Measuring the Operational Competitiveness of Commercial Operations in Public Protected Areas under Ezemvelo KZN Wildlife:

Implications for Ecotourism in the KwaZulu-Natal Province

By

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Dedication

To my present and future family

Declaration

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Prof. Edilegnaw Wale Zegeye
(Supervisor)

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Abstract

In many countries, most of the wildlife and biodiversity remains under state control, and the state employs conservation agencies to regulate their use and management. However, state sanctioned protection of wildlife and biodiversity is unable to halt the decline of a number of species as most are either classified as threatened, endangered, or vulnerable by the International Union for Conservation of Nature (IUCN). Moreover, Conservationists have identified that establishing incentives and economic value could prevent continuing deterioration of biodiversity and encourage their preservation and sustainable use. Ecotourism is one such economic incentive used in many countries, especially in developing countries to encourage biodiversity conservation. The majority of funds required to run ecotourism operation in public protected areas (PPAs) are sourced from the government. However, in the midst of declining funding from governments around the world, conservation agencies such as Ezemvelo KZN Wildlife (EKZNW) have to either find new sources of funding or find cost-effective ways to manage ecotourism operations and at the same time carryout the mandate of biodiversity conservation. Therefore, conservation will have to be conducted through detailed income and expenditure financial evaluations. These financial evaluations will provide knowledge about expenditure patterns of ecotourism operations in EKZNW. This information will assist managers to make informed decisions on strategies and alternatives that could improve ecotourism operations and financial revenues. Therefore, the study sought to measure the operational competitiveness of commercial operations in PPAs in the KwaZulu-Natal province. This was achieved by constructing an operational competitiveness (performance) profile for each public protected area in the KwaZulu-Natal province by using a non-parametric method called the Operational Competitiveness Rating procedure (OCRA). The second objective was to compare the operational competitiveness of PPAs found in each EKZNW administrative region (Ukhahlamba, Zululand and Coastal region). Financial data for commercial operations in PPAs were collected from EKZNW for the period 2007-2013. The OCRA procedure began by computing resource consumption and revenue generation calibration constants or the average share of total costs and revenues for 32 PPAs. The results show that permanent staff, utilities, maintenance and repairs, and cost of sales were cost items with the highest average share of total costs, whereas, accommodation, admissions, sales and tours, rides and hikes received higher average shares of total revenues for most PPAs. This was followed by the computation of *resource consumption and revenue generation inefficiency ratings from 2007 to 2013. The results of which show that improvements in resource competitiveness did not always correspond to improvements in revenue competitiveness, suggesting that either improvements in resource consumption or revenue generation inefficiency ratings would have more impact on operational competitiveness or combined inefficiency ratings. However, the results showed that resource competitiveness had more impact on operational competitiveness relative to revenue competitiveness, suggesting that it is important for PPAs under EKZNW to manage and prevent high costs to improve operational competitiveness. Moreover, the results also indicate that the greatest impact on operational competitiveness occurs when resource consumption and revenue generation inefficiency ratings are at their lowest. The managerial implications and strategies to decrease inefficiencies or improve operational competitiveness in PPAs under EKZNW are discussed in the study.*

List of acronyms

BCC	Banker-Charnes-Cooper Model
CCR	Charnes-Cooper-Rhodes Model
CO_2	Carbon Dioxide
DOT	Department of Tourism
DEA	Data Envelopment Analysis
EKZNW	Ezemvelo KZN Wildlife
IUCN	International Union for Conservation of Nature
KZN	KwaZulu-Natal
OCRA	Operational Competitiveness Rating Analysis
PCHA	Phongola Controlled Hunting Area
PPA(s)	Public Protected Area (s)
PU(s)	Production Unit (s)
RNNP Mahai	Royal Natal National Park Mahai
UCHA	Umkhuze Controlled Hunting Area
UIF	Unemployment Insurance Fund
WMW test	Wilcoxon-Mann-Whitney test

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CHAPTER 1. INTRODUCTION

1.1 Background

The arrival of Europeans in Africa and the new world (East Asia and the Americas) brought modern technology (e.g. rifles, wagons and railways) (Murombedzi, 2003). This enabled hunters to harvest enormous numbers of wildlife to sell in new urban and global markets (Child *et al.*, 2012). For instance, in North America, vast populations of bison and the passenger pigeon were decimated relentlessly during earlier days of European presence (Muir-Leresche and Nelson, 2000). This gave rise to the first national park in the United States in 1929 (Muir-Leresche and Nelson, 2000). The decimation of wildlife spread to the African continent, prompting European colonial powers to meet in London between 1900 and 1933 to respond to the perceived destruction of wildlife in their African colonies, making policy decisions that had a lasting impact on Africa (Child *et al*., 2012). These policies encouraged the creation of state protected areas/national parks and were effective in reducing unsustainable hunting. However, these policies consolidated the ownership of wildlife to the state and greatly limited the commercial use of wildlife (Child *et al.*, 2012). This rendered wildlife valueless and disenfranchised many landholders who derived income from hunting (Child *et al.*, 2012).

