# FACTORS DETERMINING THE DEMAND FOR WATER RECREATION IN THE MIDDLE OLIFANT SUB-BASIN: A CASE STUDY OF LOSKOP RECREATION CENTRE IN SOUTH AFRICA

by

**LEDWABA LESETJA JACOB**

RESEACH DISSERTATION

Submitted in fulfilment of the Requirements for the degree of

**MASTER OF SCIENCE**

**in**

**AGRICULTURAL ECONOMICS**

in the

**FACULTY OF SCIENCE AND AGRICULTURE**

**(School of Agriculture and Environmental Science)**

at the

**UNIVERSITY OF LIMPOPO**

**SUPERVISOR:** Prof. A. Belete (UL)

**CO-SUPERVISOR:** Ms G.M Senyolo (UL)

**2010**

## ABSTRACT

The Middle Olifant Sub-Basin is one of the water stressed basins in South Africa, and competition for water among the population is one of the biggest challenges faced in the area. With the little water that the area has, it has to meet the demand for water use among small rural users, urban users, mines, industries, large-scale agriculture, forestry, and eco-tourism. The dissertation aims to identify the factors that determine the demand for water recreation in the Middle Olifant Sub-Basin, and to evaluate the relationship between the number of trips and the costs to the recreation site.

One recreation site was selected for the study. Simple random sampling was used to select 48 respondents from the study site. Data was collected from 48 respondents using a structured questionnaire. The data analysis using Descriptive Statistics and Multiple Linear Regression showed that there are factors that determine the demand for water recreation.

According to the results obtained from the Multiple Linear Regressions, water level in Loskop Dam and the race of the respondents are positively significant t, while fuel cost, type of transport, increase in water and the number of days stayed at the site were negatively significant. It was also found that most of the people who participate in water recreation at the site are white people. The demand curve from the Travel Cost Model also indicated that people who pay less for water recreation visit the site more often as compared to those who pay higher costs. This is confirmed by the law of demand, which states that; the higher the price of a given product at a time the lower the quantity demanded.

The above findings give an indication that the Department of Water Affairs and Forestry should consider issues around water recreation when distributing water and its resources. Eco- tourism too, has to make sure that it provides information about the importance of water recreation in order to attract more people and to stimulate growth of the Tourism sector. Furthermore the study highlights that the water recreation policy in

South Africa should also be effective in order to encourage more developments in water recreation.

## ACKNOWLEDGEMENT

I wish to express my gratitude and appreciation to my supervisors, Prof. Abenet Belete and Ms Grany Senyolo, and the following staff members in the department of Agricultural Economics Mr. J.J Hlongwane, and Mrs. Petronella Chaminuka, as well as my research guide, Mrs. T. Lintz. Thank you for your encouragement, guidance, support, motivation and constructive criticism and useful suggestions that made this research project an invaluable learning experience for me. May God the Almighty bless you abundantly, and continue to strengthen you in the production of prospective Giant Agricultural Economists

My sincere gratitude goes to the staff members in the School of Agriculture and Environmental science, for the support and knowledge they provided throughout my academic life at Turfloop Campus of the University of Limpopo. The Masters students in the Department of Agricultural Economics were a constant source of inspiration. Deserving special mention are K.T Badisa, T.G Shuma, N.S Molepo, S. Mphekgoane and R. Baloi.

Not forgetting the following students in the School of Agriculture and Environmental science:  A.M Mphateng, O Chuene, and D.C Mamorobela, “thank you for being there for me during thick and thin”. I would like to say thank you to Mr P.P Manamela who sacrificed his time and help in the collection of data for this study. May the glory of the Lord be with you. And to my friends N. Mac-Donald, T. Ledwaba and T.P Matlala, “keep on praising the Lord and He shall lift you up”.

I further wish to convey my sincere thanks and acknowledgement to the Industrial Development Cooperation of South Africa and the Water Research Commission for taking the responsibility of paying the costs for my studies at both undergraduate and post graduate level, respectively. This was not going to be possible without your assistance.

I am deeply indebted to my parents Junior Kgadi Ledwaba and Isaiah Madimetja Ledwaba; my brothers Walter Diboko and Mahlatse Atiba Ledwaba, my sisters Juslet Ramadimetja Seopa, Daphney Sekati Ledwaba, Livea Mapitsi Ledwaba and Mavis Nkwe Ledwaba and especially the Seopa family, “thank you for your support, motivation and the everlasting love, you did show that blood is thicker than water***. A ke pula tsa medupi dire ge di ena  le lena di le nele”.***

Lastly, I would like to thank GOD for courage, strength, and guidance to complete this project. “TO YOU LET IT BE THE GLORY”

**Lesetja Jacob Ledwaba**
**University of Limpopo**

## DECLARATION

I declare that the mini dissertation hereby submitted to the University of Limpopo for the degree of Master of Science in Agricultural Economics has not previously been submitted by me for the degree at this or any other university; that it is my own work in design and execution, and that all materials contained herein have been duly acknowledged.

______________________ ______________________

Initials in Surname (title) Date

Student Number: ___________________

## DEDICATION

To my brother (Walter Diboko Ledwaba)

My mother (Junior Kgadi Ledwaba)

My father (Isaiah Madimetja Ledwaba)

My sister (Juslet Ramadimetja Seopa)

My sister (Daphney Sekati Ledwaba)

As well as all those people close to me

**TABLE OF CONTENTS** **PAGE**

CHAPTER 5: FACTORS DETERMINING THE DEMAND FOR WATER RECREATION IN LOSKOP DAM RECREATION CENTRE



CHAPTER 6: SUMMARY, CONCLUSION AND RECOMMENDATION

## LIST OF TABLES

**Tables** **Pages**

## LIST OF FIGURES

**Figure** **Pages**

## ACRONYMS

DWAF : Department of Water Affairs and Forestry

DEAT : Department of Environmental Affairs and Tourism

IWRM : Integrated Water Resource Management

NWA : National Water Act

MLR : Multiple Linear Regressions

TCM : Travel Cost Model

# CHAPTER 1: INTRODUCTION

## 1.1 Background

According to WALLGREN (2000) the Middle Olifant Sub-Basin of South Africa consists of about 2,500 dams for water storage and control, 31 of which are major dams. The construction of these dams has contributed to the economic growth of this area through investment in various sectors. The water in the area is used for both consumption and non-consumption, and mostly used for the industrial purposes in the mining sector, agricultural activities, household consumption, and recreational activities (Wallgren, 2000).

Water related developments may be very important for the future economic growth of the Middle Olifant Sub-Basin. The water projects provide recreational opportunities that generate tourism and support industries. In Sabine basin (1997) Tourism and Ecotourism associated with nature activities was found to be a potential means of economic growth and visitors in the basin in 1997 generated approximately $450 million to the local economy, much of which was attributed to Eco-tourism.

Growth and development of an industry such as Ecotourism may heavily depend on the availability of information about its demand. Adequate information about the demand for water recreation plays a very important role for policy makers and planners when making decisions about investments in the tourism sector. Unfortunately, most of the researches about water recreation focus more on beaches than water catchments, generating the information that will be much useful for the development in the coastal areas (beaches) than in the water catchments (Sabine Basin, 1997).

According to Hudson and Edington (2004), the term recreation is thought of as a process that “restores or recreates” the individual. It stems from the Latin word “recreātiō”, which means “to refresh”. Thus, the historic approach of defining recreation is to consider it as an activity that renews an individual for work. This approach to defining recreation has several limitations, one of which is the fact that many individuals do not view recreation as an element related to work or used to enhance an individual's job performance.

Thus, as one can see, recreation tends to be defined as a purposeful, wholesome activity. Recreation, from a contemporary standpoint, is viewed as assisting individuals to have positive leisure experiences that renew their spirit, restore their energy and rejuvenate them as individuals. Recreation is also often linked with specific types of activities, such as games, arts, crafts, outdoor recreation and others. It is assumed that people participating in such activities are recreating.

### 1.2 The recreational use of water

According to Gelt (1995), the recreational use of water has not always ranked very high among water use priorities. In fact, recreational activities are generally by-products of other types of water use. For example, the Loskop Dam was initially built to provide for the irrigation needs of farmers in the Olifants, Moses and Elands River valleys and now the resulted lake is available for recreation. Further on, recreation is considered a secondary water use, partly because it is mainly non-consumptive, while consumption traditionally defines legitimacy of water use. Again, the benefits of water recreation are neither always readily apparent, nor easily measured.

Recreation is however, not a lesser activity simply because its rewards and benefits are generally intangible. Someone who spends time and resources washing a car has the tangible benefit of a clean car to drive (Gelt, 1995). In contrast, a day of sailing provides nothing in hand, but, instead, offers refreshing experiences and pleasant memories. This, in actual fact, is the purpose of recreation: to recreate or to renew.

Water recreation offers special rewards, different from, say, what is achieved through playing tennis. Tennis is played on a clay court; water recreation by definition occurs on, in, or by water, an element with emotional, aesthetic or/and even spiritual appeal. Water recreation makes people feel the aesthetic and therapeutic value of water. They may even discover water as a close-at-hand alien environment, a world apart from the solid objects of every-day life (Gelt, 1995). Thus, water recreation offers indulgence and immersion, in the power and mystery of water.

According to Department of Water Affairs and Forestry (DWAF, 1964) water recreation means the use of water for recreation purposes, which includes all the activities that require the use of water including water surface. Tourism, sport and leisure, as the broad recreation industry, have developed into the largest sector worldwide, and are receiving increased focus and attention in South Africa. Often this industry utilizes water as an integral part of its activities, and thus, as the industry grows and diversifies, it can be expected that the demand for water-orientated recreation will intensify (DEAT, 1998).

In order to ensure the sustainability of an industry utilizing water for recreational purposes it is imperative that the water resource be protected, and that the utilization thereof be based on sound management, while ensuring equitable benefits to the affected communities. Increased pressure for governmental intervention will occur in order to ensure sustainability through a clarification of policy regarding equity, resource management, protocols and guidelines.

### 1.3 Water as a tug-of-war

Water is one of the most vital natural resources for all life on earth. The availability and quality of water always play an important role in determining not only where people can live, but also their quality of life. Even though there has always been plenty of fresh water on earth, water has not always been available when and where it is needed nor is it always of suitable quality for all uses (Solley *et al.,* 1998). In this regard, water is a finite resource that has limits and boundaries to its availability and suitability for use.

The balance between supply and demand for water is a delicate one. The availability of usable water has and will continue to dictate where and to what extent development will occur. Water must be in sufficient supply for an area to develop, and an area cannot continue to develop if demand for water far outstrips available supply. Further, water supply will be called upon to meet an array of off-stream uses (in which the water is withdrawn from the source) in addition to in-stream uses in which the water remains in place (Howard, 1998). Figure 1.1 below represents the demands on water as a tug-of-war among the various off-stream and in-stream uses.

