potential loss of accuracy. Visits are also assumed to be homogeneous and lasting for same duration. But we are aware that visits are non-homogeneous most of the times. In fact, visitors from a substantial longer distance may spend more time in the park than people living around the park (Mendes, 2003).

Due to the above weaknesses, this study used the individual travel cost method (ITCM) to value Lake Nakuru National Park. The ITCM is similar to ZTCM only that it collects information regarding individual visitor rather than a zone. Thus the ITCM derives consumer surplus from the individual visitors instead of average visitation from a zone as in the traditional ZTCM. The ITCM was specified as follows:
\[ V_j = V(C_j, Y_j, S_j, Z_j, Q_j) \]  \text{ ............................................... (19) }

Where:

- \( V_j \) = number of visitation days to the park for the last one year;
- \( C_j \) = is the sum of park entry fee (\( P \)), Airfare/road fare (\( T_c \)), opportunity cost of time spent traveling and time spent at the onsite recreation (\( T_e \));
- \( Y_j \) = is visitor’s annual personal income;
- \( S_j \) = a vector of travel costs to substitute parks (sum of park entry fee, air/road fare, opportunity cost of time).
- \( Z_j \) = a vector of individual socio-economic characteristics such as, age, years of education, persons travelling with and Occupation; and
- \( Q_j \) = captures the degree of the quality of recreational experience (amenities, quality of wildlife viewing, perception of congestion).

The advantage with ITCM is its ability to preserve the heterogeneity of the visitor’s travel costs and of visitors themselves (Glassman and Rao, 2011). Furthermore, use of individual observation rather than aggregating into concentric zones results into high efficiency of estimates and reduces inter- correlation (Brown and Nawas, 1973).

However, this study also acknowledges that there exists two main weaknesses of TCM, namely: presence of multiple visit objectives among respondents, especially for international (foreign) visitors and estimation of the opportunity cost of time spent travelling to the site and time spent while onsite for recreational experience. This study followed a procedure by Becker (2007) to deal with the first weakness by controlling for multi-site visitation by asking the respondents to indicate how many other parks they have visited or will visit during their trip. In addition, we obtained information on the days to be spent at LNNP and the number of days to be spent for the entire trip to Kenya. This information was useful in obtaining the proportion of total travel cost attributed to LNNP.

The opportunity cost of time spent travelling to the park and the time spent at the onsite experience is the wages foregone. This was assumed to be fraction of the hourly wage rate of the
respondent if employed (or personal income reported). The respondent was requested to give his personal annual income. This information was used to calculate the hourly wage rate by dividing the annual personal income reported by 250 eight hour working days (Navrud and Mungatana, 1994). To obtain the opportunity cost, the conventional practice in the literature is to use between 25 and 50 percent of hourly wage rate as cost due to recreational experience (Becker, 2007; Mendes, 2003; Navrud and Mungatana, 1994; Cesario, 1978). This study used 30 percent of the hourly wage rate as a proxy for the opportunity cost of time spent travelling and on-site stay.

3.3.3 Description of the Study Area

Lake Nakuru National Park (LNNP) is located approximately 156 kilometers North-West of Nairobi, the capital city of the Republic of Kenya. It is only 4 kilometer drive from Nakuru town, which is the hub of economic and administrative activities for the Rift Valley province. The park covers an area equivalent to 188 square kilometers, including a lake which supports over 1.3 million flamingoes. The lake water supports a dense bloom of the blue green cyanophyte Spirulina Platensis, which is fodder to the flamingoes. The lake is fringed by alkaline swamps with areas of Sedge, Cyprus Laevigatus and Typha marsh along the river inflows and springs (KWS, Website accessed on 25th June 2011).

The vegetation is mainly wooded and bushy grassland with wide ecological diversity. It has about 550 different plant species, including the unique and biggest euphorbia forest in Africa, picturesque landscape and yellow acacia woodlands. The park is home to over 450 species of birds, with flamingo concentration being the highest within the region and over 56 species of mammals such as white rhino, buffalo, lion, giraffe, Zebra, eland and waterbucks. It was the first black rhino rehabilitation centre and the only waterfowl habitat site in Kenya.

In terms of suitability for recreational experience, LNNP is easily accessible by road through three gates: Main, Lanet and Nderit. The park is also served by Naishi Airstrip for visitors in chartered flights and the roads inside the park are in good condition that facilitates easy access. Accommodation facilities are available from two highly rated resorts: Lake Nakuru Lodge and Sarova Lion Hill Lodge. There exists campsite for both special and public use, such as Naishi,
Chui, rhino, Soysambu, Makalia and Backpackers. Game viewing has been enhanced through creation of excellent viewpoints such as Lion Hill, Baboon Cliff and Out of Africa.

Lake Nakuru is the favourite destination among Kenya’s six major parks (see Appendix 1). It registered a total of 139,388 and 87,294 visitation days for foreign visitors and citizen visitors respectively, in 2010. In addition a total of 13,654 non Kenyan residents visited the park making the accumulated visitation for 2010 from all categories to reach 240,336 up from 197,037 recorded in 2009 (21% increase). It also accounted for approximately 27 percent of total visit days to Kenya’s six major parks, which stood at 839,587 visitation days for 2010. This information positions the park as a major revenue source for KWS.

3.3.4 Estimation Procedure

The choice of an appropriate functional form of the TCM model specified in equation 19 is important especially for derivation of demand curves and estimation of consumer surplus (Ziener, 1980). Previous studies in this area, as noted in the literature review chose from among linear, semi log, log-linear and double log forms (Navrud and Mungatana, 1994; Mendes, 2003; Alpizar, 2006; Becker, 2007). Recently, Poisson and its extended version Negative Binomial have gained popularity (Glassman and Rao, 2011; Kim et al., 2010; Becker, 2007; Dobbs, 1993).

The distribution of the dependent variable (number of visits per year) played a critical role in the model used for this study. As noted earlier the distribution of the dependent variable for both the international and domestic visitors is typical of count data variables such as the number of visits to a dentist per year, the number of visit to a super market per week, and the classical example of the number of arrests per year given in Wooldridge (2002) just to name a few.

Application of linear regression model (OLS) naturally is the beginning for most analysts. However, for count data the normality assumption for linear regression is violated and prediction of negative visits to LNNP is possible. Wooldridge (2002) (chap 17, pg.547) motivates the unsuitability of OLS to model this kind of count variable,

".....the normality assumption is reasonable for (roughly) continuous dependent variable that takes on a large range of values. A count variable cannot have a normal distribution and if it
takes on very few values, the distribution can be very different from normal. Instead, the nominal distribution for count data is the Poisson distribution...” (p.547).

Poisson and negative binomial functional forms are well suited for the estimation of ITCM trip generating functions given the non-negative, integer nature of the dependent variable. Three functional forms for the trip generation function (TGF) for both the international and domestic visitors were estimated. They included: linear (OLS), Poisson and Negative Binomial models.

3.3.5 The data

Two sets of data were required to operationalise the park pricing model, namely: survey data to enable us estimate the demand functions for the park and secondary data on variable costs and fixed cost used to supply recreation services at LNNP.

Survey data

To estimate the demand function, an individual travel cost questionnaire was administered to collect data on the number of visits for the last one year per individual visitor (respondent) (see Appendix III). We also collected information on travel cost of the visit including the opportunity cost of time spent travelling to the site and time spent at the park, personal annual income, socio-demographic characteristics among others from a sample of international (foreign) and domestic (national) visitors.

On-site random sampling was conducted from 29th June 2011 to 21st July 2011. The enumerators (three in number), had been carefully selected and trained to ensure as much as possible that they do not bias the study. They were instructed to interview only one randomly selected visitor in a group of visitors. Once a group arrived in a tour van, the enumerator approached the driver to introduce the purpose of the survey and request that the selected visitor in the tour party responds to the survey instrument. After the driver had given consent the enumerator proceeded to administer the questionnaire (Appendix III) to the selected respondent. In addition, we ensured that the individual was an adult and was aware of the cost and the details of the trip before

\[\text{Tour drivers were found to be in full control of the tour experience and knew the amount of time to be spent in the park and any other destination to be visited in the tour circuit} \]
responding to the survey instrument. In cases where the visitor refused to be interviewed, the main reason cited was limitation of time at hand.

A pilot survey conducted on the 28th June 2011 had indicated that due to limited time available to visitors coupled with excitement of easy encounter with wildlife in LNNP, visitors were hardly able to spare time to respond to the survey tool while inside the park. Instead, they were engaged taking photographs and maximizing their recreation. This necessitated adjustment to an early plan to interview respondents inside the park to interviewing at the point of entry (Main Gate) and point of exit (Lanet Gate) to the park.

It took respondents at least fifteen (15) minutes to complete the survey instrument but in cases where the enumerator completed the survey tool on behalf of the respondent with the respondent only providing the required information, it took a shorter period of 10 minutes. The information collected was coded, cleaned and analysed statistically before being applied in the estimation of the demand functions. A total of 250 questionnaires were administered. Out of these, 150 questionnaires were completed for international (foreign) visitors but only 131 (87%) had complete information and were used in the analysis. For domestic tourists 100 questionnaires were completed out of which 80 (80%) had complete information for the purpose of analysis.

**Secondary data**

Information on cost was obtained from the park manager based on the accounts of the last two financial years 2008/2009 and 2009/10 (see Appendix 1). As expected, the park manager did not have information on the fixed and variable cost per visitor to the national park. There were challenges in separating expenses related to provision of recreation from those related to provision of public services such as roads, investment and community programmes. Given the challenges in being able to split the cost between the fixed and the variable costs, this study assumed for simplicity that 85 percent of the operating cost is variable costs while 15 percent is assumed to be fixed cost. We further assumed that the variable cost is met by the dominant visitor group who happens to be international visitors while the domestic visitors cater for the fixed cost.
CHAPTER FOUR

4.0 PRESENTATION AND DISCUSSION OF RESULTS

4.1 Introduction

This chapter presents the summary statistics and regression results for both international and domestic visitors followed by a discussion of the same. The coefficient on travel cost was used to estimate the consumer surplus derived by individual visitor as well as aggregate consumer surplus derived by average annual visitation by visitors to obtain the use value attributed to LNNP. Finally, the translation of the economic value into monetary and financial benefits to KWS is examined through a proposed pricing strategy.