The ownership of wildlife largely remains under state control in several countries, and state agencies usually regulate the use and management of biodiversity (Muir-Leresche and Nelson, 2000). However, despite government protection of wildlife and biodiversity, a record number of species are classified as threatened, endangered or vulnerable by the International Union for Conservation of Nature (IUCN), essentially because of environmental pressures such as poaching, agriculture, mining and land clearing (Damania and Hatch, 2005). Conservationists identified that legislation needed to change to prevent this continued deterioration of biodiversity and again recognized that the preservation of many species rested on establishing their economic value and providing incentives for sustainable use (Baker, 1997, Lindsey *et al.*, 2009).

Ecotourism, as an economic incentive, has become an efficient tool for biodiversity conservation in many developing countries (Lindsey *et al.*, 2005). It is based on the principle that nature or biodiversity must pay itself by generating economic benefits (Kiss, 2004). Section 2.2 in the following chapter will go into detail about the concept of ecotourism. Ecotourism revenues worldwide were estimated at $463 billion in 2001 (Polasky, 2005). In South Africa, ecotourism generated over $2 billion in 2000 (Polasky, 2005). According to De Witt *et al.* (2012), ecotourism has the potential to generate economic benefits, improve the well-being of local communities and to conserve South Africa‟s natural and cultural heritage. Ecotourism does this through its ability to generate foreign exchange earnings and employment (Eagles, 2001). Ecotourism in public protected areas (PPAs) is conducted for the preservation of nature and many of its product features are not market related (Eagles, 2001). For instance, numerous PPAs charge low admission fees that only cover the cost of management (Eagles, 2003). As a result, PPAs cannot meet the costs of conserving biodiversity because of high expenditures (Eagles, 2002). PPAs should be able to generate sufficient funds because they often provide richer ecotourism experiences due to their size and scale (Lambeck, 1997, Eagles, 2001).

PPAs often conduct ecotourism operations having to contend with a variety of challenges. According to Emerton *et al.* (2006), funding given to PPAs has been inadequate and declining over the years. Most governments are aware of the significance of ecotourism as an economic development strategy but reduce funding for PPAs citing other pressing societal needs (Eagles, 2003). For instance, in South Africa, funding for Ezemvelo KZN Wildlife (EKZNW), KwaZulu-Natal‟s wildlife agency has been reduced and was encouraged by the provincial government to explore new funding sources (Khumalo and Molla, 2012). Therefore, it is important that the government understands that properly financed PPAs are likely to improve biodiversity conservation management (Tye and Gordon, 1995).

1.2 Research problem and motivation for the study

Numerous researchers consider ecotourism to be a strategy that supports biodiversity conservation while, at the same time, promoting sustainable local development (Ross and Wall, 1999). The majority of funds are allocated to EKZNW by the government, cover ecotourism operational activities (EKZNW, 2009). Reduced funding could undermine and destabilize revenues from ecotourism, and ultimately compromise biodiversity conservation objectives. Despite these concerns, the government reduced its funding, and Eagles (2002) suggests that the significance of ecotourism is underrated due, among other reasons, to a lack of information on the economics of PPAs and that this information is not adequately communicated. Therefore, this leads to a severe under representation of the significance of ecotourism within the fiscal sectors of government (Eagles, 2003). This, in turn, leads to a reduction in funding levels for EKZNW which will put conservation managers under increased pressure to find innovative and cost-effective ways to manage ecotourism operations and to carry out the mandate of biodiversity conservation.

Conservation managers will require economic and financial information about ecotourism operations but there is lack of research in this area (Barnes and De Jager, 1996, Porter *et al.*, 2003, Musengezi, 2010, Child *et al.*, 2012, Eagles, 2003). This information is required to make informed decisions on strategies and options that will enhance and improve ecotourism operations and revenues. Furthermore, conservation managers will have to undertake detailed income and expenditure evaluations. However, managers, according to Eagles (2001), seldom do so. These financial evaluations will provide knowledge on the expenditure patterns of ecotourism operations. At EKZNW PPAs and many around the world such operations consist of a number of activities such as accommodation, hiking, tours, sale of wildlife products, hunting and hire services (Eagles, 2003, EKZNW, 2009). The manner in which these activities are performed determines the cost of operations and the revenues it generates.