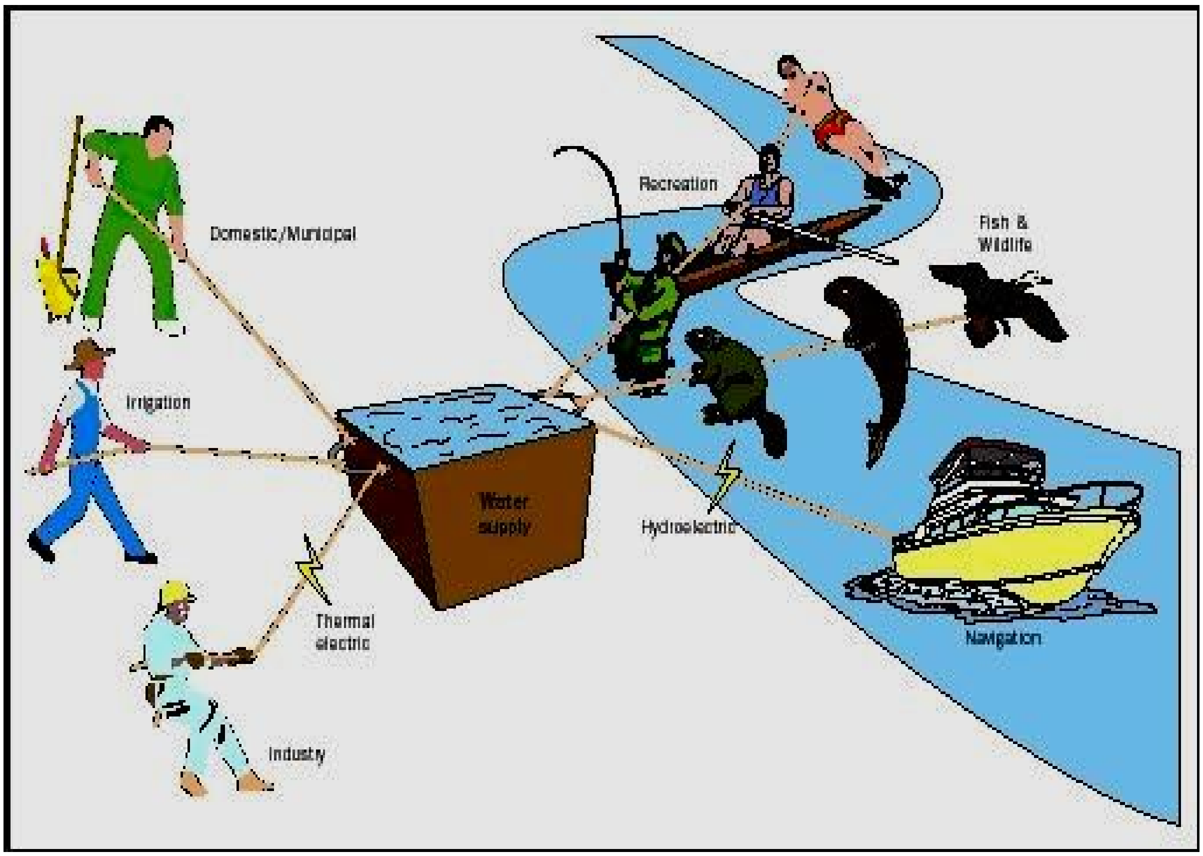


Figure 1.1: Water as a tug of war

Source: http://www.waterencyclopedia.com/Tw-Z/Uses-of-Water.html

Figure 1.1 shows water as a tug of war. Off-stream uses (depicted on the left) are those in which water is removed from its source, either by pumping or diversion (Solley *et al.,* 1998). In-stream uses (depicted on the right) are those in which water remains in place, and typically refers to stream (rather than groundwater). Where water supply is limited, conflicts may result between and among the various users.

Traditionally, water management in many countries focused on expanding or manipulating the country's supplies of fresh water to meet the needs of users. A number of large dams were built during the early twentieth century to increase the supply of fresh water for any given time and place. This era of building large dams has passed. In the twenty-first century, the finite water supply and established infrastructure require that demand be managed more effectively within the available sustainable supply (Solley *et al.,* 1998). Water-use information can be used to evaluate the impacts of population growth and the effectiveness of alternative water management policies, regulations, and conservation activities.

## 1.4 Problem statement

Little information exists about the factors determining the demand for water recreation in most of the water catchments of South Africa. This inadequate information possibly contributed to the slow growth and development of Eco-tourism in most of the water catchments in the country. Policy makers and planners do not have the required information to make necessary decisions, which will stimulate growth and attract investment in the tourism industry. This study will attempt to fill in the niche in this field. Hence the research investigates factors determining the demand for water recreation in the Middle Olifant Sub-Basin.

## 1.5 Motivation for the study

The results of the study will help in providing information about the demand for water recreation in the Middle Olifant Sub-Basin, recommend the strategies that will help to improve water recreation and ensure proper water use and distribution for the benefit of all water users.

The study will contribute to the development of the tourism sector and also assist policy makers and planners to make informed decisions, especially with regard to the distribution of scarce resource (water) among different users and to trigger growth and investments in water recreation. The higher level of investment will also help to attract more visitors to the sites and contribute to job creation.

## 1.6 Aim and objectives

- **Aim**

The overall goal of this study is to estimate the parameters determining the demand for water recreation and the relationship between the number of trips and the costs to the Loskop Dam recreation site of the Middle Olifant Sub-Basin.

**The objectives of the study are:**

- To estimate the parameters that determines the demand for water recreation in the Middle Olifant Sub-Basin.
- To estimate the relationship between the number of trips and the costs to the recreation site.

## 1.7 Hypothesis

- Factors such as water level in the dam, race of the respondents and the fuel cost to the site do not determine the demand for water recreation.
- There is a negative relationship between the number of trips and the costs to the Middle Olifant Sub-Basin Recreation site (Loskop Dam Recreation Centre).

## 1.8 Organization and structure of the study

This study is structured into six chapters, where chapter two provides the state of water research in South Africa, chapter three describes the analytical methods used (research methodology) in the study, and chapter four outlines the descriptive statistics. Chapter five explains the factors determining the demand for water recreation in the Loskop Dam Recreation Centre, while chapter six is summary, conclusion and recommendations.

# CHAPTER 2: WATER AND RECREATION IN SOUTH AFRICA

## 2.1 State of recreation in South Africa

According to the Department of Sport and Recreation (2005), recreation is defined as "a process of voluntary participation in a wide variety of activities that are undertaken during leisure times and contributes to the improvement of general health and well being of both the individual and society". This implies that policies for using water for recreational purposes are focusing on the impacts of the activities on water quantity and quality and not on the activities.

In addition to the guidance of the National Water Act of 1998 (Act No 36 of 1998), a policy is required to ensure that the National Government through the Department of Water Affairs and Forestry (DWAF) can provide explicit direction and guidance regarding water use, thereby creating a viable environment for unlocking the potential of this use and associated industry in a sustainable manner.

The DWAF is mandated as the lead organization concerning the regulation and management of the use of water for recreational purposes. The Directorate Social and Ecological Services is the lead directorate within the DWAF, responsible for policy and protocol formalizations and support concerning the use of water for recreational purposes (De Jong, 1992). The management and control of the use of water for recreational purposes is expected to achieve the purpose of the National Water Act (Act No 36 of 1998) which ensures that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors.

The basis for regulating water use is defined in the National Water Act of 1998, specifically dealing with the various types of licensed and unlicensed entitlements to use water, inclusive of recreation. However, given that the functional areas of concurrent national and provincial legislative competence comprise inter alia tourism, and that of exclusive provincial competence, provincial recreation and associated amenities, the responsibility for sustainably managing this water use, and the various aspects of this industry, will not only reside with the DWAF but also with other spheres of government and delegated authorities in a co-operative manner (DWAF, 2002).

According to Fedali (1997), a survey conducted in Walker River Basin in 1996, indicated that a 10% decrease in water level over all seasons in catchments would reduce the original number of trips taken by the population by 31%; from 1483 to 1029 total trips. This estimate may suggest that the recreationists are sensitive to changes in the level of water in the dam. That is, recreationists would likely substitute some of their trips with other water sites in the surrounding areas.

## 2.2 Water in South Africa

South Africa is extraordinarily rich in natural resources, except for water. Water is a vital but scarce resource; distributed unevenly in time (frequent droughts alternate with periods of good rainfall) and space (the eastern-half of the country is markedly wetter than the western half). Increasing demand for water, and decreasing water quality make careful water management a priority in South Africa (DWAF, 2002). It is estimated that by the year 2025, South Africa's human population will be far more than it is today, and there will be insufficient water for domestic use, agriculture, and the recreation sector.

The National Water Act (1998) in South Africa defines water resource as a public good belonging to all people. However, looking at the current inequitable allocation due to geographic characteristics and also owing to the discriminatory practices of the apartheid period, it insists on the need for an integrated management and strong institutional framework for water services provision in order to redress past inequities.

## 2.3 An ecosystem approach to Integrated Water Resource Management (IWRM)

IWRM has made its way to the forefront of environmental research very much in conjunction with the concerns about sustainability (Voinov and Costanza, 1998) and the recognition that existing administrative and socio-geographic boundaries are not able to account for both the socio-economic and ecological features of existing systems. It is suggested that catchments (watersheds or river basins) provide an alternative to existing system boundaries, as they may account for both the ecological and socio-economic properties of an area (Reid and Ziemer, 1997; Voinov and Costanza, 1998; Klaphake *et al*,. 2001).

The concept of catchments as basic management units imply that certain geographical characteristics, such as topography, delimit the area not only with respect to water, but also with respect to other media flows such as energy, material and information. The flow of water serves as an indicator of the relief and landscape characteristics, on the one hand, and as an integrator of many of the processes occurring within the catchment, on the other. The catchment area boundaries may influence local atmospheric transport and local climate, migration flows and the associated patterns of species distribution, as well as dispersion flows of water pollution (Voinov and Costanza, 1998).

The use of catchments as management units may also account for other factors of both ecological and social origin. Historically, human settlements have tended to be located towards sources of water in southern Africa and most often, those water sources are rivers. Consequently, much of the human population and the associated anthropogenic pollution, and other forms of environmental stress are often tied to the river network (Voinov and Costanza, 1998). The assumption that the catchment area offers an optimal spatial scale for the management of ecosystems may not necessarily be valid, however, it has become accepted that catchments offer a good compromise as spatial units on which to focus management strategies.