4.2 Definition of Variables and Summary Statistics

Tables 2a and 2b provide definition and summary statistics of the variables used in the analysis for both international and domestic (national) visitors:
<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visitation</td>
<td>Number of visits to LNNP over the last one year</td>
<td>1.44</td>
<td>1.00</td>
<td>11</td>
</tr>
<tr>
<td>Travel cost to LNNP</td>
<td>Travel cost to LNNP in Kenya shilling</td>
<td>57,428.98</td>
<td>11,863.65</td>
<td>514,081.00</td>
</tr>
<tr>
<td>Annual personal income</td>
<td>Annual personal income in Kenya shilling</td>
<td>7,746,541.00</td>
<td>818,253.00</td>
<td>66,500,000.00</td>
</tr>
<tr>
<td>Education</td>
<td>Years of formal education</td>
<td>15.53</td>
<td>8.00</td>
<td>16</td>
</tr>
<tr>
<td>Education Squared</td>
<td>Squared years of formal education</td>
<td>243.00</td>
<td>64.00</td>
<td>256</td>
</tr>
<tr>
<td>Nature of Trip</td>
<td>Dummy=1 if a trip is a package deal and 0 otherwise</td>
<td>0.55</td>
<td>0.00</td>
<td>1</td>
</tr>
<tr>
<td>Flight time</td>
<td>Round trip Flight time to and from Kenya</td>
<td>27.45</td>
<td>3.00</td>
<td>72</td>
</tr>
<tr>
<td>Duration in Kenya</td>
<td>Number of days spent in Kenya for the entire trip</td>
<td>13.75</td>
<td>1.00</td>
<td>90</td>
</tr>
<tr>
<td>Duration in LNNP</td>
<td>Number of days spent by a visitor in LNNP</td>
<td>1.15</td>
<td>1.00</td>
<td>3</td>
</tr>
<tr>
<td>Size of Tour Party</td>
<td>The number of other persons accompanying the respondent</td>
<td>5.14</td>
<td>0.00</td>
<td>52</td>
</tr>
<tr>
<td>Age</td>
<td>Age of respondent in years</td>
<td>42.30</td>
<td>21.00</td>
<td>77</td>
</tr>
<tr>
<td>Age Squared</td>
<td>Squared age of the respondent in years</td>
<td>1959.74</td>
<td>441.00</td>
<td>5929</td>
</tr>
<tr>
<td>Quality of Park</td>
<td>Dummy=1 if a visitor values the park more and 0 otherwise</td>
<td>0.40</td>
<td>0.00</td>
<td>1</td>
</tr>
<tr>
<td>Travel cost to Mara</td>
<td>Travel cost to Masaai Mara National Reserve in Kenya shilling</td>
<td>82,851.02</td>
<td>5,400.00</td>
<td>679,062.60</td>
</tr>
<tr>
<td>Travel cost to Samburu</td>
<td>Travel cost to Samburu National Reserve in Kenya shilling</td>
<td>14,482.94</td>
<td>5,400.00</td>
<td>190,512.00</td>
</tr>
<tr>
<td>Travel cost to Bogoria</td>
<td>Travel cost to Lake Bogoria National Reserve in Kenya shilling</td>
<td>7,184.50</td>
<td>5,400.00</td>
<td>122,301.00</td>
</tr>
</tbody>
</table>
Table 2b: Definition of Variables and Summary Statistics for domestic visitors (N= 80)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visitation</td>
<td>Number of visits to LNNP over the last one year by domestic visitors</td>
<td>2.1375</td>
<td>1</td>
<td>31</td>
</tr>
<tr>
<td>Travel Cost to LNNP</td>
<td>Travel cost to LNNP by domestic visitor in Kenya shilling</td>
<td>4,117.97</td>
<td>1,094.10</td>
<td>19,227.20</td>
</tr>
<tr>
<td>Annual Personal Income</td>
<td>Annual personal income in Kenya shilling</td>
<td>659,175.00</td>
<td>240,000.00</td>
<td>1,812,000.00</td>
</tr>
<tr>
<td>Age</td>
<td>Age of the respondent in years</td>
<td>34.4125</td>
<td>22</td>
<td>57</td>
</tr>
<tr>
<td>Age Squared</td>
<td>Squared age of the respondent in years</td>
<td>1242.088</td>
<td>484</td>
<td>3249</td>
</tr>
<tr>
<td>Education</td>
<td>Years of formal education</td>
<td>14.65</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Education Squared</td>
<td>Squared years of formal education</td>
<td>219</td>
<td>64</td>
<td>256</td>
</tr>
<tr>
<td>Duration in LNNP</td>
<td>Number of days to be spent at LNNP</td>
<td>1.075</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Travel Time to LNNP</td>
<td>Round trip travel time to LNNP</td>
<td>4.8125</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Size of Tour Party</td>
<td>The number of other persons accompanying the respondent</td>
<td>11</td>
<td>0</td>
<td>89</td>
</tr>
<tr>
<td>Employed</td>
<td>Dummy =1 if visitor is employed and 0 otherwise</td>
<td>0.625</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Self Employed</td>
<td>Dummy =1 if visitor is self-employed and 0 otherwise</td>
<td>0.3375</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Retired</td>
<td>Dummy =1 if visitor is retired and 0 otherwise</td>
<td>0.0375</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Visitation

This is the dependent variable and it captured the number of visits to LNNP for the last one year beginning July 2010 to July 2011. The number of visits is always treated as a proxy for the total time spent on the site (Dobbs, 1993) and is a discrete variable (count data). Most visitors were sure of the number of visits over the last one year. This avoided the problem of approximation and rounding off by the respondents especially in cases of repeat visits.
Beginning with the international visitation, 82 percent of the international visitors surveyed had not visited LNNP apart from the current visit. In the words of one of the international respondent,

“...safari to Africa is a once in life time experience, even if you improved the quality and product of this park, it might not affect the number of times I visit”....

From table 2a, a typical international visitor to LNNP takes on average 1.4 visits per year with the minimum recorded number of visit being 1 while the maximum being 11. The histogram (figure 4) for number of visits superimposed with a normal distribution shows the distribution of visitation that is batched around one visit and skewed to the right.

**Figure 4: Distribution of international visitation**

![Histogram showing distribution of international visitation to LNNP](image)

The above distribution is typical of count variables such as the number of visits to a park in the last one year, the number of arrests in a year, the number of visits to a dentist in a year among others. In our case, the reported number of international visits to LNNP took on relatively few values that ranged between 1 and 11.

Turning to domestic visitation (table 2b), this group takes on average 2 visits per year with the minimum visit being 1 and the maximum being 31. The distribution of visitation is also skewed
to the right (figure 5) with over 83 percent of the respondent reporting only one visit over the last one year.

**Figure 5: Distribution of domestic visitation**

![Figure 5: Distribution of domestic visitation](image)

**Travel Cost**

Travel cost was derived as the sum of the airfare or bus fare, opportunity cost of time spent travelling and staying at the park plus the gate fee paid at LNNP. The accuracy of the travel cost models depends on the precision with which one calculates the travel cost. For international visitors, the following procedure was followed to estimate the travel cost: first, respondents provided information on the total cost of a tour package or total cost for an individually arranged tour that in normal cases included air ticket, hotel reservations and other services. In addition, information on the cost of round trip air ticket (for package tours and individual tours) was gathered.

Since LNNP was only one of the many parks and other recreational activities to be enjoyed during the visit, we required a proportion of days spent at LNNP to the total days to be spent in the entire trip to Kenya. This proportion was then multiplied with the stated airfare to Kenya to obtain the airfare attributed to a visit to LNNP (see Becker, 2007 for a similar approach). The second stage involved quantification of the opportunity cost of travel and the time spent in LNNP. Respondents were asked to give the number of hours it took them to fly from their
country of origin or residence to Nairobi. Only flight time was recorded and in order to obtain roundtrip time, the reported flight time was multiplied by two. The number of hours to be spent at LNNP was also gathered from respondents.

To arrive at the valuation of opportunity cost, we calculated the wage rate per hour as the annual personal income divided by 250 eight hour working days per year (Navrud and Mungatana, 1994; Mendes, 2003). This wage rate was multiplied with the hours spent traveling and enjoying recreation at LNNP to obtain the value of the opportunity cost of the visit.

Most estimates of the opportunity cost of leisure time is as a proportion k of the wage foregone by the individual during a trip (Cesario, 1978). In this study we used 30 percent of the foregone wage as an estimate of the opportunity cost. The opportunity cost was also multiplied by the proportion of time spent at LNNP to total trip to obtain the portion attributed to LNNP. In the third stage, the gate fee to LNNP equivalent to US$75 was converted to Kenya shilling and added to obtain the travel cost estimate. Finally, we added air travel, opportunity cost, and the gate fee to obtain travel cost as one of the key explanatory variable (see equation 19, earlier specified). Travel costs for domestic visitors was estimated as the cost of fuel if self driven divided by the number of persons in the car or taken as given if the respondent paid bus fare for road transport plus opportunity cost and the gate fee for domestic visitors.

From tables 2a and 2b, the average travel cost for international and domestic visitors to LNNP was Ksh. 57,428.90 and Ksh. 4,117.95, respectively. The minimum travel cost reported by surveyed international visitors was Ksh. 11,863.70 and a maximum was Ksh.514,081 while for domestic visitors, the minimum travel cost of Ksh.1,094 was reported and the maximum of Ksh. 19,227.

**Other variables**

Information on annual personal income was obtained from both international and domestic visitors. This was given with some degree of approximation and rounding off by both groups of visitors. We are aware of the huge income dispersion and the likely inaccuracy due to approximations from respondents but it was a superior way to obtain information on income

---

15 KWS applies a more depreciated exchange rate of (Ksh.+ 5) on the market rate to shield of the impact of a stronger shilling on revenue. In this instance the exchange rate was at Ksh.94 while the market rate was Ksh. 89.93
because it retained the individual information. For domestic visitors, income information was collected in terms of monthly income groups (see Appendix III). This entailed forcing individuals into a particular income class and assigning the midpoint as the annual personal income used for the analysis. This was then multiplied by 12 months to obtain an annual personal income for the domestic visitors. From table 2a, the average annual personal income for surveyed international visitors was Ksh. 7.7 million with the minimum being Ksh. 818,253 and the maximum being Ksh. 66.5 million. The average annual personal income for the domestic visitors (table 2b) was Ksh. 659,175 with the minimum being Ksh. 240,000 and the maximum being Ksh. 1,812,000.

The age of the respondents was computed from the date of birth given (see Appendix III). From table 2a, the average age of the international visitors surveyed was 42 years, with the youngest aged 21 years and the oldest aged 77 years. The average age of surveyed domestic visitor (table 2b) was 34 years with the youngest being 22 years and the oldest being 57 years.

Years of formal education was reported in four levels, namely: primary school (8 years), high school (12 years), college (14 years), and university (16 years and above). From table 2a, the average years of formal education reported by international visitors was 15.5 years (University level) with the minimum being 8 years and the maximum of 16 years. For the domestic visitors, the average years of formal education was 14.65, with the minimum and the maximum years of education remaining same as for the international visitors.

The average length of stay in Kenya for international visitors was 14 days with the minimum being 1 day and the maximum 90 days (table 2a). Among these, an average of 1.15 days was spent at LNNP. The average round trip flight time for international visitors to Kenya from country of origin was 27.5 hours with the maximum being 72 hours. The average round trip travel time to LNNP for domestic visitors was 4.8 hours with the minimum being 1 hour and the maximum being 20 hours.