Therefore, this study argues that EKZNW should measure the performance of its ecotourism operations in each PPA it manages, since operational performance measurements are used to evaluate, facilitate control and improvements of operational practices, and to compare the performance of different organizations and departments (Ghalayini and Noble, 1996). Therefore, this information will shed light on ecotourism operations that require more control and improvements, and those that can significantly contribute to the goals and objectives of EKZNW. However, this raises some important questions including: How do costs and revenues of ecotourism operations in each protected areas compare with each other? What is the operational profile for each protected area? To shed light on these questions, this study will examine the operational performance of ecotourism operations at each of EKZNW‟s PPAs.

1.3 The study objectives

Operational performance can be used for comparative analyses, as explained by Ghalayini and Noble (1996). According to Parkan (1996), by examining the operational performance of a firm overtime, this introduces an aspects of comparison and , therefore, competition. Therefore, a PPA that uses resources cost-effectively and generates higher revenues in a given year manages its ecotourism operations more competitively for that year. This means that operational competitiveness measures the relative competitiveness of ecotourism operations over a period (Parkan, 1996). Thus, the aim of this study was to measure the operational competitiveness of commercial operations of each PPA in the KZN Province. The specific objectives are the following:

i. To construct an operational competitiveness (*performance*) profile for each PPA in the KwaZulu-Natal province for over seven years.
ii. To compare the operational competitiveness of PPAs in each EKZNW administrative region (Ukhahlamba, Zululand, and Coastal region).

These objectives can be achieved through various analytical tools. However, in this study a non-parametric method called the Operational Competitiveness Rating Analysis (OCRA) procedure was used. This study is the first of its kind in South Africa to utilise a simple and intuitive procedure to measure performance in ecotourism operations. The research methods are discussed in detail in Chapter 3.

1.4 Expected research outcomes

It is expected that the construction of a competitiveness profile for each PPA will show that certain ecotourism operations generate more or less revenue than others and that costs will generally be higher because the primary objective of PPAs is biodiversity conservation. Furthermore, it is expected that revenue and cost competitiveness of ecotourism operations in EKZNW will differ between PPAs and that certain operations, revenue or cost generating, will contribute more or less to operational competitiveness (*performance*). The study will determine the operational competitiveness of PPAs under EKZNW. Dube (2011) states that the Commercial Operations Directorate[1] is finding it difficult to point out cluster functions and sections that are performing. Therefore, the study hopes to provide EKZNW managers with an operational competitiveness profile of their commercial operations, and assist in identifying areas that require control and improvements.

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[1] EKZNW refers to its ecotourism operations department as commercial operations directorate EKZNW 2009. Ezemvelo KwaZulu-Natal Wildlife Five Year Strategic and Performance Plan for 2009 and 2014

1.5 Limitations of the study

One of the limitations of this study was the small number of PPAs considered. This narrowed a full analysis of operational competitiveness in EKZNW. Another limitation was the missing values for some operations on financial statements. Some PPAs specialised in certain revenue (output) generating operations and others did not, likewise some cost (input) generating operations also had missing values. Moreover, the data did not include quantities on revenue and cost generation activities such as the number of accommodations, admission tickets sold, tours per day or per month, wildlife products and concessions as well as prices, and the number of staff employed and supplies.

1.6 Organization of the study

The study is comprised of five chapters. In chapter 1, a background to the research and highlights of the objectives were presented. Literature on ecotourism, operational competitiveness and an overview of the status of EKZNW are presented in chapter 2. Chapter 3 focuses on the study area, conceptual framework and the empirical model. Research findings and discussions are presented in chapter 4. In chapter 5, conclusions and recommendations are presented.

CHAPTER 2. LITERATURE REVIEW

2.1 Ecotourism

A brief outline on the state of ecotourism in South Africa and a discussion on EKZNW are covered in this chapter. Furthermore, the concept of operational competitiveness (performance) is described, and empirical evidence on operational competitiveness (performance) and ecotourism from previous studies are presented.

2.1.1 Definition of Ecotourism

The term „ecotourism‟ can be traced back to the work of Miller (1978) on ecodevelopment (Fennell, 2007). Miller recognized the significance of incorporating socio-political, economic, and biotic spheres to maintain environmental and human needs. These ideas on ecodevelopment were integrated into the International Union for the Conservation of Nature (IUCN)‟s World Conservation Strategy in 1980, which emphasised the necessity for a link between protected area management and economic activities of local communities (Honey, 1999). Furthermore, Miller‟s concept on „ecotourism was recognized by conservationists at the IUCN‟s 1982 World Congress on National Parks in Bali, Indonesia, highlighting that conservation needs to include communities and promote economic development (Honey, 1999).