The hierarchical structure of catchments, sub-catchments and sub-sub-catchments is very useful for upgrading or downgrading scale, "zooming" in and out, changing resolution, depending upon the type and scale of the managerial problems to be resolved. Furthermore, the view of a catchment area as a hierarchy of nested sub-catchments is compatible with the view of an ecosystem as a hierarchy of nested smaller ecosystems.

In the past, South African approaches to water resources management followed a typical command and control type approach where the focus was on controlling the hydrological cycle, largely through construction of dams, in order to harvest its goods and services, and reduce its threats, and thus produce predictable outcomes. It was thus noted that this type of top–down approach to management of natural resources inevitably results in a reduction in the natural range of variation of ecosystem properties and processes as well as decline in both the services provided and the resilience of the system (Holling and Meffe, 1996).

Furthermore, aspects of the system where quantitative understanding is relatively poor, such as ecological functioning, may have largely been ignored in the decision-making processes. This may have been due to no or less scientific ability to understand and predict such interactions, than the ability or willingness of policy makers and planners to accommodate ecosystem dynamics, especially, when expressed by non-quantitative means.

The management of water resources to maximize consumptive water use is slowly giving way to a realization that management for environmental values, such as biodiversity, and social and cultural values is necessary (Cortner and Moote, 1994). This is typical of the change in the way that natural resources are now managed; a fundamental shift from, in this case, water resources management performed by a single statutory organization, possibly based on static information from a large systems analysis type of simulation model, to an approach to management that recognizes the importance of the stakeholders, including the environment in the process and the inevitability of change and uncertainty.

In the ecological field, this shift in the management approach found expression in the form of “adaptive management” (Holling, 1978), which is widely advocated as the paradigm which natural resource managers should adopt. It is built on a recognition that ecosystems are complex systems, which are “adaptive”, or “self-organizing” and that management systems must be able to adapt to change or surprise in the system. In this context management must be both anticipatory and adaptive (Kay, 1997).

Therefore, in South Africa, the promulgation of a new National Water Act (NWA) in 1998 created an enabling environment for an ecosystem approach to management of water resources. Guidelines developed for the implementation of the NWA show that adaptive management concepts are becoming embedded in South African water resources management approaches, although some have cautioned that the rush to implement the Act could lead to these principles being compromised (Rogers *et al*., 2000).

### 2.4 Rainfall and dams in South Africa

With a mean annual rainfall of approximately 450 mm, South Africa is regarded as semi-arid. There is, however, wide regional variation in annual rainfall, from less than 50 mm in the Richtersveld on the border with Namibia, to more than 3000 mm on the mountains of the South Western Cape, even though only 28% (Schulze, 1997) of the country receives more than 600 mm. Annual rainfall distribution is skewed such that there are more below average than above average rainfall years. Rain does not always fall were it is most needed, and some areas of high demand, such as Gauteng, receive less water than needed. Most rain falls in the narrow belt along the eastern and southern coasts.

About half of South Africa's annual rainfall is stored in dams. There are about 550 government dams in South Africa with a total capacity of more than 37000 million $m^3$ (De Jong, 1992). Dams have both positive and negative impacts. They can be beneficial for people in that they regulate the flow of a river, reduce flood damage and contribute to perennial rather than seasonal flow. In addition, sediment is deposited in a dam, and the growth of aquatic plants means that nutrients are removed from the water. As a result, it is likely to be true that water leaving a dam may be cleaner than water entering it.

The riverine ecosystem is usually affected negatively by a dam. Alterations in flow regime (quantity of water and timing of periods of high and low flow), temperature and water quality may cause reductions in biodiversity of riverine organisms below dams. Reduction in water flow reduces the river's scouring ability and this can lead to silting of estuaries.

According to De Jong (1992), South Africa's landscape is not well suited to dams. There are few deep valleys and gorges, with the result that most dams are shallow with a large surface area. Together with the hot, dry climate, this results in much water evaporating from dams. In addition, the high silt load (a result of an arid climate, steep river gradients and poor farming methods) of our rivers means that the capacity of South Africa's dams is quickly reduced as they become silted. The rivers of the Western Cape for instance carry relatively less silt than those in the rest of the country.

### 2.5 Water quality and pollution in South Africa

Healthy streams and rivers support a wide variety of water life. Rainwater and cool, tumbling mountain streams contain high levels of oxygen. Low concentrations of nutrient substances which are washed into the system provide both key growth chemicals (such as nitrates) and food (like rotting plants – detritus). Water plants, in turn, produce photosynthesis to provide more life supporting oxygen and food sources for water organisms (DWAF, 2002). All of these actors interact as a complex web of life both within the river itself and in its surrounding catchments. Much human activity has unfortunately, disrupted these ecological processes and degraded water quality.

It is a well known fact that water gives life. It waters the fields of farmers; and the stock and crops of communities; it provides recreation; generally electricity for our town and mines and industries; and provides food for the plants and animals that make up our natural heritage. Reliable, safe drinking water, water for sanitation and hygiene and water for crop production is critical for alleviating poverty in South Africa. Rural development and urban renewal both depend on water to achieve their goals (Department of Water and Forestry, 2002).

According to the Department of Water and Forestry (2002), before the promulgation of the National Water Act (Act No. 36 of 1998), water use was based on riparian and prior appropriation doctrines through a system of permits and/ water rights defined and undefined. The National Water Act (NWA), has transformed the way water is controlled, from a system of rights based on land ownership to a system designed to allocate water equitably in the public interest.

The progressive reallocation of water to sectors of society that were previously excluded from access to water can help to bridge the divide between the first and the second economies, whilst maintaining existing beneficial water uses and encouraging the greater efficiencies needed in our dry country (DWAF, 2002).

This should be done in a manner that ensures that an acceptable balance between the use of water resources and the protection of integrity and diversity of aquatic environment are achieved. The main responsibility of the Department of Water Affairs and Forestry is to ensure that sufficient water describe and account for, using the same approaches and techniques as for other aspects of acceptable quality and equitable resources is available to meet basic human needs and to support economic and social development.

Industrial and agricultural pollutants common in South Africa include agricultural fertilizers, silt, toxic metals, litter and pesticides. These pollutants affect aquatic ecosystems and human health. Disease-producing bacteria are common in urban waste water, particularly from informal settlements that lack sewage and water purification facilities (DWAF, 2002). For example, typhoid, cholera and gastroenteritis are transmitted by water contaminated with untreated sewage.

### 2.6 Demand and supply for water recreation

It is possible, and frequently helpful to regard the demand for and supply of recreation facilities in the same way as that of the other products. There are service providers of recreation, and there are customers and each has a particular pattern of location, within the economy (Brown, 1967). There are however, a few differences. For many recreational activities and mostly those taking place outside the home the customer has to travel to the place where the product is produced.

We do not have to travel to the factory or to the farm in order to consume its products, but to enjoy recreation the customer frequently has to travel to the usually immobile point of production, whether this is a beautiful stretch of country side or a historic town. This makes the demand more important than it is for other goods and services we consume (Seneca, 1969). When considering recreation in relation to other services, it is not only non-transportable but also non-storable, which then implies that the importance of the location of demand and supply, and customer and product in relation to each other is obvious.

The immobile and non-storable supplies catering for a demand that is mobile but has a limited range may lead to problems of overcrowding or under utilization of the resources. The reason here remains that too many or few visitors at a particular time to the beach, picnic site or Local Park at particular time cannot easily be served by moving the recreational opportunity to another place or time; or by adding or drawing upon accumulated stock of the product.

This inflexibility in supply would not matter that much if the demand for recreation does not itself vary so greatly through space and time. Unfortunately, recreational demands of people are highly concentrated in particular places, and highly packed at particular times. Therefore, these spatial and temporal patterns of demand are fundamental to the problem of adequacy of recreational provision, or more simply to the problem of providing what we want, where we want it.

The whole argument is sharpened, and the necessity of equating demand and supply is made more essential by the realization that recreation is rather more than just another economic service provided by the free market (Mack and Myers, 1965). Instead, the government and the people it represents, has come to accept the idea that recreation is good for the individual, and by extension good for the society as a whole.

It is also important to note that recreation has had a welfare aspect ascribed to it for some time (Brown, 1967). This has made the equating of supply and demand a matter of public concern, and has led public authorities to stimulate demand in some cases, and to take some responsibility for providing, and frequently subsidizing, some chosen types of recreational activities.

## 2.7 Summary

Water recreation plays an important role in providing aesthetic beauty to the recreationists, and it also boost the economy of a country through job creation. In most cases, the tourism sector faces the challenges of inefficient water allocation between it and other water users. This is mainly because this industry does not use water to produce something that can be bought and consumed or be sold to other people.

# CHAPTER 3: RESEARCH METHODOLOGY

## 3.1 Introduction

This chapter outlines the research methodology that was used to collect data and analysing parameters that are considered in identifying the factors that determine the demand for water recreation in the Middle Olifant Sub-Basin (Loskop Dam). It also provides a short description of the study area, data collection methods, sampling and instruments used in the data collection.

## 3.2 The study area

The Loskop Dam, built on the farms of Loskop and Vergelegen, is situated on the Olifants River, approximately 32 kilometres south of Groblersdal, Mpumalanga, where the river flows through a narrow gorge. The Olifants River rises near Bethal in the South Eastern Mpumalanga and flows in a northerly direction as far as Middelburg before turning north-west towards the Loskop Dam. The Wilge River, which is the main tributary, has its confluence with the Olifants River 24 kilometres upstream of the dam wall.

The largest part of the catchment area is situated on the Highveld plateau at an altitude of more than 1 500 metres above sea level; the remaining part is on slopes of the plateau in the Lowveld. The most important towns in the catchment area are Middelburg, Bethal, and Delmas. The mean annual runoff is approximately 451 million $m^3$. The catchment area of Loskop dam is 12 300 $km^2$ and at full supply level its surface area is 2350 ha. The dam basin is underlain by felsitic rock which is extensively jointed.
Loskop Dam is a popular picnic and holiday resort. It is a paradise for fresh-water angling in a lovely sub-tropical climate. The Dam falls within the Loskop Nature Reserve where aquatic animals such as crocodiles and hippopotamus can be seen.

## 3.3 Method used in data collection

The data in this study was collected using a structured questionnaire which was developed based on the knowledge of the recreationists and their recreational activities at the site. The developed questionnaire was structured in such a way that respondents would be able to demonstrate their demographic characteristics, the travel activities and expenditure characteristics, as well as the characteristics of the various activities.