The average size of a tour party for international visitors was 5 persons with the maximum being 52 persons, while for domestic visitors, the average tour party comprised of 11 persons with the maximum of 89 persons.
Finally, travel cost to substitute and complementary parks, the study had identified Maasai Mara, Lake Bogoria, Hells Gate and Samburu as parks that could potentially act as both rival and complementary parks to LNNP. Visitors were asked if they planned to visit these parks and what the travel cost was. It turned out that of the international visitors, approximately 73% and 17% were going to visit or had actually visited Maasai Mara and Samburu, respectively. The travel cost to these parks was calculated in the same manner as already explained in the derivation of the travel cost to LNNP. From table 2a, the average travel cost by an international visitor to Maasai Mara, Lake Bogoria, and Samburu was Ksh. 82,851, Ksh. 7,184, and Ksh. 14,482, respectively. With regard to domestic visitors, a visit to LNNP was the primary purpose of visit and they were not planning to visit another park.

4.3 Regression Results

4.3.1 Presentation of results

Three functional forms for the trip generation function (TGF) for both the international and domestic visitors were estimated. They included: linear (OLS), Poisson and Negative Binomial models. The regression results are contained in tables 3a and 3b for international and domestic visitors, respectively.

Results for international visitors

We begin with the linear model in which the overall significance of the explanatory variables captured by the F-statistics equivalent to 1.5 (with P-Value of 0.1450) is generally weak. The null hypothesis that the coefficients are jointly equal to zero cannot be rejected, implying that the model provides a poor fit for data on international visitation. The explanatory power of the model captured by adjusted R square equals to 0.22.

The linear model indicates that travel cost has the expected negative sign and is statistically significant at the 90 percent level. The sign indicates that recreation demand is an ordinary good and an increase in the cost of travel leads to a decrease in the number of visits to LNNP, holding all other factors constant. Annual personal income has the expected positive sign but is not statistically significant. The sign indicates that recreation demand is a normal good. The nature of the trip captured by a dummy=1 if a trip is a package and 0 if individually arranged is
negatively related to visitation to LNNP and is statistically significant at 95 percent. The size of party accompanying the respondent is also negatively related with visitation to the park and is statistically significant at 95 percent.

As noted in chapter 3, linear model (OLS) is not appropriate because it can result into inefficient, inconsistent and biased estimates for count data (Wooldridge, 2002). It was, therefore, necessary to model the trip generating function (TGF) as Poisson. The dependent variable-visititation is not normally distributed and instead, the distribution is Poisson.

**Table 3a: Regression results for international visitors**

<table>
<thead>
<tr>
<th></th>
<th><strong>Visititation</strong></th>
<th><strong>OLS</strong></th>
<th><strong>Poisson</strong></th>
<th><strong>Negative Binomial</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Constant</strong></td>
<td>7.483**</td>
<td>3.966***</td>
<td>3.966***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.7)</td>
<td>(2.9)</td>
<td>(3.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Travel Cost to LNNP</strong></td>
<td>-0.00000036</td>
<td>-0.00000291**</td>
<td>-0.00000291*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-1.7)</td>
<td>(-2.2)</td>
<td>(-1.8)</td>
<td></td>
</tr>
<tr>
<td><strong>Annual personal income</strong></td>
<td>1.61E-08</td>
<td>1.22E-08</td>
<td>1.22E-08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.8)</td>
<td>(1.1)</td>
<td>(1.0)</td>
<td></td>
</tr>
<tr>
<td><strong>Age in Years</strong></td>
<td>-0.132</td>
<td>-0.064*</td>
<td>-0.064*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-1.4)</td>
<td>(-1.9)</td>
<td>(-1.8)</td>
<td></td>
</tr>
<tr>
<td><strong>Age Squared</strong></td>
<td>0.002</td>
<td>0.001**</td>
<td>0.001**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.5)</td>
<td>(2.3)</td>
<td>(2.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Level of Education</strong></td>
<td>-0.21</td>
<td>-0.145**</td>
<td>-0.145**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-1.7)</td>
<td>(-2.3)</td>
<td>(-2.7)</td>
<td></td>
</tr>
<tr>
<td><strong>Nature of Trip</strong></td>
<td>-0.517**</td>
<td>-0.349***</td>
<td>-0.349**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-2.4)</td>
<td>(-2.9)</td>
<td>(-2.3)</td>
<td></td>
</tr>
<tr>
<td><strong>Size of Tour Party</strong></td>
<td>-0.039**</td>
<td>-0.026***</td>
<td>-0.026**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-2.1)</td>
<td>(-2.9)</td>
<td>(-2.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Travel Cost to MaraNR</strong></td>
<td>-8.66E-07</td>
<td>-6.87E-07</td>
<td>-6.87E-07</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-0.7)</td>
<td>(-0.9)</td>
<td>(-0.7)</td>
<td></td>
</tr>
<tr>
<td><strong>Travel Cost to SambNP</strong></td>
<td>-6.37E-06</td>
<td>-4.75E-06</td>
<td>-4.75E-06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-1.4)</td>
<td>(-1.5)</td>
<td>(-1.4)</td>
<td></td>
</tr>
<tr>
<td><strong>Travel Cost to LBogNP</strong></td>
<td>6.78E-06</td>
<td>5.22E-06</td>
<td>5.22E-06</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.1)</td>
<td>(1.1)</td>
<td>(0.6)</td>
<td></td>
</tr>
<tr>
<td><strong>Quality of Park</strong></td>
<td>0.273</td>
<td>0.185</td>
<td>0.185</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.2)</td>
<td>(1.3)</td>
<td>(0.9)</td>
<td></td>
</tr>
<tr>
<td><strong>alpha((\alpha))</strong></td>
<td>NA</td>
<td>NA</td>
<td>9.82E-08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
<td>(-0.1)</td>
<td></td>
</tr>
<tr>
<td><strong>R-squared</strong></td>
<td>0.155</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td><strong>Log-Likelihood</strong></td>
<td>NA</td>
<td>-171.4</td>
<td>-171.4</td>
<td></td>
</tr>
<tr>
<td><strong>Number of Observations</strong></td>
<td>131</td>
<td>131</td>
<td>131</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

(a) Likelihood-ratio test of alpha=0: chibar2 (01) = 9.5E-07 Prob>=chibar2 = 0.500
From the Poisson model, the value of the log of Pseudo likelihood is -171.4. The estimates of the parameters are the maximum likelihood estimates and the estimation of the variance-covariance matrix of the parameters estimates. Log Pseudo likelihood can be used to compare models (Cameron and Trivedi, 1990). The Wald chi-squared statistic equivalent to 35.6 with 11 degrees of freedom for the full model is also provided. The Wald chi-square statistic tests for the null that all the estimated coefficient are equal to zero—a test for the model as a whole. From the P-value of 0.0002, the estimated Poisson model is statistically significant at 99 percent.

Like was the case with OLS, the travel cost variable in the estimated Poisson model has the expected negative sign and is statistically significant at 95 percent. Annual personal income has a positive relation with international visitation but is not statistically significant. This is in line with our apriori expectation that the variable will not be statistically significant as entry fees normally constitute a very small proportion of the international visitor’s income. Literature indicates the same findings regarding personal income and international visitation (see for example, Navrud and Mungatana, 1994; Chase, 1996; Mendes, 2003).

The age of the respondent has the expected negative sign in relation to visitation to LNNP and is statistically significant at 90 percent. This implies that younger to middle aged visitors registered low visits to LNNP as they advance in age. However, age squared has a positive relationship with visitation and is significant at 95 percent level, implying those near retirement or in retirement are likely to visit LNNP more often.

Travel cost to Maasai Mara and Samburu National Reserves have a negative relationship with visitation to LNNP but were not statistically significant. Travel cost to Lake Bogoria National Reserve had a positive relationship but not statistically significant. The travel costs to substitute parks were expected to influence the visits to LNNP, positively. Thus Lake Bogoria is a substitute park to LNNP, at least as far as viewing of flamingoes is concerned while Maasai Mara and Samburu National Reserves are complementary parks to LNNP with regard to the viewing of game. The travel costs to both the substitutes and complementary parks were
expected to be statistically insignificant since we do not expect to have a perfect substitute or a perfect complement for recreational experience at LNNP (Navrud and Mungatana, 1994).

Education in years has a negative relation with visitation to LNNP and is statistically significant at 99 percent. The result is contrary to our expectation that the higher the level of formal education the higher the likelihood of taking a visit to LNNP for recreation. This could be explained by limited variation in the stated level of education. Most respondents indicated they had university education.

The size of the tour party had a negative and statistically significant relationship with visitation to LNNP. Where the decision to visit a park is group based (package) the likelihood of visiting LNNP is small among many recreation sites in a package. Finally, the quality of recreation at LNNP, captured through dummy = 1 if the visitor values visitation to LNNP highly and 0 if otherwise, was positively related with visitation but was not statistically significant.

Test for Over-Dispersion

Poisson functional form is a natural first step for count data models (Winkelmann and Zimmermann, 1998). However it has been heavily criticized for being too restrictive. Particularly, the implicit assumption in the model that the variance of the dependent variable is equal to its mean, a condition that rarely holds because of event occurrence dependence or due to unobserved heterogeneity. There are various tests for over dispersion in the standard Poisson model (Cameron and Trivedi, 1990). This study uses the nested test for over-dispersion within the negative binomial regression model.

The negative binomial regression is often used instead of the standard Poisson whenever the variance of the dependent variable is significantly greater than the mean- i.e. in presence of over-dispersion (Greene, 2002, chap.21, p. 743). The regression output has a nested test for over-dispersion through a constant alpha (α). We used the t-statistic to test for the null hypothesis of no over dispersion against the alternative of over dispersion. From our negative binomial regression (table 3a), the estimated implicit variance term of the multiplicative heterogeneity (constant alpha) is about 9.82x10^-8. Looking at the P-Values of 0.500, the null hypothesis that alpha=0 cannot be rejected and conclude that the variance of the dependent variable is not
statistically different from the mean. This implies that over-dispersion in the sample of international visitors is not significant so the standard Poisson form is appropriate.

**Results for domestic visitors**

Turning to domestic visitors, the results from three functional forms, namely linear, Poisson and negative binomial are presented in table 3b. We begin with the linear form in which the overall significance of the explanatory variables captured by the F-Statistics equivalent to 0.99 (with a P-value of 0.4531) is generally weak. The null hypothesis that the coefficients are jointly equal to zero cannot be rejected, implying the functional form provides a poor fit for data on domestic visitation. The explanatory power of the model captured by adjusted R-square is also low at 0.11.