According to Fennell (2007), there is unanimity amongst researchers that ecotourism is a form of nature-based tourism. Nature-based tourism is "travel for the purpose of enjoying underdeveloped natural areas or wildlife"(Goodwin, 1996). Moreover, Eagles (1996) suggests that nature-based tourism has four submarkets separated according to the travelling purpose of tourists and these are shown below in Figure 2.1.

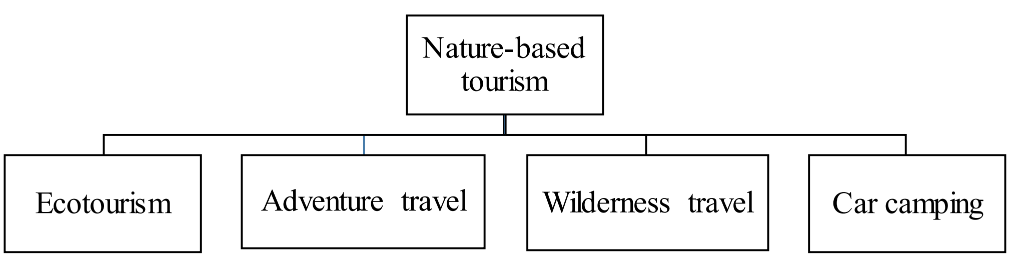

Figure 2.1 Submarkets of nature-based tourism

Source: Adapted from Myburgh and Saayman (1999) and Honey (1999)

In Figure 2.1, Eagles (1996), cited in Myburgh and Saayman (1999) describes adventure travel as tourism for seeking thrills by mastering dangerous environments. Wilderness travel comprises of personal recreation by travelling in undisturbed natural environments, while car camping is safe family travel to areas that are partly undisturbed and partly undeveloped. Ecotourism has been defined by different researchers but the definition presented by Myburgh and Saayman (1999) is used in this study, and this definition rests on three pillars, namely; the promotion of and enhancement of natural and cultural environment, effective planning and sustainable management of the environment, and the participation of the local community. These are illustrated in Figure 2.2 below.

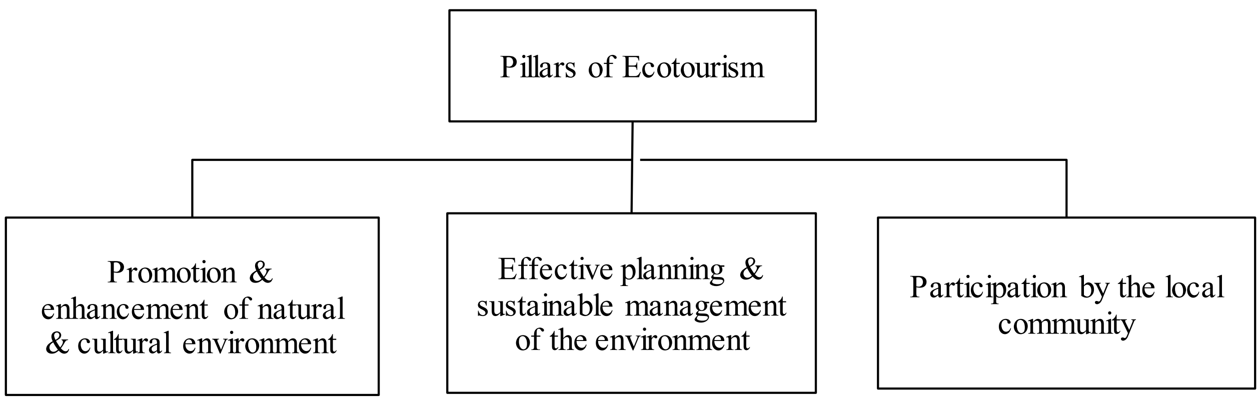

Figure 2.2 Pillars of ecotourism

Source: Myburgh and Saayman (1999)

Ecotourism can be distinguished into deep and shallow ecotourism (Acott *et al.,* 1998, cited in Fennell, 2007). "Deep ecotourism is characterised according to intrinsic value, small-scale development, community identity and community participation" (Fennell, 2007; pg. 21). On the other hand, shallow ecotourism is characterised by its high emphasis on profit taking over social and environmental concerns (Fennell, 2007). In shallow ecotourism, the natural environment is viewed as another resource to be exploited for maximum human benefit (Fennell, 2007). The approach to nature is business-as-usual and perceptions on environmental sustainability are weak (Fennell, 2007). The concept of ecotourism has come a long way and it is important to understand its impact to society. Therefore, the next section will discuss the benefits of ecotourism to society.