## 3.4 Sampling

From the information obtained from the management of the recreation site (Forever Resort of Loskop dam), the number of people visiting the site varies according to seasons. The recreation site is able to receive 300 to 500 visitors per day during summer, and this may even increase to 1000 when there are competitions taking place at the site. Between 300 and 400 visitors are received during winter times, which is the time that the survey was conducted. The study used simple random sampling, whereby a sample size of 48 respondents was randomly selected from the population size of between 300 to 400 people. This variation is caused by the fact that when other people were leaving, others were arriving at the site.

## 3.5 Methods used in data analysis

The Statistical Package for Social Sciences (SPSS) for Windows was used to analyze data. Descriptive Statistics (means, frequencies, and standard deviations) were calculated. Multiple Linear Regression was used to estimate the parameters of the demand of water recreation. The Travel Cost Model was used in evaluating the relationship between the number of trips and the costs incurred when accessing the site.

### 3.5.1 Multiple Linear Regression

Multiple Linear Regression is used in this study to answer the objective number one of the study, which is to estimate the factors determining the demand for water recreation in the Middle Olifant sub-basin (Loskop Dam). According to Woodhouse (1999), Multiple Linear Regression (MLR) is a method used to model the linear relationship between a dependent variable and one or more independent variables. The model is suitable such that the sum-of-squares of differences of observed and predicted values is minimized. By estimating and measuring relationships the model provides a better understanding of what is happening in the recreation site.

- **General model**

The basic Multiple Linear Regression model with the independent variable r and the multiple regressors is represented as:

$r = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_{3} + \ldots + \beta_n X_n + U$

Where: r is the number of trips taken by the respondent in a season to the site.

$X_{1\ldots} X_n$ are explanatory variables

$\beta_{0\ldots} \beta_n$ are the parameters

U… is the disturbance term

### 3.5.2 Travel cost model (TCM)

The TCM is a means of determining value figures for things which are generally not bought and sold, and therefore fall outside the market's pricing system (Adamowicz., *et al*. 1994). The non-market assets which it is most often applied to are 'recreational resources which necessitate significant expenditure for their enjoyment.' This means that the TCM is often used to assess the value of parks, lakes, and similar public areas which host a good deal of recreational activities, and which are significantly far away from many people to require users to drive or fly to the site.

The basic premise of the TCM is that, although the actual value of the recreational experience does not have a price tag, the costs incurred by individuals in travelling to the site can be used as surrogate prices. The weak complementarities of the goods required for travel to the site make it possible to estimate a demand curve for the site, and from it, a measure of the site's consumer surplus can be found (Smith and Kaoru, 1990).

There are also some variations of the travel cost models that can be used in valuing the changes in site characteristics such as improved water quality on a lake such as an increase in the number of hiking trials in a wildness area (Kealy and Rockel, 1990). Examples of these models include; Contingent Valuation and Conjoint Analysis which are examples of Stated Valuation Techniques. We also have the Revealed Preference approach which is divided into Hedonic Wage studies and Hedonic Pricing technique.

The Revealed Preference Method is the most widely used multiple site model. A Revealed Preference model considers an individual's discrete choice of one recreation site over a set of many possible sites. The Stated Preference techniques are used to measure the value of an environmental resource by looking at how people's actual behaviour change as levels of environmental quality changes (Smith and Kaoru, 1990).

It is important to note that consumer surplus figure is a measure of the user value of the site only, and does not necessarily measure the site's environmental or intrinsic value. The single site Travel Cost Model is employed in the study. The single site model is a demand model for trips to a recreation site by a person over a season.

The Travel Cost Model in this study is employed to evaluate the relationship between the number of trips to the site and the cost to site; this evaluation is conducted using a demand curve. According to Provencher and Bishop (1997), TCM is widely applied to estimate the economic benefit of non-market resources for site-specific recreational activities. This method is also a means of determining the demand for things which are generally not bought and sold, and therefore, fall outside the market pricing system. The basic travel cost model for a single site of dependent variable r with the multiple regressors is represented as:

$r = f\ (X_1, X_2, X_3, \ldots, Xn)$

Where: r is the number of trips taken by a person in a season to the site.

$X_{1\ldots}\ X_n$ are explanatory variables

- **Specific model**

To estimate the relationship between the number of trips and costs to the site, and the factors determining the demand for water recreation, demand is specified as a function of demographic variables, travelling factors, and recreation factors and it will be measured using the number of trips respondents take to the recreation site (NTRP) such as;

$NTRP = f\ (\beta_0 + \beta_1 RACE + \beta_2 NPPLCM + \beta_3 FUELCST + \beta_4 TYPETRAN + \beta_5 TIMETRAV + \beta_6 WTERQLTY + \beta_7 WTERLVDM + \beta_8 HOURSTAD + \beta_9 ICRWLVL + \beta_{10} SWIMNG + \beta_{11}\ DAYSSTAY)$

Where:

NTRP = Number of trips t

RACE = Race of the respondents

NPPLCM = the number of people that the respondents come with to the site

FUELCST = Fuel cost from the respondents' residence to the recreation site

TYPETRAN = Type of transport used by the respondents

TIMETRAV = time travelled by the respondent to the recreation site

WTERQLTY = Water quality in the dam

WTERLVDM = water level in the dam

HOURSTAD = Hours stayed by the day visitors at the site

ICRWLVL = Increase in water level in the dam

SWIMNG = Swimming activity at the site

DAYSSTAY = Days stayed by the respondents at the site.

Most of the variables included in the empirical model were chosen based on theory and evidence from the past studies. Some variables were, however, included based on a hypothesized relationship with the dependent variable. Many past studies have demonstrated the characteristics of recreation sites such as finding that the water level in the dam affects the number of trips to the site (Fedali *et al*., 1997).

Table 3.1: Description of variables

| **Variables** | **Description** | **Unit measure** |
|---|---|---|
| **Dependent variable** | | |
| NTRP | Number of trips to the recreation site per year | Number |
| **Independent variables** | | |
| **Demographic factors** | | |
| RACE | 1 if the race of the respondent is white 0 otherwise | Dummy |
| NPPLCM | Number of people coming with to the site | Number |
| **Travelling factors** | | |
| FUELCST | Costs of fuel paid by the recreationists to Loskop Recreation Centre | Rand |
| TYPETRAN | Time travelled to the site | Hours |
| TIMETRAV | 1 if the respondent used private transport 0 otherwise | Dummy |
| **Recreation factors** | | |
| WATERQUTY | 1 if there are water quality problems 0 otherwise | Dummy |
| WATERLVDM | 1 if changes in the level of water in the dam influence the response's decision to visit the site 0 otherwise | Dummy |
| HOURSTAD | Number of hours stayed at the site ( day visitors) | Number |
| ICRWLVL | 1 if the respondents come more often to the site because of increase in water level, 0 otherwise | Dummy |
| SWIMNG | 1 if the respondent participates in swimming, 0 otherwise | Dummy |
| DAYSTAY | Number of days stayed at Loskop Recreation Centre( long staying visitors) | Number |

### 3.6 Summary

This chapter outlined the research methodology that was used to collect data as well as analysis of the parameters. Three research techniques which include descriptive statistics, Multiple Linear Regression and the Travel Cost were used in conducting the study. A single site was used as the study area which is Loskop Dam Forever Resort, and a sample size of 48 respondents was selected and interviewed.

# CHAPTER 4: CHARACTERISTICS OF THE RESPONDENTS AND WATER RECREATION AT LOSKOP DAM RECREATION CENTRE

## 4.1 Introduction

This chapter is aimed at providing some information about the characteristics of the respondents and water recreation in Loskop Dam Forever Resort of South Africa. The information given below is derived from the descriptive analysis as well as the frequencies of the data collected as described in chapter 3. In this chapter, the demographic characteristics of the recreationists, the travelling characteristics, and the recreational characteristics are discussed. The results are provided in tabular forms and charts, and all of them are interpreted in terms of percentages, minimum, maximum and means.

## 4.2 Demographic characteristics

### 4.2.1 Race of the respondents

Figure 4.1 shows the race of the respondents. The results show that 75% of the people visiting the site are white people while 25% of them are black people. From the sample size that was used for this study, it implies that white respondents where dominating the people who visited the site at the time that the survey was conducted. This may imply that white people participate more often at the Loskop Recreation centre, as compared to the blacks.

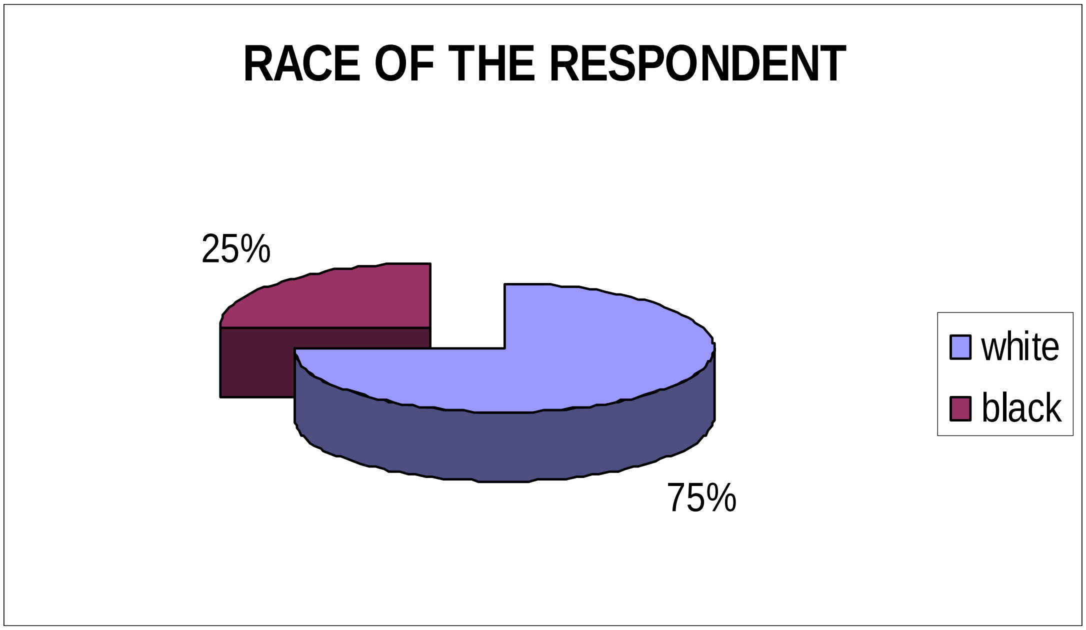


Figure 4.1: Race of the respondents

### 4.2.2 The number of people that the respondent comes with to the site

The number of people that the respondent comes with to the site may have the influence on demand for water recreation. Table 4.1 indicates the average number of people the respondent comes with to the site. The results show that on average, the respondents come along with 7 people to the site. The minimum number of people that the respondents come with to the site is 1 while the maximum is 40 people**.** Those respondents coming along with 40 people may be because they manage to hire transport to the site, during holidays.