The linear model indicates that travel cost has the expected negative sign but is not statistically significant. The sign indicates that recreation demand is an ordinary good and an increase in the travel cost leads to a decrease in the number of visits by domestic visitors to LNNP, holding all other factors constant. Annual personal income has the expected positive relationship with domestic visitation and is statistically significant. The sign indicates that recreation demand is a normal good and an increase in personal income leads to more visits to LNNP. Other explanatory variables such as level of education, education squared, age and squared age of the respondent and occupational dummies had the expected signs but were not statistically significant.

The study performed count data regressions for domestic visitors as well. Beginning with the Poisson model in which the value of the log of Pseudo likelihood is -159.3. The Wald chi-squared statistic is equivalent to 52.5 with 8 degrees of freedom for the full model and the P-value of 0.0000 (see notes on table 3b). As noted earlier, the Wald chi-square tests for the null hypothesis that all the estimated coefficients are equal to zero—a test for the model as a whole. From the P-value of 0.0000, the Poisson is statistically significant at 99 percent. So the null hypothesis that all the estimated coefficients in the model are equal to zero is strongly rejected.

The travel cost variable in the estimated Poisson model has the expected negative relationship with domestic visitation and is statistically significant at 99 percent. Annual personal income has the expected positive relationship and is also statistically significant at 99 percent. This is in line with our apriori expectation that domestic visitation is sensitive to variation in personal income.

Navrud and Mungatana (1994) found similar results (see also Abala, 1987; Mendes, 2003).
The age of the respondent has the expected negative sign in relation to domestic visitation and is statistically significant at 95 percent. Age squared has a positive relationship with domestic visitation and is statistically significant at 95 percent, implying those in advanced age are likely to visit LNNP more often.

The level of education in years has the expected positive relationship with domestic visitation but is not statistically significant. This is in line with our apriori expectation that those with higher levels of education are likely to post more visits to LNNP. The findings are in line with similar studies in this area (see Abala, 1987; Chase, 1996; Glassman and Rao, 2011).

Table 3b: Regression Results for domestic visitors

<table>
<thead>
<tr>
<th>Visitation</th>
<th>OLS</th>
<th>Poisson</th>
<th>Negative Binomial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-2.589</td>
<td>-2.877</td>
<td>-0.8250</td>
</tr>
<tr>
<td></td>
<td>(-0.3)</td>
<td>(-0.8)</td>
<td>(-0.12)</td>
</tr>
<tr>
<td>Travel Cost to LNNP</td>
<td>-0.0002442</td>
<td>-0.000121</td>
<td>-0.0000867</td>
</tr>
<tr>
<td></td>
<td>(-1.1)</td>
<td>(-3.4)</td>
<td>(-2.0)</td>
</tr>
<tr>
<td>Annual Personal Income</td>
<td>2.26e-06*</td>
<td>1.18e-06***</td>
<td>9.57e-07***</td>
</tr>
<tr>
<td></td>
<td>(1.8)</td>
<td>(4.5)</td>
<td>(2.8)</td>
</tr>
<tr>
<td>Age in Years</td>
<td>-0.584</td>
<td>-0.246**</td>
<td>-0.3034**</td>
</tr>
<tr>
<td></td>
<td>(-1.1)</td>
<td>(-2.6)</td>
<td>(-2.0)</td>
</tr>
<tr>
<td>Age Squared</td>
<td>0.009</td>
<td>0.004***</td>
<td>0.005**</td>
</tr>
<tr>
<td></td>
<td>(1.2)</td>
<td>(3.0)</td>
<td>(2.2)</td>
</tr>
<tr>
<td>Level of Education</td>
<td>1.129</td>
<td>0.646</td>
<td>0.46507</td>
</tr>
<tr>
<td></td>
<td>(0.7)</td>
<td>(1.3)</td>
<td>(0.7)</td>
</tr>
<tr>
<td>Education Squared</td>
<td>-0.046</td>
<td>-0.026</td>
<td>-0.018</td>
</tr>
<tr>
<td></td>
<td>(-0.7)</td>
<td>(-1.4)</td>
<td>(-0.8)</td>
</tr>
<tr>
<td>Dumemployed</td>
<td>5.879</td>
<td>2.894***</td>
<td>2.881***</td>
</tr>
<tr>
<td></td>
<td>(1.3)</td>
<td>(3.9)</td>
<td>(2.8)</td>
</tr>
<tr>
<td>Dumselfemployed</td>
<td>7.521</td>
<td>3.659***</td>
<td>3.439***</td>
</tr>
<tr>
<td></td>
<td>(1.3)</td>
<td>(4.7)</td>
<td>(3.3)</td>
</tr>
<tr>
<td>alpha(u)</td>
<td>NA</td>
<td>NA</td>
<td>0.2986***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-3.0)</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.11</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Log-Likelihood</td>
<td>NA</td>
<td>-1.59</td>
<td>-1.40</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
</tbody>
</table>

Notes:
(a) Likelihood-ratio test of alpha=0: chibar2(01) = 37.3 Prob>=chibar2 = 0.000
(b) *significance at 90% level, ** significance at 95% level and ***significance at 99% level
Test for Over-Dispersion

As was the case with international visitor’s model, the Negative binomial model has a nested test for over-dispersion through a constant alpha (α). We used the t-statistic to test for the null hypothesis of no over dispersion against the alternative of over dispersion. From the negative binomial regression above, the constant alpha equivalent to 0.2986 is statistically significant at 99 percent (i.e. p-value=0.000, see table 3b, note (a)). This indicates that over-dispersion in the sample of domestic visitors is significant and therefore, in this case, the appropriate model is the negative binomial.

From the negative binomial model, the value of the log of Pseudo likelihood is -140, compared to -159 reported for the Poisson. The Wald chi-squared statistic is equivalent to 22.8 with 8 degrees of freedom for the full model and the p-value equals 0.0037. Thus, the null hypothesis that all the estimated coefficients are equal to zero is strongly rejected at 99 percent and we concluded that the Negative binomial provides the best fit for our data on domestic visitation.

The travel cost in the estimated negative binomial has a negative relationship with domestic visitation and is statistically significant at 95 percent. Annual personal income has a positive relationship with domestic visitation and is statistically significant at 99 percent. This is in line with our apriori expectation that domestic visitation is sensitive to variation in personal income. Navrud and Mungatana (1994) found similar results (see also Abala, 1987; Mendes, 2003; Glassman and Rao, 2011)

The age of the respondent has the expected negative sign in relation to domestic visitation and is statistically significant at 95 percent. However, age squared has a positive relationship with domestic visitation and is statistically significant at 95 percent, implying those in advanced age are likely to visit LNNP more often.

The level of education in years has the expected positive relationship with domestic visitation but is not statistically significant. This is in line with our apriori expectation that those with higher
levels of education are likely to post more visits to LNNP. The findings are in line with similar studies in this area (see Abala, 1987; Chase, 1996; Glassman and Rao, 2011).

Occupational status of the respondents who reported to be employment (i.e. dummy=1 if employed and 0 otherwise) has positive relationship with domestic visitation and is statistically significant at 99 percent. The positive relationship between occupational status and visitation is also noted for respondents who reported to be self employed (i.e. dummy=1 if self-employed and 0 otherwise) was statistically significant at 99 percent. The reference occupational status was retired-if the respondent chose retired (i.e. dummy =1 if retired and 0 otherwise). It would appear therefore, that domestic visitors who were still actively employed were more likely to visit LNNP compared to those retired.

4.3.2 Discussion of results

The main factors determining international visitation to LNNP are: travel cost, personal income, age of respondent, education level, nature of the trip and the size of a tour party. Based on the Poisson model for international visitors, we present the marginal effects (Table 4a) that enable us to exactly interpret changes in international visitation as we vary each of the explanatory variables from the mean, holding other factors constant. Marginal effects represent percentage change in dependent variable with respect to 1 unit change in a given explanatory variable from either the mean or from the median, while holding other factors constant at the mean (Wooldridge, 2002; Winkelmann and Zimmermann, 1998). In this case, the marginal effect was calculated as coefficients multiplied by the mean of the dependent variable-mean of visits.

From table 4a, a one shilling increase in travel cost from the mean (Ksh. 57,666) reduces international visitation by 0.000389 percent, holding all other factors constant (at the mean). If travel cost is increased by Ksh.10,000 from the mean, it reduces visitation by 3.89 percent, holding all other factors constant. The semi-elasticity of visitation with respect to changes in travel cost appears small and is estimated at -0.0004.

The price elasticity of demand is generally low when the proportion of income spent on the activity is low. This implies that the international visitors interviewed were mainly from high income groups in their respective countries. For example, the average annual personal income
reported was Ksh.7.7 million compared to the average travel cost to LNNP of Ksh.57,667 (travel cost accounts for only 0.75 percent of reported income).

The above results are consistent with other findings in this area that generally finds an inelastic demand function for foreign visitors (see for example, Navrud and Mungatana 1994; Mendes, 2003; Alpizar, 2006). Navrud and Mungatana (1994) used a semi-log demand function for international visitation and found it to be inelastic with the price elasticity ranging between -0.169 and -0.842. Mendes (2003) used a semi-log model and estimated that a unit increase in entrance fees reduced the number of days spent on the recreation site by between 0.243 and 0.496, assuming the 33-50 percent opportunity cost of time. The author concluded that price-demand of recreation was inelastic because it was less than one. Finally, Alpizar (2006) used a log-linear function and estimated the long run price elasticity of demand at -0.68 (i.e. less than unit and therefore inelastic).

**Table 4a: Marginal effects after Poisson for international visitors**

| Variable                     | dy/dx    | P>|z|  | Mean(X) |
|------------------------------|----------|------|---------|
| Travel Cost to LNNP          | -3.89E-06| 0.03 | 57666.6 |
| Annual personal income       | 1.64E-08 | 0.271| 7700000 |
| Age in years                 | -0.086   | 0.055| 42.229  |
| Age Squared                  | 0.001    | 0.023| 1954.060|
| Level of education           | -0.193   | 0.022| 15.527  |
| Nature of Trip               | -0.478   | 0.006| 0.557   |
| Size of Tour Party           | -0.034   | 0.003| 5.061   |
| Travel cost to Mara          | -9.18E-07| 0.33 | 83271.7 |
| Travel cost to Samburu       | -6.34E-06| 0.125| 14549.7 |
| Travel cost to L Bogoria     | 6.97E-06 | 0.252| 7184.5  |
| Quality of Park              | 0.252    | 0.19 | 0.405   |

Notes:
(a) \(y=\)predicted number of visits (predict)= 1.335
(b) (*) dy/dx is for discrete change of dummy variable from 0 to 1
The demand for international visitation to LNNP is not sensitive to variation in annual personal income variation. The coefficient on annual personal income equivalent to $1.64 \times 10^{-8}$ is very low and is not statistically significant. These results are consistent with the findings by Mendes (2003) that demand for recreation was not sensitive to variation in personal income, because entry prices to the parks only accounted for a very small proportion of a visitor's personal income. However, Navrud and Mungatana (1994) found a statistically significant positive relationship between personal income and international visitation. Finally, Chase et al., (1998) found that although income did not influence choice of park to visit, it influenced the decision to take a trip to a certain country and length of stay by the visitor in a selected park.