2.1.2 The role of ecotourism

Ecotourism is one of the largest and most rapidly growing sectors in the world with estimated growth rates of 10-15 percent (Scheyvens, 1999). Furthermore, ecotourism accounts for 6 percent of the world"s gross domestic product and 11.4 percent of the consumer spending (Honey, 1999). It is clear that the growth of ecotourism is unprecedented. According to Scheyvens (1999), some researchers (Hoenegaard, 1994, cited in Schyvens, 1999) highlight the benefits of ecotourism, whereas some (Boo, 1990; Ziffer, 1989; Cater and Lowman, 1994, cited in Sheyvens, 1999) advice about uncritically accepting ecotourism as the panacea of environmental woes. Therefore, this section highlights the positive and negative impacts of ecotourism.

In the previous chapter, it was noted that ecotourism was primarily used as a strategy to mitigate against the loss of biodiversity by providing economic incentives for their conservation. Even though it is not perfect, ecotourism has proven to be an effective way to conserve species diversity around the world (Fennell, 2007). Furthermore, foreign exchange earnings from ecotourism bring economic benefits to local communities, and leads to improvements in the quality of their lives (infrastructure) (Myburgh and Saayman, 1999, Scheyvens, 1999). Moreover, ecotourism raises the societal awareness of environmental issues. Ecotourism has psychological benefits because the self-esteem of people is enhanced due to outside recognition of their culture and natural resources (Scheyvens, 1999). Ecotourism has social value since it improves social cohesion by bringing people of different backgrounds together (Myburgh and Saayman, 1999, Scheyvens, 1999).

The disadvantage of ecotourism is that it brings in irregular cash gains for local communities (Scheyvens, 1999). The disadvantage is that ecotourism in many instances becomes shallow ecotourism and the focus quickly becomes about profit taking over the primary purpose of conservation (Fennell, 2007). This can cause further harm to the environment. Moreover, other drawbacks of ecotourism may include social disintegration as people take on outside values, lose respect for their cultures, and it raises the level of pollution (noise, light, air and waste) that does harm to the environment (Scheyvens, 1999). In several countries, biodiversity is a valuable asset and South Africa is no exception due to its rich natural resources. The status of ecotourism in South Africa is the focus in the next section.

2.1.3 Ecotourism in South Africa

Developing countries often have the natural and cultural endowments to offer a range of tourism products (Holden, 2013). Amid the range of tourism products (Ecotourism, agro-tourism, academic tourism, scientific tourism, etc.) they can offer, ecotourism often tends to receive higher priority (Mowforth and Munt, 2008). This is because ecotourism has many benefits, especially for the poor and the environment. It features prominently on sustainable development programmes in developing countries (Holden, 2013).

According to Driver (2012), South Africa is third amongst countries with the highest biodiversity in the world, but highlights that a significant proportion of ecosystems are endangered. This could be a result of the level and intensity of ecotourism and conservation that takes place in protected areas[2], particularly private protected areas. According to ABSA (2003), 80 percent of nature conservation occurs on privately owned land, covering over 20.5 million hectares of land (Cousins *et al.*, 2008). However, many conservationists have serious doubts about private protected areas‟ contribution to biodiversity conservation (Simberloff, 1998). Many of these private protected areas practice shallow ecotourism (See section 2.1.2) and conceal themselves behind the cover of biodiversity conservation whereas the primary motive is profiteering. Lambeck (1997) states that a market approach to conservation on private protected areas tends to promote charismatic/flagship[3] species usually preferred by tourists, and disregard umbrella[4] and keystone species[5]. In short, they do not embrace a comprehensive approach to biodiversity conservation. However, PPAs prioritize the conservation of a wide range of species within an ecosystem with different habitat requirements, and capture critical ecological functions (Lambeck, 1997). Despite the criticism, the combination of public and private conservation areas has made South Africa‟s fauna and flora a major attraction for local and overseas tourists (Bhaktawar and Van Niekerk, 2012, Van der Merwe *et al.*, 2004).

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[2] A protected area as defined by the IUCN is an area that is particularly committed to the protection and maintenance of biological diversity and of natural and associated cultural resources, and through legal or other effective means.