**Table 4.1: The average number of people the respondent comes with to the site**

| | N | Mini | Maxi | Mean | Std deviation |
|---|---|---|---|---|---|
| The number of people the respondent comes with to the site | 48 | 1 | 40 | 7 | 6.679 |

## 4.3 Travelling characteristics

### 4.3.1 The cost of fuel paid by the respondent to Loskop Recreation Centre (per person, per day) and the time travelled to the site

The travelling costs to the recreational sites play a vital role in determining the number of trips taken to the site, and it may as well impact on the recreation sites that the respondents may want to visit. Table 4.2 shows the average costs of fuel paid by the respondent for a one round trip to the Loskop recreation site. The results show that on average, costs for fuel to the recreational site is R420.95, while the minimum and maximum cost for fuel are R10 and R1000 respectively for a one day trip. These might discourage the respondents who stay far from the Loskop Dam Recreation Site to do more visits in a season, since they incur more costs of fuel as compared to the respondents who stay next to the recreation site.

The variable time travelled to the recreational site may have a positive influence on demand for water recreation, especially to the respondents who enjoy doing sight-seeing along the way. Table 4.2 shows the average time travelled from the household residence to the Loskop Recreational Site. The results show that respondents who stay near the site travel a minimum time of 0.5 hour, and the maximum time is 4.5 hours while the average time travelled is almost 1.5 to 2 hours to Loskop Dam.

**Table 4.2: The average cost of fuel paid by the respondent to reach the site in Rand and the average time spend on the way**

| | N | Minimum | Maximum | Mean | Std deviation |
|---|---|---|---|---|---|
| Fuel cost | 42.00 | 10.00 | 1000.00 | 420.95 | 257.746 |
| Time travelled | 46 | 0.5 | 4.5 | 1.6 | 0.9094 |

### 4.3.2 Type of transport

Figure 4.2 shows the type of transport system that the respondents use to visit the site. It is found that 98% of the respondents use private transport to visit the site, while only 2% of the total sample size uses public transport. This may imply that people who do not have their own transport are likely not to visit the water recreation at the Loskop Recreation Centre.

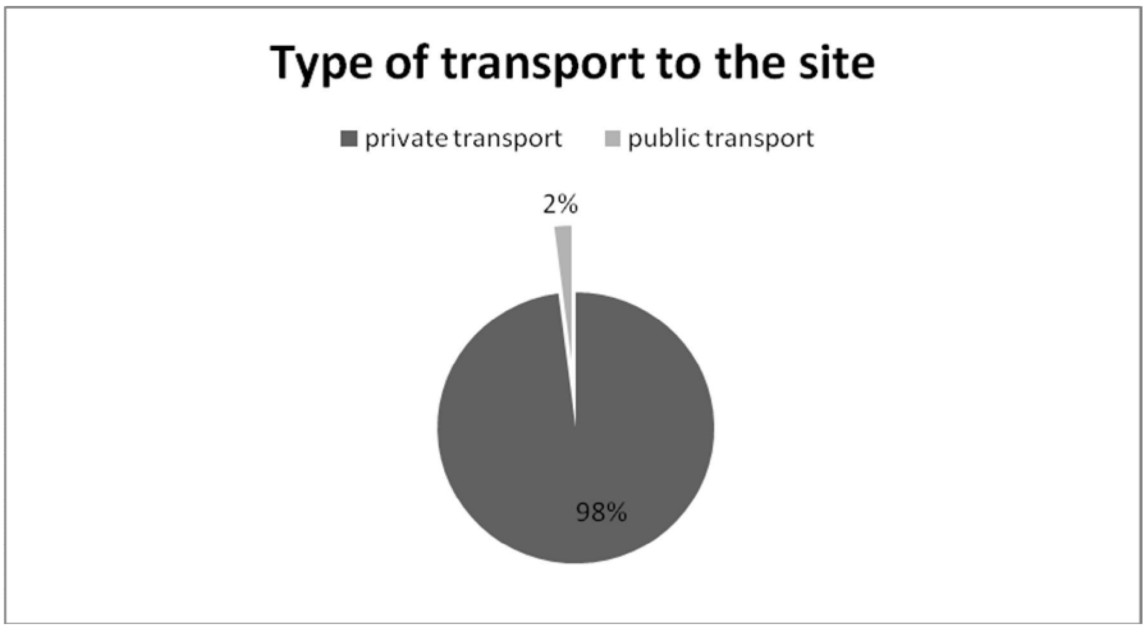


Figure 4.2: Type of transport to the site

## 4.4 Recreation characteristics

### 4.4.1 Level of importance for swimming

Swimming is one of the hobbies that is mostly practiced by people in most water recreational areas and is expected to have impact on the demand for water recreation. Figure 4.3 shows the level of importance for swimming at Loskop Recreation Centre. The results indicate that 92% of the respondents visit the site for swimming. About 6% and 2% of the respondents find swimming to be important and not important respectively. Perhaps this may imply that swimming is one of the important recreational activities that attract more visitors to the site, and it can be used as one of the important marketing tool for the water recreational in the Loskop recreation centre.

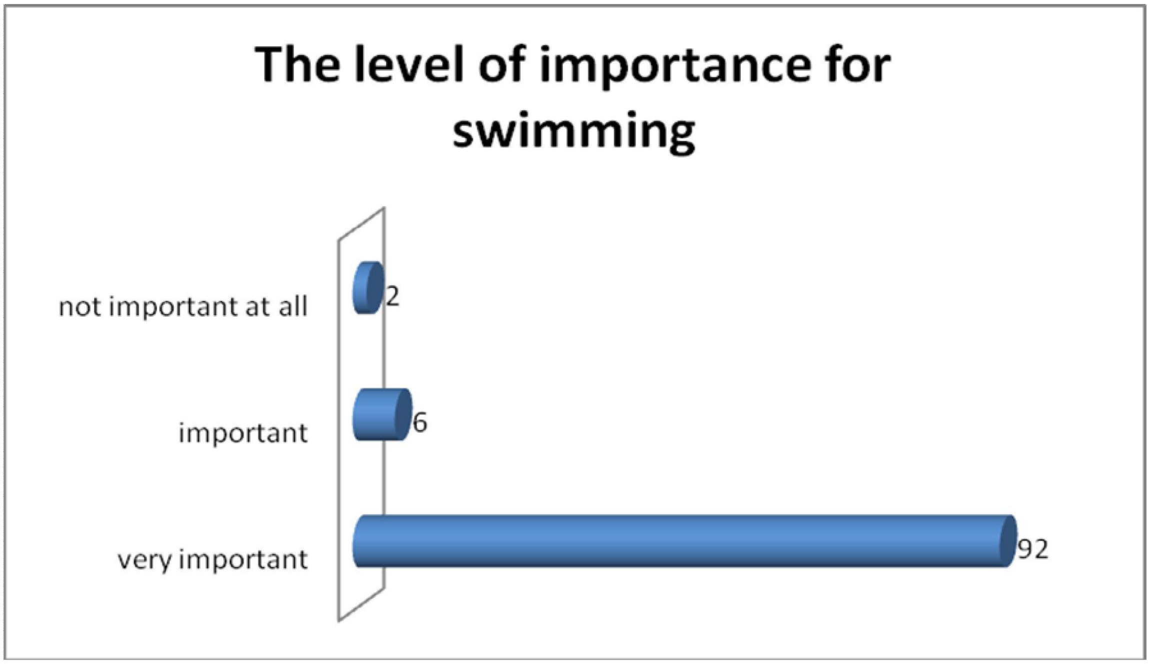


Figure 4.3: The relative importance of swimming to the respondents

### 4.4.2 Number of days respondents spent at the Loskop Recreation Centre

Table 4.3 shows the average number of days that respondents had spent at the recreation centre. On average, respondents spent 3 days at the site with the minimum and maximum number of days of 1 and 31 respectively.

**Table 4.3: The average number of days spent at the Loskop Recreation Centre**

| | N | Minimum | Maximum | Mean | Std deviation |
|---|---|---|---|---|---|
| Days stayed | 37 | 1 | 31 | 3 | 4.969 |

#### 4.4.3 The number of hours respondent spent at the site (day visitors)

Table 4.4 indicates the average number of hours that day visitors spent at the site. On average, the amount of hours stayed at the site is 6 hours per day for day visitors and with the minimum and maximum hours being 5 and 8 respectively.

**Table 4.4: The average number of the hours spent at the site**

| | N | Minimum | Maximum | Mean | Std deviation |
|---|---|---|---|---|---|
| Hours stayed | 9 | 5 | 8 | 6.22 | 1.202 |

#### 4.4.4 Impact of increase of water levels in the dam on the respondents

Figure 4.4 shows the impact of increase of the water level on the respondents. The results show that 67% of the respondents make more trips to the site because of the increase in the water level, while 33% of the respondents say they switch from non-water based activities to water based activities because of the increase in the water level in the dam. This may imply that the high level of water in the dam has influence on demand for water recreation at Loskop Recreation Centre which is supported by Fedali (1997) who stated that that in Walker River Basin a 10% decrease in water level over all seasons in catchments would reduce the original number of trips taken by the population by 31%; from 1483 to 1029 total trips

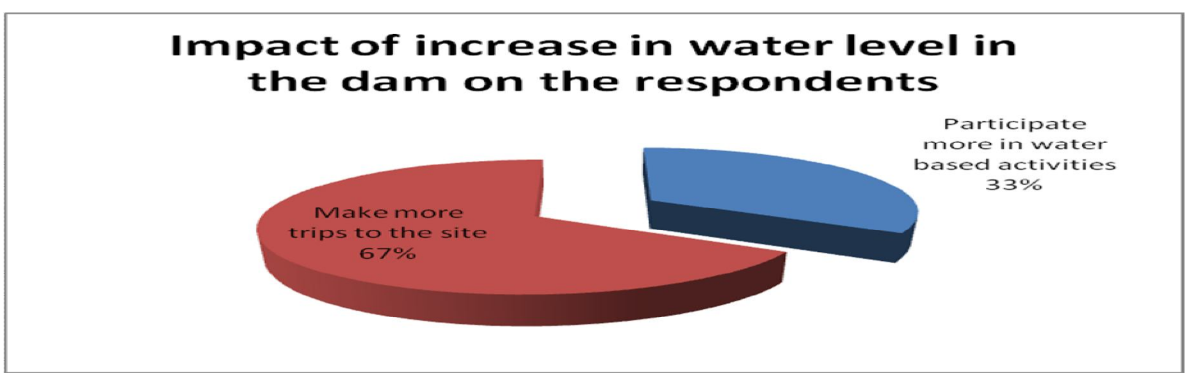


Figure 4.4: Impact of increase of water levels in the dam on the respondent

## 4.5 Summary

This chapter provided the general overview of the demographic, travelling and recreational characteristics of the respondents at the Loskop Dam of Mpumalanga province. The overview was presented in terms of frequencies and descriptive analysis. From the frequencies it was found that almost all respondents use private transport to visit the site. In general, at most, three quarter of the sample size appeared to be white people and swimming is found to be very important to most of the respondents at the site.