Age has increasing marginal effects on demand for recreation since the coefficient on age and the quadratic term (age squared) is negative and positive, respectively and both are statistically significant at 95 percent level. Age has a negative effect on visitation up to the turning point and thereafter becomes positive as one advances in age. Thus a one year increase in the age of the respondent from the mean age of 42 years reduces the visitation by international visitors by a less percentage compared to the previous age, holding all other factors constant. This continues, until the turning point is reached and thereafter an additional year, leads to more visitation to LNNP. This finding is frequent in recreational economics literature. For example Walsh (1986) asserts that age could be the most significant socio-economic characteristic determining participation in recreational activities. Respondents from international visitors had an average age of 42 with a maximum of 77 years.

An additional year of education of the respondent from the mean (15 years) reduces international visitation by 19.3 percent, holding all other factors constant. This seems contrary to our expectation and the economic literature on recreational demand (Mendes, 2003; Navrud and Mungatana, 1994; Glassman and Rao, 2011). We suspect that the way the variable was measured, i.e. visitors were asked to state their level of education and then years of education was allocated based on the stated level of education, could be the reason for the unexpected sign. There was little variation with most visitors indicating they had acquired university education.

An individual who takes on a package tour (i.e. the nature of visitation is such that dummy=1 if visitor is in package deal and 0 if in individually arranged tour) has 0.5 fewer trips to LNNP,
compared to an individual in non-package tour. For package tours, individuals have no control in
the choice of the parks the package providers decide on for purposes of recreation. Individually
arranged tours are likely to better assign priority sites to visit. An increase in the size of the tour
party from the mean of 5 persons reduces visitation to LNNP by 3.4 percent, holding all other
factors constant. The decision on which park to visit becomes difficult to make as group
dynamics sets in.

Turning to domestic visitation, the negative binomial provided the best fit for our data. The main
factors determining domestic visitation are: travel cost, personal income, age of the respondent
and the occupational status of the respondent. The marginal effects after negative binomial are
presented in table 4b. As was the case with the marginal effects after the Poisson (table 4a) this
was calculated as the coefficient multiplied by the mean of the dependent variable.

**Table 4b: Marginal effects after Negative binomial for domestic visitors**

| Variable                  | dy/dx   | P>|z|  | Mean(X) |
|---------------------------|---------|------|---------|
| Travel Cost to LNNP       | -1.63e-04 | 0.043 | 4117.97 |
|                           | (-2.0)  |      |         |
| Annual Personal Income    | 1.80e-06 | 0.004 | 659175  |
|                           | (2.8)   |      |         |
| Age in Years              | -0.5705 | 0.040 | 34.4125 |
|                           | (-2.0)  |      |         |
| Age Squared               | 0.0087  | 0.026 | 1242.09 |
|                           | (2.2)   |      |         |
| Level of education        | 0.8745  | 0.462 | 14.7    |
|                           | (0.7)   |      |         |
| Education Squared         | -0.0339 | 0.449 | 219.1   |
|                           | (-0.8)  |      |         |
| Dumemployed*              | 5.22    | 0.025 | 0.64    |
|                           | (2.2)   |      |         |
| Dumselfemployed*          | 17.75   | 0.162 | 0.34    |
|                           | (1.4)   |      |         |

Notes:

(c) y=predicted number of visits (predict)= 1.887

(d) (*) dy/dx is for discrete change of dummy variable from 0 to 1
We begin with the coefficient on travel cost that indicates that a one shilling increase in the travel cost from the mean (4117.97) leads to a decrease in domestic visitation to LNNP by 0.0168 percent and an increase in travel cost by Ksh. 1,000 from the mean, leads to a decrease in visitation by 16.8 percent, holding all other factors constant. The proportionate decrease in domestic visitation due to increase in travel cost is larger compared to that of the international visitors but is also less than unit. The proportion of entry price to annual personal income is also small. These results are in line with similar findings elsewhere (see Mendes, 2003; Glassman and Rao). However, Navrud and Mungatana, 1994 estimated a zonal travel cost model for domestic visitors and found a more elastic price-elasticity of demand of between -1.77 to -1.99. It should be noted that this estimate of elasticity was zone based, rather than individual.

A one shilling increase in the personal annual income from the mean (KSh. 659175), increases visitation from domestic visitors by 0.00017 percent and an increase of personal income by 10,000 from the mean, increases visitation by 1.7 percent, holding all other factors constant. The magnitude of the coefficient is small; indicating demand for recreation by domestic visitors is not sensitive to variation in income. These results are consistent with economic literature in recreational demand (see Navrud and Mungatana, 1994; Glassmann and Rao, 2011). The average annual income of the domestic visitors interviewed was Ksh. 659,175 which places them among the middle to high income groups in Kenya.

Like was the case with the international visitors, age has increasing marginal effects on demand for recreation since the coefficient on age and the quadratic term (age squared) is negative and positive, respectively and both are statistically significant at 95 percent level. Thus a one year increase in the age of the respondent from the mean age of 34 years reduces the visitation by domestic visitors by less percentage compared to the previous age, before reaching a turning point. After the turning point, an increase in age from the mean, increases visitation from domestic visitors, holding all other factors constant.

Education has the diminishing marginal effects on demand for recreation but is not statistically significant. This is evidenced by the positive sign on the coefficient of level of education and the negative sign on the coefficient of the quadratic term, education squared (Wooldridge, 2002).
A domestic visitor who is employed makes five more trips to LNNP compared to one who is retired, holding all other factors constant. Finally, domestic visitors who are self employed make eighteen more visits to LNNP compared to those who are retired, holding all other factors constant. This variable, like personal income reflects ability to pay for recreation.

4.3.3 Consumer Surplus Estimates for LNNP

Consumer surplus is the net benefit of a visit to the park. The net benefit is the difference between the value of the visit and the costs of the visit, aggregated over the entire visitation recorded at LNNP over the last one year (July 2010 to July 2011). Using the Poisson and negative binomial regression outputs, we can compute the consumer surplus or the welfare measure per visit per consumer. We follow Herberling and Templeton (2009) to estimate the average individual consumer surplus per visit as the negative reciprocal of the travel cost coefficient. Loomis and Creel (1990) and Glassman and Rao (2011) have also estimated consumer surplus in the same approach.

For the international visitors we can calculate the consumer surplus per visit as \(-1/\beta_{\text{travelcost}}\) which is approximately Ksh.343,543 (i.e. \(\beta_{\text{travelcost}} = -0.00000291\)). An average visit for international visitors lasts for 1.3 days which translates into Ksh. 264,264 consumer surplus per day per visitor. If we multiply by the number of visit day recorded for the entire sample size, then we can derive the consumer surplus for the 131 observations equivalent to Ksh. 34,618,584 for international visitors. We can further obtain the annual direct use economic value obtained from LNNP by international visitors by multiplying the consumer surplus per day per visitor times the annual visitation days. In 2010, LNNP reported a total of 139,388 visitation days from international visitors, which translates to Ksh. 36.8 billion.

For the domestic visitors, the consumer surplus is calculated in the same way as proposed above (i.e. \(Cs = -1/\beta_{\text{travelcost}}\)). This is equivalent to Ksh.11, 236.00 (i.e. = -1/-0.000089). On average, a visit by domestic visitors lasted for 1.1 days which translates into Ksh. 10,215 per day per visitor. Multiplying by the sample size of 80, we can obtain aggregate consumer surplus of Ksh. 817,163.60. The net economic value of annual domestic visitation to LNNP can be calculated by multiplying the total number of visitation days (see Appendix I) by the consumer surplus per day.
per visitor. For 2010, LNNP recorded a total of 87,294 domestic visitation days, which translates into Ksh.891,708,210.

Finally, the total net use value for LNNP in 2010 is the sum of the net value that accrue to the international visitors and the value that accrues to domestic visitors. This is estimated at Ksh. 37.7 billion. This value alone, which is about 1.2 percent of Kenya’s Gross Domestic Product and excludes the non-use value such as existence, option and bequest values vouch for the current form of land use for conservation purpose.

4.3.4 Pricing Mechanism

The final issue addressed in this study is the need to translate the above economic value into a monetary value that will be able to meet the cost of supplying the tourism product in LNNP. To be able to perform a pricing mechanism, we required three pieces of information: first, the trip generation function was used to simulate changes in visitation as travel cost is varied only through the entry fee until visitation is reduced to near zero (i.e. towards choke price) (see Beal, 1995). Secondly, we used regression analysis for the simulated data to estimate demand function for foreign and domestic visitors. Finally, the overall cost of supplying recreational services for LNNP was obtained from KWS (an average of the cost for the last three financial years) was used to derive a cost recovery pricing strategy.

The Poisson model provided the best fit for visitation data for foreign visitors while the negative binomial was superior for domestic visitation. Entry fees for international visitors was varied from the mean (Ksh. 57,428) in sequence of Ksh. 10,000 and marginal effects used to predict expected visitation while holding all other factors constant at the mean. For domestic visitors entry fees were varied from the mean (Ksh. 4,118) in sequence of Ksh. 1,000 and the same procedure followed in computing the expected visitation (see Appendix I for simulated data).

The actual recorded visitation days demanded at zero additional entry fees (at the mean) is the observed 139,388 and 87,294 for international and domestic visitors, respectively. At this unchanged circumstance, through the marginal effects the models had predicted average visitation per person at 1.3 and 1.9 for foreign and domestic visitors respectively. These two provided information to enable us calculate the average number of visitors to LNNP in a good
year\textsuperscript{16} such as 2010 at 104,021 and 46,187 for international and domestic visitors, respectively. With an average number of visitors per year and predicted visits per year (from the models) we were able to derive visitation days for each of the above travel cost variation. Regression analysis for visitation against price was then used with these data to estimate the demand functions for international and domestic visitors. The price and visitation was divided by 1000 for scaling purposes (see Appendix I for data used).

The two estimated demand curves, the t-statistics and the adjusted $R^2$ are as follows:

\[ V_f = 161.5 - 0.38P_f \]  \hspace{1cm} R^2 = 0.99, Fstat = 3880, N = 15  
\[ (297.8) \hspace{1cm} (-62.3) \]

\[ V_d = 116.3 - 6.27P_d \]  \hspace{1cm} R^2 = 0.97, Fstat = 317, N = 15  
\[ (40.4) \hspace{1cm} (-17.8) \]

Values in brackets are the t-statistics. The F-statistics and the adjusted $R^2$ indicate that the linear model provide a good fit for the data. Inverting the demand functions, we obtain:

\[ P_f = 423.2 - 2.63V_f \]
\[ P_d = 18.5 - 0.16V_d \]

From the above price functions, the choke price is Ksh. 423,200 and Ksh. 18,500 for international and domestic visitors respectively. In order to estimate the effect of price changes on visitation and total revenue, the above demand functions were used to calculate total revenue assuming the visitations predicted by our model holds. Figures 6a and 6b shows the relationship between price, total revenue and visitation for domestic and international visitors, respectively.