[3] Flagship species are charismatic large animals used in conservation biology to arouse public interest and sympathy.

[4] Umbrella species are species that require vast amounts of land to conserve and that saving them will automatically save other species; and

[5] Keystone species are species whose activities maintain the existence of many more species (Simberloff, 1998).

The South African tourism industry has grown significantly since 1994, with 3 million foreign arrivals in 1993 to 9.9 million in 2009 (Department of Tourism (DOT), 2011). Furthermore, by 2010, international visitor arrivals were 10.3 million, majority of which (7.3 million) were tourists and it is estimated that by 2020, international arrivals will reach 30.5 million (Van der Merwe and Saayman, 2005, DOT, 2011). Moreover, South Africa attracts more international tourists than any other African country, and has recorded annual tourism growth rates of more than 12 percent for the last ten years, making tourism one of the best performing and largest industries in the country (Visser, 2004, Van der Merwe and Saayman, 2005, DOT, 2011). Tourism is labour intensive and it is regarded as the largest supplier of jobs whose share of total employment was 11.6 percent in 2001, only to decline to 8.6 percent in 2005 (SAYB, 2003/2004, Earle, 2008). The majority of these international tourists are nature-based tourists, especially ecotourists (Van der Merwe *et al.*, 2004, DOT, 2011).

Ecotourism in South Africa is part of the sustainable development agenda and it is viewed as an instrument of empowerment for underprivileged communities (Holden, 2013). Therefore, the greatest impact should be in underprivileged rural communities but according to the DOT (2011), many communities do not benefit from ecotourism operations because of direct exclusion by some private protected areas establishments or community power struggles over benefits. However, where benefits have been observed, ecotourism provides employment and economic development for rural communities (Holden, 2013). For instance, many protected areas, public and private, have promoted joint economic benefits whereby specific services and functions are outsourced to local communities, and allowing community members to sell their crafts (Honey, 1999, Myburgh and Saayman, 1999, Mahony and Van Zyl, 2002). Ecotourism has many reported benefits. Therefore, this makes it essential to know the activities that take place on protected areas, especially PPAs that are part of ecotourism operations. In the next section, ecotourism operations in PPAs are discussed.

2.2 Ecotourism commercial operations in public protected areas

Ecotourism is a catalyst for economic, social and environmental development, and it requires traditional business skills in areas such as marketing, finance, human resources and operations to succeed (Parker and Khare, 2005). Most PPAs differ in size, the products they provide depending on the environment and the extent of their market focus (Porter *et al.*, 2003). This ultimately leads to different operational goals and objectives in ecotourism and biodiversity management in PPAs (Porter *et al.*, 2003). However, typical revenue sources for most PPAs are accommodation, wildlife product sales, admission fees, rentals and concessions, and wildlife viewing (Eagles, 2002, Porter *et al.*, 2003, Parker and Khare, 2005). According to Dixon and Sherman (1991), there are three main costs associated with maintaining protected areas: direct costs, indirect costs and opportunity costs. Direct costs are recurrent costs of maintaining and managing a protected areas, including administrative costs, staff costs, and maintenance costs for roads and facilities (Dixon and Sherman, 1991). Indirect costs of protected areas can include damages caused by wildlife in protected areas, and opportunity costs of a protected areas are the losses of potential benefits related to protecting an area rather than harvesting the resources it holds (Dixon and Sherman, 1991).

According to Eagles *et al.* (2002), the benefits and costs of ecotourism interact in complex ways but it is imperative that PPAs maximise the benefits while minimising the costs. PPAs derive most of their revenues from accommodation and admission fees (Eagles, 2001). PPAs are usually larger and offer more variety in terms of game viewing. As a result, tourist demand tends to be higher (Porter *et al.*, 2003). Furthermore, accommodation and admission fees from PPAs are usually below the market price and thus affordable (Eagles, 2002). However, over reliance on accommodation and admission fees makes PPAs sensitive to variations in tourist demand (Eagles, 2002). Concessions[6] generate substantial revenues for PPAs and activities such as hiking, trails, restaurants, shops, game viewing and accommodation can be concessional (Myburgh and Saayman, 1999, Eagles, 2002). Revenues from PPAs are always not enough to cover costs. In this regard, Myburgh and Saayman (1999) state that most PPAs in South Africa are managed at a loss. PPAs may never run at a profit or break-even because of their primary mandate of conserving biodiversity (Myburgh and Saayman, 1999). If this is the case, this means that for PPAs to conserve biodiversity sustainably, government will have to subsidize these areas until the situation improves.