From the descriptive statistics it is found that respondents pay an average cost of approximately R400.00 for fuel, with an average time of half an hour travelled to the site. It is also found that people, who take one day trips to the site, stay for six hours on average, per visit.

# CHAPTER 5: FACTORS DETERMINING THE DEMAND FOR WATER RECREATION IN THE LOSKOP DAM RECREATION CENTRE

## 5.1 Introduction

This chapter is aimed at providing some information about factors that determine the number of trips to Loskop Dam Recreation Centre and the demand curve that shows the demand for water recreation. The information below is derived from the multiple linear regression and travel cost models as described in chapter three. In this section factors that are significant to the number of trips to the site and the adjusted R-squared are described. The results are presented in Table 5.1 and figure 5.1.

## 5.2. Multiple Linear Regression results of the demand for water recreation

Multiple Linear Regression is found to have a reasonable percentage of fit, with the adjusted R square being 55%. This makes the model to be modestly good when considering the intricacy of the research objectives and the abundant factors that influence the demand for water recreation and the remaining 45% represent the unexplainable variables in the model. Three out of eleven variables listed in the model exhibit the expected effects on demand for water recreation. From the eight significant variables, two variables are positively significant to the study while six are found to be negatively significant to the study.

**Table 5.1 Coefficient for the factors that determine the number of trips to the Loskop Recreation Centre**

| Variables | B | Std. Error | T | Sig |
|---|---|---|---|---|
| (Constant) | 21.820 | 4.891 | 4.462 | .000 |
| RACE | 1.755** | .663 | 2.649 | .012 |
| NPPLCM | -.074* | .044 | -1.703 | .097 |
| FUELCST | -.006*** | .002 | -2.990 | .005 |
| TYPETRAN | -5.633** | 2.072 | -2.718 | .010 |
| TIMETRAV | .271 | .503 | .539 | .593 |
| WATRQUT | .628 | .599 | 1.048 | .302 |
| WATRLVM | 2.562*** | .713 | 3.595 | .001 |
| HOURSTAD | -1.976*** | .645 | -3.062 | .004 |
| ICRWLVL | -1.672** | .688 | -2.430 | .020 |
| SWIMNG | -1.893** | .838 | -2.259 | .030 |
| DAYSSTAY | -.004 | .060 | -.064 | .950 |
| Model summary | | | | |
| R square | 0.66 | | | |
| Adjusted R square | 0.55 | | | |
| Standard Error of estimates | 1.590 | | | |

*, **, ***, (they represent 10%, 5%, and 1% respectively)

## 5.3 Demographic factors

### 5.3.1 Race of the respondent

The variable ‘race of the respondents’ has a positive influence on the demand for water recreation. This variable is found to be positively significant to the demand for water recreation. This perhaps implies that the white respondents have a great impact on the demand for water recreation at the Loskop Dam Recreation Site. Since the variable race of the respondents was mostly represented by white respondents at the time that the data was collected, this may mean that Indians, Coloureds and Blacks participate less often in water recreation at Loskop Recreation Centre. This perhaps reflects the bias that originated from the sampling procedure.

### 5.3.2 Number of people that the respondents come with to the site

The estimated coefficient of the number of people that the respondent comes with to the site is negative and significant to the demand for water recreation. This may suggest that the number of people that the respondent comes with to the site may not have impact on the number of trips that the respondents take to the Loskop Recreation Centre. This may imply that the respondents may not be considering the number of people to take with them when making a decision to visit the site.

## 5.4 Travelling factors

### 5.4.1 Fuel cost

The explanatory variable ‘fuel cost’ (FUELCST) is found to be negatively significant to the demand for water recreation, suggesting that respondents may be sensitive to high price of fuel. This implies that respondents who pay high fuel costs to the site are likely not to come very often to the recreation site, and this means that the number of trips taken to the site would be reduced resulting in lesser demand for water recreation. This is mainly because the lower the travelling cost to the site, the more the number of trips would be demanded.

### 5.4.2 Type of transport

The type of transport used by the respondents is found to be negatively significant to the demand for water recreation. This suggests that the type of transport (TYPETRAN) used by the respondents is likely to negatively affect the demand for water recreation in the site. The level of ownership over the transport used by the respondents may impact negatively on demand for water recreation in the sense that people who use private transport are likely to spend more money on the recreation as compared to the respondents who use public transport and this may also affect the number of trips or visits made to the site.

## 5.5 Recreational factors

### 5.5.1 Water level in the dam

As anticipated, water level in the dam (WATERLVDM) has a positive influence on the demand for water recreation. This variable is positive and significant to the study, which implies that an increase in the level of water in the dam may result in an increase in the number of trips taken to the site by recreationists and consequently, an increase in the demand for water recreation at the Loskop Recreation Centre.

This was supported by Fedali (1997) who found that “a ten percent decrease in water level over all season in catchments would decrease the original number of trips taken by the population by 31% from 1483 to 1029 total trips”. The levels of water seem to be an important factor in the demand for water recreation. This might be because low water levels make it difficult for boating and angling because of the submerging hazards that would be approaching the surface. Low water levels also could decrease the availability and quality of habitat areas for fish, causing crowding, the spread of disease and stranding in isolated pools of water.

### 5.5.2 Hours spent at the site per day

The number of hours stayed (HOURSTAD) at the site is statistically significant to the demand for water recreation with the negative expected sign of the coefficient. This suggests that respondents who stay for hours at the recreational site are likely not to visit the site again, unlike visitors who spend days at the Loskop recreational site. This may also be because the respondents who stay for hours at the site may not be able to find the true value of the recreation due to the little time they spent at the site.

### 5.5.3 Swimming

The variable ‘swimming’ is negatively significant to the demand for water recreation, which implies that respondents who visit the Loskop Recreation Centre are likely not to participate in the swimming activity. This may be because respondents at Loskop Recreational site are not allowed to swim in the dam due to the dangerous animals such as crocodiles and hippopotamus that are found in there; they are only allowed to swim in the small swimming pools.

### 5.5.4 Increase in water level

The variable ‘increase in water level’ (ICRWLVL) is one of the variables that were expected to have a positive influence on the demand for water recreation. But from the analysis the variable is found to be negatively significant to the demand for water recreation. This implies that an increase in the water level in the dam may not affect the number of trips taken by the respondents to the site.

## 5.6 Estimation of the Travel Cost Demand Curve

Travel cost demand curve, is a curve that shows the relationship between the number of trips per year made by respondents and the costs related to those trips. In this study, travel cost demand curve is used to estimate the demand for water recreation at the Loskop Dam Recreation Centre of Mpumalanga Province of South Africa.

Figure 5.1 shows the relationship between the number of trips per year by the respondents and the total costs incurred to the Loskop Dam Recreation Centre. Each point represents the combination of total costs for recreation and the number of trips reported by the respondents. The figure shows that people who pay high costs for recreation do less trips to the site, highlighting the law of demand which says the higher the costs the lower the demand for the product.

This may be, because they stay far from the recreation site in terms of the distance travelled and they spend much time to reach the site. Other factors such as the level of income of the respondents may have an impact on the number of visits to the site. This is because people with high income may make more visits as compared to people with low income as highlighted by some values on figure 5.1 on the next page.

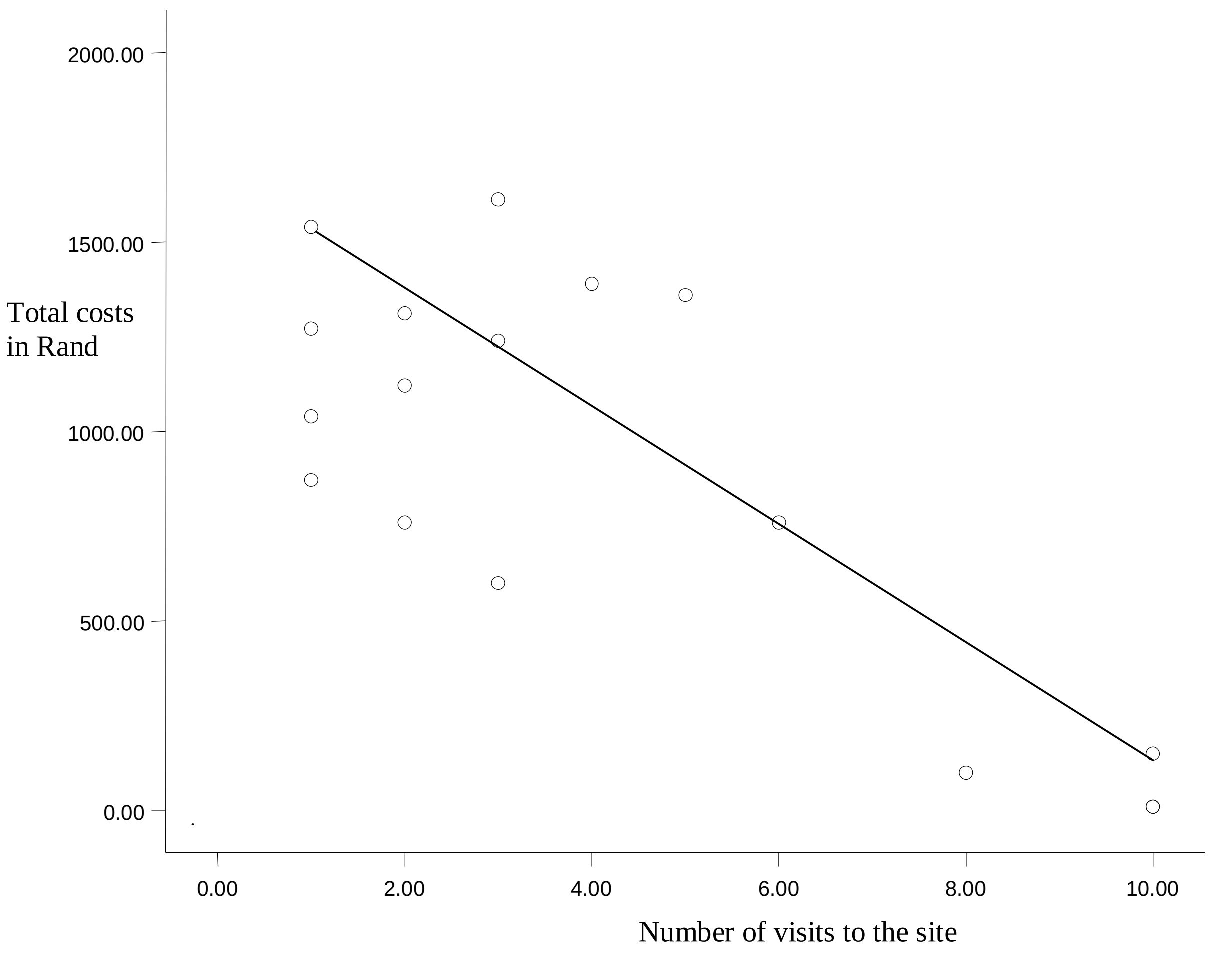


Figure 5.1: Travel cost demand curve

### 5.7 Summary

This chapter has provided the general overview of the factors determining the number of trips to Loskop Recreation Centre, as well as the estimated demand for water recreation at Loskop Dam which show the relationship between costs and number of trips to the site. From the Multiple Linear Regression model, eight factors from eleven factors used in the model are significant to the study, with two being positively significant (race of the respondent and water level in the dam) and the remaining three factors are not significant, implying that they may not be contributing to the determination of demand for water recreation.