\textsuperscript{16} 2008 and 2009 were very bad years due to internal and external shocks (i.e. post election violence and global financial and economic crisis) so that a 3 year average was underestimating the average annual visit to LNNP
The revenue maximizing domestic price is Ksh. 4,000 that yields total revenue of Ksh. 350 million (figure 6a). The right hand side y-axis captures variation of visitation in thousands with increase in entry price. At the current price of Ksh. 500 the domestic visitation estimated from the model is approximately 87,294. This level of visitation and price yields Ksh. 43.7 million in total revenue. This implies that KWS can experiment with prices of between Ksh. 1,000 and Ksh. 2,000 for domestic visitors and get additional revenue of Ksh. 150 million. For example, a price increase to Ksh. 2,000 would reduce visitation from 87,294 to 65,000 visitation days which remains high for domestic visitors.

The revenue maximizing price for international visitors is not easily discernable. What we know is that at zero prices (open access) the number of visitation will be over 161,000 and that Ksh. 423,200 (US$ 4,150) is the choke price (nil visit at this price). The revenue maximizing price is anywhere between Ksh. 100,000 and Ksh. 120,000 (or US$ 990 – US$ 1200), using current exchange rate of Ksh. 101.5 per US$). KWS can experiment with a price increase of between Ksh. 10,000 (US$ 100) to Ksh. 50,000 (US$ 495) per visitation. This price increase will yield total
revenue estimated at Ksh. 5.8 billion and still have a high level of international visitation days, approximated at 124,000 (see figure 6b).

Figure 6b: Relationship between entry fee (price), total revenue (TR) and international visitation

![Graph showing the relationship between entry fee, total revenue, and international visitation]

Finally, we interacted the price functions with the cost of supplying the tourism product at LNNP. The three year average operating cost is estimated at Ksh. 103,897,906.00. As explained in chapter 3, this study assumed for simplicity that 85 percent of the operating cost is variable costs while 15 percent is assumed to be fixed cost. The variable cost is met by the dominant visitor group (international visitors) while the domestic visitors cater for the fixed cost. We used the estimated demand functions to calculate the price that will equate total revenue to total cost. This is the cost recovery pricing (Becker, 2007).

Thus the cost obligation to international visitors is Ksh. 88,313,220.00 and the cost recovery price from figure 6b lies between Ksh. 5,000 to Ksh. 7,000. So the current entry price of Ksh. 7,050 for international visitors is generally cost recovery for recreational services in LNNP. With regard to domestic visitors the cost is Ksh. 15,584,686 and the cost recovery is Ksh. 500 (figure 6a). We conclude this section by arguing that the current price set-up at LNNP is actually cost recovery. However, there is greater scope to generate more revenue and even make profit than is
currently being pursued. This is evidenced by the huge consumer surplus enjoyed by both international and domestic visitors.
CHAPTER FIVE

5.0 CONCLUSION AND POLICY RECOMMENDATION

5.1 Summary and Conclusion

The main objective of this paper was to examine the factors determining demand for recreation services by both international (non-residents) and domestic (national) visitors with Lake Nakuru National Park (LNNP) as the case study. It also aimed at estimating the current use value of the LNNP and to derive demand curves for each of the category visitors to the park. Information on demand curves and the cost of supplying recreation service was then used to derive a cost recovery price.

The demand analysis was undertaken through a two step regression analysis (Beal, 1995). In the first part, the study applied count data models, namely: Poisson and Negative Binomial models to estimate the trip generating function for international and domestic visitors. The main factors determining demand for recreation by international visitors are: travel costs, age of the visitors, education level of the visitor, nature of the trip (either as a package or individual) and the size of the tour party accompanying the visitor. For the domestic visitor the determining factors are travel costs, personal income, age of the visitor, and occupation of the respondent.

The current use value of Lake Nakuru National Park is estimated at Ksh. 37.7 billion. This value alone is approximately 1.2 percent of Kenya’s Gross Domestic Product and it excludes the non-use values such as existence, option and bequest. It vouches for the current form of land use of LNNP for conservation purpose.

In the second part, the Poisson and the Negative Binomial models were used to predict the number of visitation as travel cost is varied through increase in the gate fee. This data was used to obtain a second step regression and estimation of demand curves for LNNP by both the international and domestic visitors. This demand curves were inverted and used for a pricing strategy that ensured that the price was set in a way that fully recovers the cost of supplying the tourism product by LNNP. The study established that the current price set-up at LNNP of Ksh. 7,050 for international visitors and Ksh. 500 for domestic visitors was in fact cost recovery.
However, there is greater scope to raise more revenue from a raise in entry fees, as evidenced by the estimated consumer surplus. For international visitors, the revenue maximizing price lies between Ksh. 100,000 and Ksh. 120,000 per visitation. This level of entry fees is likely to yield total revenue of over Ksh. 10 billion. At zero prices (open access) the number of international visitation will be over 161,000 and a price of Ksh. 423,200 per visitation will attract nil visits (i.e. choke price). For domestic visitors, the revenue maximizing price is Ksh. 4,000 that yields total revenue of Ksh. 350 million. At this price, the amount of visitation estimated is equivalent to 46,000. At zero prices (open access) the number of domestic visitation will be over 116,300 and a price of Ksh. 18,500 per visitation will attract nil visits (i.e. choke price) from this category of visitors.

5.2 Policy Recommendation

Based on the above findings, this study recommends that KWS could experiment with a price increase of between Ksh. 10,000 (US$ 99) to Ksh. 50,000 (US$ 495) per international visitation to LNNP. This price increase will yield total revenue estimated at Ksh. 5.8 billion and still have a high level of international visitation days, approximated at 124,000.

With regard, to domestic visitation, KWS could increase the current price from Ksh. 500 to between Ksh. 1,000 (US$ 10) and Ksh. 2,000 (US$ 20). This increase could yield total revenue of between Ksh. 182 million and Ksh. 293 million from domestic visitors alone. For example, a price increase to Ksh. 2,000 would reduce visitation from the current 87,294 to 65,000 visitation days which remains a good level of domestic visitation.

To avoid a sudden jump in prices, KWS could follow a phased approach of increasing the entry prices along the broad price guidelines in this study and involve stakeholders in consultation and advocacy for the price changes.

Recreational demand is positively related with personal income. It implies, therefore, as the Kenyan economy grows and per capita income increase, the demand for recreation will increase. KWS needs to be aware of this and make arrangements to accommodate the expected increase in demand in the organisation’s strategic plan for 2008-2012 and the next medium term.
development plan for 2013 to 2018. Regular revision of park entry prices will afford the agency enough revenue to undertake future investments in facilities to enhance recreation.

5.3 Limitations of the study

First, pricing of park visits in Kenya depends on attributes of specific Park under consideration. This study is only relevant for the case of Lake Nakuru National Park. However, for a complete picture on pricing, a study covering the major national parks would be desirable. This study could not achieve this given the limited time within which it was to be completed and limited resources. Second, the survey data used was collected over a span of three weeks (21 days) from 29th June to 21st July 2011. With such short duration of data collection, the possibility of biased data cannot be ruled out. Third, the measurement of the cost of supplying the tourism product may be underestimated due to failure to take into account the true social costs of supplying the product. Furthermore, the splitting of the total cost into variable and fixed costs was arbitrary. It is believed that this can be improved.

5.4 Areas for further research

There is need for holistic approach to pricing of park visits in Kenya covering more parks. Other pricing strategies such as differential pricing and assigning of weights for international consumer surplus for equity purpose could also be pursued. It is also important that the true social cost of supplying recreational services is internalized. This remains an area for further economic and ecological inquiry.
APPENDICES

APPENDIX I: RELEVANT SECONDARY DATA ON PRICING OF PARKS IN KENYA

Figure A1: Park visits to six major parks, 2007-2010

Figure A2: Trends in entry fee for international visitors (US$) to six major parks 2006 to 2010
Table A1: Annual visitation days to Lake Nakuru National Park in 2010

<table>
<thead>
<tr>
<th>Time</th>
<th>Foreign Visitors</th>
<th>Citizens</th>
<th>Non-Kenyan Residents</th>
<th>Total</th>
<th>Annual Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan-10</td>
<td>8455</td>
<td>5282</td>
<td>1026</td>
<td>14763</td>
<td>2006</td>
</tr>
<tr>
<td>Feb-10</td>
<td>10224</td>
<td>4845</td>
<td>996</td>
<td>16065</td>
<td>2007</td>
</tr>
<tr>
<td>Mar-10</td>
<td>7139</td>
<td>4237</td>
<td>761</td>
<td>12137</td>
<td>2008</td>
</tr>
<tr>
<td>Apr-10</td>
<td>6074</td>
<td>7196</td>
<td>1112</td>
<td>14382</td>
<td>2009</td>
</tr>
<tr>
<td>May-10</td>
<td>6993</td>
<td>5070</td>
<td>1216</td>
<td>13279</td>
<td>2010</td>
</tr>
<tr>
<td>Jun-10</td>
<td>8786</td>
<td>5443</td>
<td>736</td>
<td>14965</td>
<td>2006/07</td>
</tr>
<tr>
<td>Jul-10</td>
<td>18889</td>
<td>8308</td>
<td>1433</td>
<td>28630</td>
<td>2007/08</td>
</tr>
<tr>
<td>Aug-10</td>
<td>22958</td>
<td>12279</td>
<td>1451</td>
<td>36688</td>
<td>2008/09</td>
</tr>
<tr>
<td>Sep-10</td>
<td>15875</td>
<td>7342</td>
<td>1017</td>
<td>24734</td>
<td>2009/10</td>
</tr>
<tr>
<td>Oct-10</td>
<td>14304</td>
<td>7266</td>
<td>1261</td>
<td>22831</td>
<td></td>
</tr>
<tr>
<td>Nov-10</td>
<td>9955</td>
<td>5495</td>
<td>774</td>
<td>16224</td>
<td></td>
</tr>
<tr>
<td>Dec-10</td>
<td>9736</td>
<td>14031</td>
<td>1873</td>
<td>25638</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>139388</td>
<td>87294</td>
<td>13654</td>
<td>240336</td>
<td></td>
</tr>
</tbody>
</table>