Most PPAs are managed by central governing bodies or conservation agencies (Eagles, 2002, Porter *et al.*, 2003). These conservation agencies collect revenues from PPAs, and thereafter allocate operating budgets (Eagles, 2002). However, these can be ineffective because budget

[6] Concessions are arrangements that PPAs make with private partners to develop a tourism facility in a specified area (Myburgh and Saayman, 1999).

allocations are not closely linked with ecotourism use levels (Eagles, 2002). Therefore, PPAs in most cases are unable to meet costs and generate significant revenues (Eagles, 2002). In conclusion, revenue and cost generation activities will vary and depend on the size, environmental endowments, and management of the PPAs. Therefore, the next section discusses ecotourism as it occurs in PPAs of the KZN Province in South Africa.

2.3 KwaZulu-Natal public protected areas and ecotourism: *Ezemvelo KZN Wildlife*

The KZN Province covers an area 92 285km^2 and it is situated on the eastern coast of South Africa in the biologically rich transition zone between the tropical biota in the north and subtropical biota in the south (Eeley *et al.*, 1999, Goodman, 2003). The abundance of KZN"s biodiversity mainly comes from its altitudinal gradient and its varied geology, topography and climate (Eeley *et al.*, 1999, Goodman, 2003). The land mass rises from a relatively flat coastal terrain in the east, above a series of hills, to the Drakensburg Mountains which reach over 3000m and run from a north-south direction over a distance of 150-280km and forms the western boundary of the province (Eeley *et al.*, 1999, Goodman, 2003). Predominant ecosystems in KZN consist of marine coral reefs, rocky reefs, beaches, estuaries, coastal lakes, moist lowland and upland grasslands, dry forests, moist forests and semiarid savannah systems (Eeley *et al.*, 1999, Goodman, 2003).

EKZNW is a governmental agency in control of biodiversity conservation in the KZN Province (Goodman, 2003). It was created in 1997, via a merger between the Natal Parks Board and the KwaZulu Department of Nature Conservation (Goodman, 2003). According to Dube (2011), EKZNW falls under the KZN Department of Agriculture, Environmental Affairs and Rural Development (DAERD), and in addition, the Member of the Executive Council (MEC) has the authority to appoint the executive board at the agency. Furthermore, EKZNW receives financial support from the government through the KZN provincial treasury (Goodman, 2003, Dube, 2011). However, the agency also receives additional funding from non-governmental organizations (NGOs) and philanthropic organizations (Dube, 2011).

Goodman (2003) reports that immediately after its establishment, EKZNW had inadequate financial resources to manage several PPAs. For instance, there were many staff members with few resources to operate on. Most of the funding goes into its operational activities (EKZNW, 2009, Dube, 2011). According to Emerton *et al.* (2006), cited in Dube (2011), recurrent costs take up most of the funding allocated to protected areas, mostly staff costs, whereas investment needs remain underfunded. Recurrent costs consist of monthly and annual charges for goods and services, salaries and added personnel costs, fuel and administration supplies (Dube, 2011). Moreover, the main sources of revenue for EKZNW"s commercial operations are the sale of wildlife products, the provision of accommodation, resale trading, the hire/lease of facilities (including conferencing), hunting, trails, rides and tours (EKZNW, 2009). The EKZNW (2009) report states that revenues from the sale of goods, services and hunting have been increasing for a decade and have contributed significantly to the agency"s budget amid decreasing financial support from the government. However, most of the PPAs in KZN operate below optimal occupancy levels and as such do not generate sufficient revenues to finance their operations (Dube, 2011). Some researchers argue that the use of centralized revenue system, as is the case with EKZNW, impedes managers from making long-term investments (Eagles, 2002). Incomes from commercial operations are not retained, making it difficult for managers to make monthly and annual budget allocations that are not linked to revenues (Dube, 2011).

According to Ridl (2012), the parliamentary committee of the KwaZulu-Natal Province has requested of EKZNW to be financially self-sufficient. There has been frequent demands by the government for EKZNW to design and implement a strategy that is aligned with recent trends on sustainable funding for protected area management, in which there is balance between biodiversity conservation objectives and revenue generation (Dube, 2011). The reasons for this request range from poor corporate governance, chronic financial mismanagement and pressing socio-economic development needs (Dube, 2011, Ridl, 2012). Nonetheless, Ian Player in Ridl (2012) argues that the Mpumalanga Parks Board was also requested to find alternatives sources of funding and that had devastating consequences for biodiversity conservation in the province. The EKZNW strategy 2009-2014 indicates that the agency is considering new business models to achieve business efficiency through optimizing the use of financial resources and increasing their financial resource base (EKZNW, 2009). Furthermore, EKZNW states that it plans to place more emphasis on an aggressive marketing strategy to grow and enhance revenues (EKZNW, 2009). Dube (2011) suggests that in order for EKZNW to reduce its dependence on the government finance, it is essential that the agency focus on three areas namely, payment for ecosystems services, public-private partnerships and co-management with the private sector and communities.