The estimated demand curve indicates that the respondents seem to be sensitive to high prices, mainly because the respondents who stay far from the sites tend to make fewer trips to the site as compared to those staying next to the site. It also shows that most of the people who visit the site are not from the surrounding area because, the majority of the respondents who were surveyed pay more to visit the site as indicated on figure 5.1 in page 36.

# CHAPTER 6: SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

## 6.1 Introduction

This chapter reviews the main findings of the study and discusses the conclusions resulting from the empirical results. Particularly, the chapter discusses the point to which the research questions and hypotheses stated at the beginning of the study have been addressed in the analysis. It also recommends the best ways to augment water recreation activities in the study area in particular, and in South Africa in general and further highlights the importance of water recreation to the people. In addition, several suggestions are advanced for further research.

## 6.2 Summary

The main aim of the study was to estimate the parameters that determine the demand for water recreation in the Middle Olifant Sub-Basin and to estimate the relationship between the number of trips and the costs to the Loskop dam recreation centre using the demand curve. The first objective was to estimate the parameters that determine the demand for water recreation in the Middle Olifants Sub-Basin (Loskop Dam) and the second objective of the study was to estimate the relationship between the number of trips and the costs to the recreation site.

From the Multiple Linear Regression results, it was found that factors such as the race of respondents and the water level in the dam are positively significant to the study, while the factors such as fuel cost, type of transport, increase in water and the number of days spent at the site were negatively significant and contribute to the determination of demand for water recreation at Loskop Dam. Based on this information the null hypothesis that says that factors such as water level in the dam, race of the respondents and the fuel cost to the site do not determine the demand for water recreation was rejected. This is because these factors contribute to the determination of demand for water recreation, and may also play an important role in attracting more people to the recreation site.

Chapter two provided a theoretical and empirical literature review on water recreation. Chapter 5, which is the empirical analysis, revealed that there are factors that determine the demand for water recreation. It revealed that recreation factors such as swimming and increase in the water level in the catchment's area have negatively affected the demand for water recreation in the middle Olifant. The other revelation is that the travelling factors such as the type of transport and fuel cost to the site also affected the demand for water recreation negatively.

## 6.3 Conclusion

Two analytical techniques were used to carry out the quantitative analysis. These are Multiple Linear Regression and the Travel Cost Model. The Multiple Linear Regression model was used to estimate the parameters that determine the demand for water recreation and the Travel Cost Model was employed to estimate the relationship between the number of trips and the costs to the Loskop Dam Recreation Site. Descriptive statistics were used to distinguish demographic, travelling and recreational characteristics that affect demand for water recreation.

The findings from the Multiple Linear Regression and Travel Cost demand curve show that the demand for water recreation is sensitive to high cost of recreation, while most of the respondents come from distant areas and tend to take less trips to the site because of high costs for recreation. This implies that for the respondents to take more trips to the site, it will be important for the Department of Sports and Recreation, the State, the Department of Water Affairs and Forestry, Recreational institutions and other Institutions involved in recreation to embark on mechanisms that will help in making the recreation affordable, thus encouraging more people to participate in water recreation.

The study formulated two research hypotheses to evaluate and to identify the factors that determine the demand for water recreation in the Middle Olifant Sub-Basin. The research hypotheses that were used are: Factors such as water level in the dam, race of the respondents and the fuel cost to the site do not determine the demand for water recreation, and there is a negative relationship between the number of trips and the costs to the Middle Olifant Sub-Basin of Loskop Recreation Site.

In conclusion, the first hypothesis was rejected because it was found that there are factors that determine the demand for water recreation in the Loskop Dam Recreation Centre, and these factors are significant to the study. The second hypothesis was accepted because; as the costs of accessing the sites increases, the number of trips taken by respondents to Loskop Dam Recreation Centre decreases. This indicates that there is a negative relationship between the number of trips to the site and the costs. Hence, from the descriptive statistics it was learnt that 98% of the respondents use private transport to visit the site with a maximum of R1000 rand incurred for accessing the site.

### 6.4 Policy recommendations

The results from the study indicate that the water level in the dam has a positive impact on demand for water recreation, and it was found that swimming has a negative impact on demand for water recreation while most of the respondents said swimming is very important to them. It is therefore, recommended that the Department of Water Affairs and Forestry should seriously consider water recreation when distributing water and its resources since this industry contributes much to the South African economy. It is also imperative for the tourism sector to improve their water recreation activities in order to attract lots of people in the water recreation sector in order to stimulate the growth and development of this sector.

Adequate information about the importance of water recreation should also be provided in order to encourage all the races to participate in water recreation. Hence, it was found that almost 75% of the people who participate in water recreation at the Loskop Recreation Centre were the whites.

The findings from this study are essentially relevant to Loskop recreation centre. Thus the results from the study cannot be generalized for other areas in South Africa since they are based on single site. Similar studies should also be conducted in the country in order to capture the necessary information about the factors that retard growth of the tourism industry.

It is also recommended that the Water Research Commission should put much more effort to continue with research on this kind of study, mainly because this study represents a very small part of water recreation. There is more that need to be uncovered about the water recreation in water catchments areas and on how this industry can be improved for the benefits of this country. As the data used for this study was collected only from the Loskop Recreation Centre, future studies can be done in other recreational areas, province by province, to compare the characteristics of water recreation in South Africa. Future research should also focus on measures to ensure that there is no dumping of harmful particles into the dam, since it is one of the important factors that discourage people from visiting the site

## REFERENCES


ADAMOWICZ, W., LOUVIERE, J., and WILLIAMS, M. 1994. 'Combining Revealed and Stated Preference Methods for Valuing Environmental Amenities.' Journal of Environmental Economics and Management. 26: 271-292.

ANONYMOUS.1995.http://www.waterencyclopedia.com/Tw-Z/Uses-of-Water.html. Accessed on January 8, 2008.

BROWN, G. 1967. "Analytical Issues in Demand Analysis for Outdoor Recreation". Journal of Farm Economics, Vol. 49, No. 5, Proceedings Number, pp. 1295-1304.

CORTNER, H., and M. MOOTE. 1994. Trends and Issues in Land and Water Resources: Setting the Agenda for Change. Environmental Management 18 (1994), pp. 167–173.

DE JONG, R.C. 1992. Draft Policy Guidelines for Cultural Resource Management in Nature Conservation and Forestry Areas in South Africa. National Cultural History Museum, Pretoria.

DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM. 1998. A National Strategy for Integrated Environmental Management in South Africa. Discussion Document. Pretoria.

DEPARTMENT OF SPORT AND RECREATION. 2005. National Sport and Recreation Act, (Act 36 of 1998). Published in Government Gazette No. 27787.

DEPARTMENT OF WATER AFFAIRS. 2008. State of South Africa's water Infrastructure. Pretoria; Department of Water Affairs and Forestry (DWAF).

DEPARTMENT OF WATER AFFAIRS, 1964, Regulations framed in terms of paragraphs (b), (c) and (j) of section seventy of the water act, 1956 (Act 54 of 1956).

DEPARTMENT OF WATER AFFAIRS. 2002. Using Water for Recreational Purposes. Regulations Framed in Terms of Paragraphs (b), (c) and (j) of Section Seventy of the Water act, 1956. (Act 54 of 1956*)*.

FEDALI, E. 1997. Recreation Demand Model for Walker Lake and Substitute Sites. Unpublished Thesis, Department of Applied Economics & Statistics, University of Nevada, Reno.

FEDALI, E., and W. D. SHAW. 1997. Can Recreation Values for a Lake Constitute a Market for Banked Water? Discussion paper. Department of Applied Economics and Statistics, University of Nevada, Reno.

GELT, J. S/F. 1995. Water recreation Make big splash in Arizona. http://ag.arizona.edu/azwater/arroyo/083recr.html. Accessed on November 4, 2008.

HOLLING, C.S. 1978. Wiley IIASA International Series on Applied Systems Analysis, John Wiley and Sons, New York. Adaptive Environmental Assessment and Management.

HOLLING, C.S., and G.K. MEFFE. 1996. Command and Control, and the Pathology of Natural Resource Management. Conservation Biology Vol. 10, No. 2 (1996), pp. 328–337.

HOWARD, G. 1998. Olifants/Doring River Basin Study Phase 1: Water Resources Evaluation: Hydrology.

HUDSON, S., and C. EDINGTON. 2004. Leisure Programming, New York: McGraw-Hill Higher Education, pp. 50-52.

KAY, J. 1997. The Ecosystem Approach: Ecosystems as Complex Systems. In: T. Murray and G. Gallopinn, Eds. Proceedings of the First International workshop of the CIAT-Guelph Project "Integrated Conceptual Framework for Tropical Agroecosystem Research Based on Complex Systems Theories", Centro Internacional de Agricultura Tropical, Cali, Colombia, pp. 69–98.

KEALY, M.J., and M. ROCKEL. 1990. The Value of Non-consumptive Recreation in United States. Unpublished manuscript, 1990. Cornell University, Department of Natural. Resources, Ithaca, NY.

KLAPHAKE, A., SCHEUMANN, W., and SCLIEP, R. 2001. Biodiversity and International Water Policy: International Agreements and Experiences Related to the Protection of Freshwater Ecosystems. Institute for Management in Environmental Planning, Technical University of Berlin, Berlin.

MACK, R.P., and S. MYERS. 1965. "Outdoor recreation", in R. Dorfman (ed.), Measuring Benefits of Government Investments, Washington, DC: The Brookings Institution.