Source: KWS

Table A2: Simulated visitation data used for second step regression

<table>
<thead>
<tr>
<th>Mfx predicted visits</th>
<th>Average Travel Cost</th>
<th>Visitation days</th>
<th>No. of Foreign visitors</th>
<th>Mfx Predicted visits</th>
<th>Average Travel Cost</th>
<th>Visitation days</th>
<th>No. of domestic visitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.50</td>
<td>17,428.00</td>
<td>156031</td>
<td>2.60</td>
<td>500</td>
<td>120087</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.46</td>
<td>27,428.00</td>
<td>151871</td>
<td>2.50</td>
<td>1118</td>
<td>115468</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.42</td>
<td>37,428.00</td>
<td>147710</td>
<td>2.30</td>
<td>2118</td>
<td>106231</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.38</td>
<td>47,428.00</td>
<td>143549</td>
<td>2.10</td>
<td>3118</td>
<td>96993</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.34</td>
<td>57,428.00</td>
<td>139388*</td>
<td>104021</td>
<td>1.89</td>
<td>4118</td>
<td>87294*</td>
<td>46187</td>
</tr>
<tr>
<td>1.30</td>
<td>67,428.00</td>
<td>135227</td>
<td>1.70</td>
<td>5118</td>
<td>78518</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.26</td>
<td>77,428.00</td>
<td>131066</td>
<td>1.60</td>
<td>6118</td>
<td>73900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.22</td>
<td>87,428.00</td>
<td>126905</td>
<td>1.40</td>
<td>7118</td>
<td>64662</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.19</td>
<td>97,428.00</td>
<td>123785</td>
<td>1.30</td>
<td>8118</td>
<td>60043</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.15</td>
<td>107,428.00</td>
<td>119624</td>
<td>1.20</td>
<td>9118</td>
<td>55425</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.12</td>
<td>117,428.00</td>
<td>116503</td>
<td>1.10</td>
<td>10118</td>
<td>50806</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.08</td>
<td>127,428.00</td>
<td>112343</td>
<td>1.00</td>
<td>11118</td>
<td>46187</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.06</td>
<td>137,428.00</td>
<td>110262</td>
<td>0.92</td>
<td>12118</td>
<td>42492</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.02</td>
<td>147,428.00</td>
<td>106101</td>
<td>0.85</td>
<td>13118</td>
<td>39259</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.9</td>
<td>157,428.00</td>
<td>102981</td>
<td>0.77</td>
<td>14118.0</td>
<td>35564.2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Actual observed visitation for 2010
APPENDIX II: DEMAND FUNCTIONS AND THE RAMSEY PRICING RULE

Assume a representative tourist maximizes his direct utility function:

\[ U = U(X, Q) \]

Subject to:

\[ M = P_X X + P_Q Q \]

where \( X \) is a unit of composite private commodity and \( Q \) is the quantity of an environmental amenity (visitation to Lake Nakuru national park).

\( M \) is the visitor's income, \( P_X \) is a vector of commodities prices and \( P_Q \) is a price vector of entrance fees to the national park.

Maximizing of the above constrained utility function yields individual demand functions. The lagrangian function:

\[ \mathcal{L} = U(\cdot) + \lambda (M - P_X X - P_Q Q) \]

The F.O.C

\[ \frac{\partial \mathcal{L}}{\partial X} = \frac{\partial U(\cdot)}{\partial X} - \lambda P_X = 0 \]

\[ \frac{\partial \mathcal{L}}{\partial Q} = \frac{\partial U(\cdot)}{\partial Q} - \lambda P_Q = 0 \]

\[ \frac{\partial \mathcal{L}}{\partial \lambda} = M - P_X X - P_Q Q = 0 \]

The solution to the above equation is obtained by dividing (2a) by (2b) and substituting in (2c) to obtain individual's Marshallian demand functions:

\[ q_i = q_i(M, P_X, P_Q) \]

Holding all other factors constant, the entry price is the main determinant of individual visitation to the park, so that:

\[ q_i = q_i(P_i) \]

Aggregating across the total visitation yields two separate aggregate demand curve for the two main categories of visitors to lake Nakuru National Park: Foreign and Domestic visitors so that (See Chase et al. 1998).

\[ Q = Q(M, P_X, P_Q) \]

Normalizing \( P_X = 1 \) and based on theory, aggregate demand curves for park visitation is expected to be a function of the entry fees to that park, entry fees to substitute parks, park visitors income, socio-economic characteristics and park amenities (uniqueness). The aggregate demand functions for the park may be written out as:
\[ Q_i = Q_j(P, M, Z) \] (5)

Where: \( Q_j \) is the aggregate visitation from \( j \) categories of visitors in the last one year and in this case, \( j=1,2,...,n \).

\( P \) = a vector of park entry fees to the park and substitute parks;

\( M \) = park visitors personal income

\( Z \) = a vector of socio-economic characteristics and park attributes.

Equation (5) is used in our theoretical framework and in the empirical application part of this study. In the theoretical section, by holding all other factors constant and assuming that only price matters in variation of visitation, then:

\[ Q_j = \frac{Q_j(P_j)}{Q_j(P_m)} \] (6) which is the direct aggregate marshallian demand curve. The inverse demand curve is given by:

\[ P_j = \frac{P_j(Q_j)}{P_j(0)} \] (6a)

for \( j = 1,2,...,n \) visitor categories

Total revenue to the park manager is given by:

\[ R(Q_1, ..., Q_n) = P_1(Q_1)Q_1 + ... + P_n(Q_n)Q_n \] (7)

Where: \( P_j \) is the park entry price for the \( j=1,2,...n \) categories of visitors

\( Q_j \) is the quantity of visitation by the \( j = 1,2,...n \) category of visitors.

Let us also assume that the cost of supplying the tourism recreation services is strongly additive and includes fixed and variable costs such that:

\[ C = Pc(Q_1, ..., Q_n) + I \] (8)

Where: \( C \) is cost of supplying tourism product and includes variable costs \( PC(.) \) and a fixed cost \( I \).

The social costs/benefits\(^{17}\) associated with visitation are represented by \( A \). \( A \) is the net of negative ecological costs \((g)\) and positive spillover effects of tourism \((T)\)

\[ A = -g(Q_1, ..., Q_n) + T(Q_1, ..., Q_n) \] (9)

The park manager wants to choose the level of visitation so as to maximize social welfare\(^{18}\) and faces the following constrained maximization problem:

---

\(^{17}\) Social costs are not obvious; they include environmental degradation, soil erosion, animal stress and social stress to the communities surrounding parks. Social benefits include creation of jobs, entrepreneurship and better lives to people around the park

\(^{18}\) Social welfare is defined as the consumer and producer surplus
\[ W = \sum_{j=1}^{n} \int P_j(Q_1, ..., Q_n) \delta Q + P_j(Q_j)Q_j - PC(Q_1, ..., Q_n) - l + A \quad \ldots \quad (10) \]

\[ \text{St:} \quad P_1Q_1 + \cdots + P_nQ_n = PC(Q_1, ..., Q_n) + l \quad \text{and} \quad Q_1, ..., Q_n \geq 0 \]

i.e. subject to the constraint that revenue exactly equals costs (or that a profit is a given constant) and the need to avoid choke prices by ensuring that visitation levels remain positive. Let \( Q_j = q_j \) for easy of manipulation.

The solution for the constrained welfare maximization problem is found by introduction of a Lagrange multiplier \( \lambda \) and equation (10) gives the optimal pricing rule for visitor categories. The lagrangian function becomes:

\[ L = SB(q_1, ..., q_n) - SC(q_1, ..., q_n) + \lambda \left[ \sum_{j=1}^{n} P_j q_j - PC(q_1, ..., q_n) - l \right] \quad \ldots \quad (11) \]

Where:

- \( SB \) and \( SC \) are respectively social benefit and social variable cost functions, \( q_j \) are the \( n \) visits from the various visitor categories;
- \( PC(q_1, ..., q_n) \) is the private variable cost function, \( l \) is the fixed cost and \( \lambda \) is the lagrangian multiplier, which is a shadow price indicating how much net social benefits will increase when the budget constraint is reduced by one unit.

\[ SB(q_1, ..., q_n) = \sum_{j=1}^{n} \int P_j(q_1, ..., q_n) \delta q + P_j(q_j)q_j + A \quad \ldots \quad (12) \]

Where: \( P_j(.) \) is the inverse demand function for the \( j = 1, 2, ..., n \) visitor categories and captures the consumer surplus, \( p_j q_j q_j \) is the producer surplus and \( \lambda > 0 \) in the case of positive marginal spillover effect. In our empirical application, \( \lambda = 0 \).

First order conditions:

\[ \frac{\delta L}{\delta \lambda} = 0 = \sum_{j=1}^{n} P_j q_j - PC(q_1, ..., q_n) - l \quad \ldots \quad (13) \]

i.e. the budget constraint as a condition must be satisfied

\[ \frac{\delta L}{\delta P_i} = 0 = \sum_{j=1}^{n} \frac{\delta q_j}{\delta P_i} - \sum_{j=1}^{n} \frac{\delta SC}{\delta q_j} \frac{\delta q_j}{\delta P_i} + \lambda \left[ q_j + \sum_{j=1}^{n} P_j \frac{\delta q_j}{\delta P_i} - \sum_{j=1}^{n} \frac{\delta PC}{\delta q_j} \frac{\delta q_j}{\delta P_i} \right] \quad \ldots \quad (14) \]

There are \( n \) systems of equations in (14), one for each of the \( j = 1, 2, ..., n \) categories of visitors. We can rewrite equation (14) as follows:
\[
0 = \sum_j \frac{\partial q_j}{\partial P_i} - \sum_j MSC_j \frac{\partial q_j}{\partial P_i} + \lambda \left[ q_j + \sum_j \left( \frac{P_j - MPC_j}{q_j} \right) \frac{\partial q_j}{\partial P_i} \right] \quad \ldots \ldots \quad (15)
\]

Collecting like terms:

\[
0 = \sum_j (P_j - MSC_j) \frac{\partial q_j}{\partial P_i} + \lambda \left[ q_j + \sum_j \left( \frac{P_j - MPC_j}{q_j} \right) \frac{P_j}{q_j} \right] \quad \ldots \ldots \quad (16)
\]

Rewrite (16) into elasticity form:

\[
0 = \sum_j (P_j - MSC_j) \frac{\partial q_j}{\partial P_i} \frac{q_j}{P_j} + \lambda \left[ q_j + \sum_j \left( \frac{P_j - MPC_j}{q_j} \right) \frac{P_j}{q_j} \right] \quad \ldots \ldots \quad (17)
\]

\[
0 = \sum_j (P_j - MSC_j) E_{ji} \frac{q_j}{P_j} + \lambda \left[ \sum_j \left( \frac{P_j - MPC_j}{q_j} \right) E_{ji} \frac{q_j}{P_j} \right] \quad \ldots \ldots \quad (18)
\]

Where \( E_{ji} \) is the uncompensated cross elasticity of demand for visitation of \( j = 1, 2, \ldots, n \) category of visitors with respect to change in prices of substitute parks. In the case where there are no externalities, then \( MSC_j = MPC_j \) and the expression becomes:

\[
0 = \left( 1 + \lambda \right) \sum_j (P_j - MPC_j) E_{ji} \frac{q_j}{P_j} + \lambda q_j \quad \ldots \ldots \quad (19)
\]

\[
\frac{-\lambda}{1 + \lambda} q_j = \sum_j (P_j - MPC_j) E_{ji} \frac{q_j}{P_j} \quad \ldots \ldots \quad (20)
\]

\[
\frac{-\lambda}{1 + \lambda} q_j - \sum_{j \neq i} (P_j - MPC_j) E_{ji} \frac{q_j}{P_j} = \frac{P_i - MPC_i}{P_i} E_{ii} q_i \quad \ldots \ldots \quad (21)
\]

\[
\frac{-\lambda}{1 + \lambda} \frac{1}{E_{ii}} - \sum_{j \neq i} \left( \frac{P_j - MPC_j}{P_j} \right) E_{ji} \frac{P_j}{P_i} q_i = \frac{P_i - MPC_i}{P_i} \quad \ldots \ldots \quad (22)
\]

Assuming that cross price elasticity; \( E_{ji} = 0 \) then (22) simplifies to the inverse elasticity mark-up rule:

\[
\frac{P_i - MPC_i}{P_i} = \frac{-\lambda}{1 + \lambda} \frac{1}{E_{ii}} \quad \ldots \ldots \quad (23)
\]
λ tells us how much social welfare will increase when the revenue constraint is eased by one unit.