PROVENCHER, B., and R. C. BISHOP. 1997. "An Estimable Dynamic Model of Recreation Behavior with an Application to Great Lakes Angling." Journal of Environmental Economics and Management 33:107-127.

REID, L., and R. ZIEMER. 1997. Basin Assessment and Watershed Analysis: Issues in Watershed Analysis, USDA Forest Service Pacific Southwest Research Station. edwood Sciences Laboratory, Arcat, CA.

ROGERS, K.H., ROUX, D., and BIGGS, H. 2000. Challenges for Catchment

Management Agencies: Lessons from Bureaucracies, Business and Resource Management. Water SA 26 4, pp. 505–513.

SABINE BASIN. 1997. Recreation, Tourism and Economic Development. http://www.sra.dst.tx.us/srwmp/comprehensive_plan/final_report/pdf/SECT11.pdf. Accessed on 13 August 2009.

SENECA, J. 1969. "Water Recreation, Demand, and Supply." Water Resources Research, 5(6), pp. 1179-1185.

SCHULZE, R.E. 1997. South African Atlas of Agrohydrology and Climatlogy. Water Research Commission, Pretoria Report TT82/96.

SMITH, V. K., and Y. KAORU. 1990. Explaining the Variation in Recreation Benefits Estimates. American Journal of Agricultural Economics, v.72, no .2, pp. 419-433.

SOLLEY, W. B., PIERCE, R. R. and PERLMAN, H. A. 1998. Estimated Use of Water in the United States in 1995. U.S. Geological Survey Circular 1200.

VOINOV, A., and R. COSTANZA. 1998. Watershed Management Over the Web. Proceedings of the 1998 Conference on Web-based Modeling and Simulation, San-Diego.

WALLGREN, O. 2000. Water allocation in the Olifants River Basin, South Africa: An Evaluation of Policy Options. Unpublished M.S. Thesis. University of Waterloo, Waterloo Ontario, Canada.

WOODHOUSE, C.A., 1999. Artificial Neural Networks and Dendroclimatic Reconstructions: An example from the Front Range, Colorado, USA: The Holocene, v. 9, no. 5, pp. 521-529.

**QUESTIONNAIRE**

**FACTORS DETERMINING THE DEMAND FOR WATER RECREATION IN THE MIDDLE OLIFANT SUB-BASIN: A CASE STUDY OF LOSKOP RECREATION CENTRE OF SOUTH AFRICA (LOSKOP DAM RECREATION SITE)**

**Instructions for the interviewer:** We prefer to conduct the survey with:

- The household head if you are here with your family
- The one who is responsible for the total outlay related to recreation
- Thus if you ask a family only the household head should answer one questionnaire, however if you are asking a group of friends where everybody is responsible for his own expenditure, everybody can answer a questionnaire.

**Purpose of the survey**

The study is part of a German based research on Integrated Water Resources Management (**IWRM)** in the Middle Olifants Sub-Basin of South Africa. The purpose of the questionnaire is to be able to get the necessary data to estimate the demand for water in recreation. For this, we need to collect information on demand for recreation, factors affecting the demand for recreation and various ways in which water can be used in recreation. The results will benefit the policy makers in evaluating the non-consumptive value of water resources and revise their policies accordingly.

**Confidentiality**

Herewith it is guaranteed that any information obtained from this survey will be treated with strict confidentiality. The data will be used for research purposes only.

**Section 1: General Information**

Contact Person: Lesetja Jacob Ledwaba
University of Limpopo Turfloop campus

Private bag X1106

Sovenga

0727

Interviewer ……………………………………………………………..

Date of interview …………………………………………………….

(optional)

Respondent`s name …………………… ……………………………….

Address ...………………………………..

…………………………………......

Phone ……………………………………

**Section 1: Characteristics of the respondents**

1.1. Gender: male ☐ female ☐

1.2. Marital status married ☐ single ☐

Widowed ☐ divorced ☐

1.3. Race of the respondent (To be marked by looking at the respondent! Not to be asked!)

White ☐ Black ☐ Asian ☐ Others ☐

1.4. Year of birth: ……………………….

1.5. Level of education:

Highest educational level obtained:

Pre school ☐ Primary ☐

Secondary school ☐ Bachelor´s Degree ☐

Honors Degree ☐ Master´s Degree ☐

Doctor´s Degree ☐ Others ☐

Please specify: ……………………………..

1.6. What is your occupation?

Student ☐ Pensioner ☐

Self-employed ☐ Employed ☐

Unemployed ☐

1.7. Please give your income in Rand per month (or tick from the options provided below )

…………………………………………….

Less than R500.00 ☐ from R500.00 to less than Rl000.00 ☐

From R1000 to less than R5000 ☐ from R5000 to less than Rl 0000.00 ☐

More or equal to R10000.00 ☐

**Section 2**

**Travel and Expenditure Characteristics**

Part A: These questions refer to this trip

2.1 Where is your place of residence (name of the village, municipality):

…………………………………………

2.2 Type of the area[1]: urban ☐ rural ☐

2.3 Are you staying overnight? Yes ☐ No ☐

If yes,

a) How many nights are you staying? …………………………………….

b) How much do you pay for accommodation per person per night?

…………………..................................................................................

If not, how long do you stay on day (in hours)

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

2.4 How far is your place of residence in kilometers? …………………………......

2.5 How long, does it take you to come to Loskop Dam? (Hours or minutes, please underline the used measure) …………………………..

2.6 What type of transport are you using? Private ☐ Public ☐

2.7 If you travel with your own car,

a) How much do pay for fuel for a roundtrip to visit this site (indicate the costs per car)? …………...................................................

b) How much do you pay for toll fees for a roundtrip?

…………………………………………………….

2.8 If you travel with public transport how much do you pay for a roundtrip to visit this site? ……………………………………………………

2.9 Please indicate the following annual expenditures of your car?

---

[1] Definition of rural: According to official U.S. Census Bureau definitions, rural areas comprise open country and settlements with fewer than 2,500 residents (http://www.ers.usda.gov/Briefing/Rurality/WhatisRural)
Definition of urban: >2500 residents/

a) Annual car insurance expenses…………………

b) Annual maintenance and repair expenses?

…………………………………………………….

2.10 With how many people are you coming to visit this site?

…………………………………

2.11 With how many people do you share the travel costs? ……………………………..

2.12 What is your relationship with these people you travel with?

| Name | Relationship to respondent<br>1 = wife/husband<br>2 = child<br>4 = grand child<br>5 = Niece/Nephew<br>6 = Father/Mother<br>7 = Sister/Brother<br>8 = other (specify) | Age (year of birth) |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

2.13 What did you pay as entrance fee for yourself?

……………………………………………………….

2.14 What are your average expenditures for food per person per day?

……………………………………………………….

2.15 Do you have any other additional costs for equipment facilities (e.g. boat, fishing or swimming equipment etc.) that are related to your trip to this site?

Yes ☐ No ☐

If yes, please fill out the following table!

| Equipment Facility | Purchase or renting price (please underline) | Only for owned durable Goods (boat) | | | |
|---|---|---|---|---|---|
| | | Year of purchase | Life expectancy | Repair costs/trip | Selling price[2] |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

2.16 Is the visit to the recreation site the only purpose of your trip[3]?

Yes ☐ No ☐

If not, what are your other purposes for this trip?

- ☐ Visiting friends or family along the way
- ☐ Take side trips for business
- ☐ Visit other recreation sites
- ☐ Do site seeing in the area

**Part B: These questions refer to past trips**

**Instructions for the interviewer:** Only ask for b) if the respondent cannot remember the number of trips taken during the last twelve months

2.17 How many times did you do one day trip to the site during

a) The last twelve months? …………………………..

b) The last three months? …………………………….

[2] This means: If you were to sell the good today what would it be worth?

[3] Only purpose means: The person leaves home and travels directly to the recreation site and back.
Multiple purpose means: The person leaves home e.g. visits some friends and then travels to the recreation site.

2.17.1 On average how many hours did you stay on a day?

……………………………………………………………………..

2.18 How many times did you stay overnight at the site during

a) The last twelve months? ………………………….

b) The last three months? …………………………....

2.18.1. On average how many nights did you stay?

……………………………………………..........................

**Section 3**

**Activity characteristics**

3.1 What is the main purpose of visiting the site?

………………………………………………………………………………………………

3.2 Please list the importance of available recreation activities at this site, which influence your decision to come here! (Mark with an X)

| **Activities** | **Very important** | **Important** | **Not so important** | **Not important at all** |
|---|---|---|---|---|
| Swimming | | | | |
| Angling | | | | |
| Boating | | | | |
| Tennis | | | | |
| Abseiling | | | | |
| Volleyball | | | | |
| Walking | | | | |
| Picnicking | | | | |
| Landscape Viewing | | | | |

3.3 Do you think there are water quality problems? Yes ☐ No ☐

If yes, does this influence your decision to come here? Yes ☐ No ☐

3.4 Does the water level in the dam influence your decision to come here?

Yes ☐ No ☐

If you answered no, go to question 3.5

If yes,

3.4.1. How does a decrease in the water level affect your participation in the recreation?

a) I change my activities from water based to non-water based activities. ☐

b) I come less to this site. ☐

c) Others, please specify: ………………………………………………………………..

3.4.2. How does an increase in the water level affect your participation in the recreation?

a) I change my activities from non-water based to water based activities ☐

b) I come more often to this site ☐

c) Others, please specify: ………………………………………………………………..

3.5 Are there other water related substitute sites of your choice?

Yes ☐ No ☐

If yes,

a) how far from your place? (Km) …………………………………………………...

b) Why did you choose this site? ....................................................................

3.6 What other water based activities do you - or the members of your household participate in most often at other recreation sites (not Loskop recreation site)? Please name the activity, the site name, the distance of the site from your place, the frequency of visit during the last three months and the subjective expenditures

| Activity | Site Name | Distance to site (km) | Frequency of visit during the last three months | Average length of stay (days) | Total expenditures[4] occurring for one trip |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

3.7 How satisfied are you with the facilities at this site?

Very satisfied ☐ somewhat satisfied ☐ no opinion ☐

Dissatisfied ☐ very dissatisfied ☐

3.8 Do you have suggestions as to how the recreation derives could be improved? Explain.

…………………………………………………………………………………………

………………………………………………………………………………

***THE INFORMATION PROVIDED HEREIN WILL BE PROFESSIONALLY AND PRIVATELY TREATED***

***THANK YOU FOR YOUR TIME***

***GOD BLESS***

[4] **Total expenditures include:** costs for fuel or public transport, entrance fees, equipment expenditures, accommodation expenditures if they are staying overnight