NOTE: for more details on the derivation, interested readers are referred to Oum and Tretheway (1988)
APPENDIX III: SURVEY INSTRUMENT

S/NO: International............

TRAVEL-COST QUESTIONNAIRE TO LAKE NAKURU NATIONAL PARK FOR INTERNATIONAL VISITORS (NON-KENYAN)

Module I: Introduction

The purpose of this survey is to obtain information to enable us estimate the recreational use value of Lake Nakuru National park (LNNP). One part of this involves how much time and money tourists like yourself have spent on coming to visit this park. The study is conducted to facilitate Mr. Peter Chacha Wankuru, an MA economics student at the University of Nairobi to write his thesis on pricing of National Parks in Kenya.

We would like to seek your consent to participate in the survey and the enumerator will be at hand to assist you in filling the questionnaire. For this purpose, we would very much appreciate knowing the following information:

Module II: Questions on visits to this Park (and Substitute Parks) in the Last one year

Q1. How many times have you visited this park, in the last one year? ________________

Q2. On average, how many days did you stay in this park during your last visit? ____

(if only one day, please estimate the number of hours spent in this park? ________)

Q3. Which other park among the ones list below did you visit in the last one year (including visits before reaching Lake Nakuru, today) and how much did it cost you? (Use the currency of your choice)

<table>
<thead>
<tr>
<th>National Park</th>
<th>Days in the park</th>
<th>Travel Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Air ticket and road transport costs</td>
</tr>
<tr>
<td>(1) Maasai Mara NR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Lake Bogoria NR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Hells gate NP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Samburu NR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Other(please specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q4. What is your monthly expenditure on the following items? (Provide a simple estimate)
1. House Rent/Mortgage: Amount ___________ Currency _________
2. Food and Beverages: Amount ___________ Currency _________
3. Transport/Fuel cost: Amount ___________ Currency _________
4. Clothing and Footware: Amount ___________ Currency _________
5. Communication/mobile/internet: Amount ___________ Currency _________

Module III: Questions on the Current Visit to Lake Nakuru National Park (LNNP)

Q5. Was your trip/visit to Kenya a package deal i.e. all expenses included?

(1) Yes
(2) No

(If No skip to Q10)

Q6. If Yes to Q5, how much did your trip cost? Amount _______ Currency _____

Q7. Did the amount stated in (Q6) above include the air fare?

(1) Yes
(2) No

Q8. How much was the air fare? Amount ___________ Currency _________

Q9. How much extra will you spend over & above the package price? Amount _______ Currency _______

(If done through Q9, skip to Q13)

Q10. How much will you spend on your entire trip/visit? Amount _________ Currency _____

Q11. How much did you spend on the air fare? Amount ___________ Currency _________

Q12. How much extra will you spend over & above the trip and airfare? Amount _________

Currency ______

Q13. How much time did it take to fly from your home or resident country to Kenya? ______ hrs

Q14. How many days will you spend on your entire trip to Kenya? _____ days

Q15. How many days will you spend in this park? _____ days

(If only one day in (Q15) above, how many hours will you spend in this park? _______ hrs)

Q16. What is the main reason for visiting this park? (Please circle only one)
1. To view flamingoes  
2. To view Wildlife  
3. To enjoy wilderness  
4. Other (specify ________________________)

Q17. How many other people are accompanying you during this visit? __________________

Q18. Which other park among the ones listed below are you going to visit after Lake Nakuru National Park? (Please fill the table on the expected number of days to spend in the park and the costs)

<table>
<thead>
<tr>
<th>National Park</th>
<th>Days in the park</th>
<th>If only 1 day, how many hours</th>
<th>Travel Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bus fare/road transport (cost of fuel if self driven)</td>
</tr>
<tr>
<td>(1) Maasai Mara NR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Lake Bogoria NR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Hells gate NP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Samburu NR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5) Other (please specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q19. If the park manager invests more on this park to improve facilities, including development of new products, visitors like yourself would:

(a) Consider paying higher entry fees:

(b) Consider staying for more days in Lake Nakuru National park?

Q20. How would your enjoyment be affected if there were many other visitors in the park?
   1. Reduced
   2. Unchanged
   3. Increased

Module IV: Questions on Socio-economic and Demographic Characteristics of the Respondent
Q21. What is your nationality?
   1. United Kingdom
   2. USA
   3. Germany
   4. Italy
   5. Other (please specify)

Q22. Which year were you born?

Q23. What is your highest completed level of formal education?
   1. Primary/Elementary level
   2. High School
   3. University
   4. Other (please specify)

Q24. What is your occupation?
   1. Employed
   2. Business/self employed
   3. Retired

Q25. What is your annual personal income after tax (in the nearest thousands)? Amount
   
   Currency

We sincerely appreciate your time and cooperation. This information will be of great help in finalizing the Study and is for use for academic purpose only. Kindly, check to ensure that all the questions are answered. For more detail and further inquiries on the study, please find here below my email address and cell phone number.

Email: ptahcha80@yahoo.com  Cell: +254-736-460-923
TRAVEL-COST QUESTIONNAIRE TO LAKE NAKURU NATIONAL PARK FOR DOMESTIC VISITORS (KENYAN NATIONALS)

Module I: Introduction

The purpose of this survey is to obtain information to enable us estimate the recreational use value of Lake Nakuru National park (LNNP). One part of this involves how much time and money tourists like yourself have spent on coming to visit this park. The study is conducted to facilitate Mr. Peter Chacha Wankuru, an MA economics student at the University of Nairobi to write his thesis on pricing of National parks in Kenya.

We would like to seek your consent to participate in the survey and the enumerator will be at hand to assist you in filling the questionnaire. For this purpose, we would very much appreciate knowing the following information:

Module II: Questions on visits to this Park (and Substitute Parks) in the last one year

Q1. How many times have you visited Lake Nakuru National park, in the last one year?________________

Q2. On average, how many days did you stay in this park during your last visit?______

(If only one day, how many hours did you spend in this park? _______________)

Q3. Which other park among the ones listed below did you visit in the last one year (including visits before visiting Lake Nakuru today?) and how much did it cost you?

<table>
<thead>
<tr>
<th>National Park</th>
<th>Days in the park</th>
<th>Travel Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Bus fare/ road transport (cost of fuel if self driven)</td>
</tr>
<tr>
<td>Maasai Mara NR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lake Bogoria NR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hells gate NP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Samburu NR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q4. What is your monthly expenditure on the following items? (Please provide a simple estimate)

1. House Rent/Mortgage: Ksh.____________________
2. Food and Non Alcoholic Beverages: Ksh.____________________
3. Transport/fuel cost: Ksh.____________________
4. Clothing and foot ware: Ksh.____________________
5. Communication/Mobile airtime. Ksh________________

Module III: Questions on the current Visit to Lake Nakuru National Park

Q5. In which City/Town/District do you live in Kenya and how much time and money did it cost you to travel to this park? (Please fill the table)

<table>
<thead>
<tr>
<th>City/town/district of residence</th>
<th>Time taken to Travel to park (hrs)</th>
<th>Bus fare/road transport (cost of fuel if self driven)</th>
<th>Entry fee</th>
<th>Other expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Nairobi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Mombasa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Kisumu</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Nakuru</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Other (Please specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q6. How many days will you spend in this park? _____ days

(If only one day, how many hours will you spend in this park? _____________hrs)

Q7. What is the main reason for visiting this park? (Please circle only one)

1. To view flamingoes  2. To view Wildlife  3. To enjoy wilderness
4. Other (specify________________________)
Q9. Which other park among the ones listed below are you going to visit after Lake Nakuru National Park? (Please fill the table on the expected number of days to spend in the park and the costs)

<table>
<thead>
<tr>
<th>National Park</th>
<th>Days in the park</th>
<th>If only 1 day, how many hours</th>
<th>Travel Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bus fare/road transport (cost of fuel if self driven)</td>
</tr>
<tr>
<td>(1) Maasai Mara NR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Lake Bogoria NR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Hells gate NP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Samburu NR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6) Other (please specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Q10. If the park manager invests more on this park to improve facilities, including development of new products, visitors like yourself would:

(a) Consider paying higher entry fees:

(b.) Visit Lake Nakuru National Park more often?

Q11. How would your enjoyment be affected if there were many other visitors in the park?
   1. Reduced  2. Unchanged  3. Increased

Module IV: Questions on Socio-Economic and Demographic Characteristics of the Respondent

Q12. Which year were you born? _________________________________

Q13. What is your highest completed level of formal education?
   (1) Primary/Elementary level
   (2) High School
   (3) University
   (4) Other (please specify _________________________)

83
Q14. What is your occupation?

1. Employed
2. Business/self employed
3. Retired

Q15. What is your monthly personal income after tax?

(a) Less than Ksh.20,000
(b) Ksh. 20,000 - 40,000
(c) Ksh.41,000 - 60,000
(d) Ksh. 61,000 - 80,000
(e) Ksh.81,000 -100,000
(f) Ksh.101,000 - 120,000
(g) Ksh.121,000 -150,000
(h) Ksh.151,000 and above

We sincerely appreciate your time and cooperation. This information will be of great help in finalizing the study and is for use for academic purpose only. Kindly, check to ensure that all the questions are answered. For more detail and further inquiries on the study, please find here below my email address and cell phone number.

Email: ptahchacha80@yahoo.com
Cell: +254-736-460-923
REFERENCES