The discussion above shows that EKZNW is beset with management and financial problems, of which it is trying to improve. Prior to improvements, the operational performance profiles of commercial operations are required to make informed decisions. The concepts of operational performance or competitiveness are discussed in the following section.

2.4 Operational competitiveness of firms

The industrial revolution of 1770s changed many aspects of production forever (Hudson, 2014). Prior to the industrial era, goods were produced using craft production[7](Stevenson and Hojati, 2007). Craft production had serious limitations since products were produced by trained craftsmen who custom fitted parts, production was slow and costly (Stevenson and Hojati, 2007). Furthermore, another limitation was that production costs did not decrease as volume increased (Stevenson and Hojati, 2007). However, as the industrial revolution progressed, companies began to develop standard measuring systems to assess productivity in factories and in time, these were refined through improvements in management theory and practice (Stevenson and Hojati, 2007). Nowadays, every organization is constantly alert to the necessity for improvements, and operational performance measurements serve as a firm basis for prioritizing such improvements (Yasin and Gomes, 2010). Operational performance measurement is a firm‟s assessment of the efficiency of its operations and this is measured by a variety of techniques (Andersen and Fagerhaug, 2002).

Data envelopment analysis (DEA) is one such technique used to analyse operational performance. DEA is a non-parametric and linear programming technique used for determining the relative performance of organizational units, particularly when there are multiple inputs and outputs that make comparison difficult (Boussofiane *et al.*, 1991). According to Cracolici *et al.* (2008), DEA is based on the work of Farrell (1957) and was further refined by Charnes *et al.* (1978) and Banker *et al.* (1984) with their Charnes-Cooper-Rhodes (CCR) and Banker-Charnes-Cooper (BCC) models, respectively. The model has been frequently used to measure efficiency because it does not require assumptions about the functional form. The model can be used to measure efficiency in public sector organizations (e.g. schools, hospitals, airports, courts etc.) and private sector organizations (banks, hotels etc.) (Cracolici *et al.*, 2008). Moreover,

[7] Craft production is production in which highly skilled workers use simple, flexible tools to produce small quantities of customized goods (Stevenson and Hojati, 2007).

researchers and practitioners utilise productivity models to measure operational performance and there are three basic forms, namely, total factor productivity, partial productivity and total productivity models (Tangen, 2004). Total factor productivity models use the ratio of total output to the sum of associated labour and capital to determine efficiency. Partial productivity measures performance as the ratio of total output to one class of input (e.g. output per labour hour), while, total productivity models consider the ratio of total output to all input factors when measuring performance (Tangen, 2004).

The evaluation of operational performance provides information that can be used to monitor performance trends and information that can serve as a foundation for benchmarking against other organizations (Andersen and Fagerhaug, 2002). In sum, the value in operational performance measurement lies in the feedback that can be obtained by an organization in answering questions such as "Did we perform better?" "What can we do to perform better?" "What should we focus our attention on"? and "Where should we allocate resources?"(Parkan, 1999). Therefore, in order to operate ecotourism activities with a minimal impact to the environment and cost effectively, EKZNW has to evaluate the operational performance of its ecotourism activities and identify areas of improvement along with information for strategic decision making purposes. In this study, operational performance is referred to as operational competitiveness due to the comparative nature of performance models. In the following section, empirical literature on operational competitiveness (performance) and ecotourism are examined.

2.5 Operational competitiveness and ecotourism: *Empirical evidence from literature*

The primary mandate of PPAs is to conserve biodiversity and they use nature-based ventures such as ecotourism as vehicles to achieve their objectives. Therefore, measuring performance or competitiveness gives management the opportunity to determine whether products offered or resources utilised are facilitating PPAs to achieve the objective of biodiversity conservation. However, empirical literature on operational competitiveness (performance) as it relates to ecotourism is scarce. Most literature on competitiveness in the tourism industry covers destination competitiveness[8] and accommodation performance. The discussion below highlights some examples.

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[8] Destination competitiveness is the "*ability of a destination to create and integrate value-added products that sustain its resources while maintaining market position relative to its competitors*" (Hassan, 2000 cited in Crouch, 2010).

Crouch (2010) conducted a study to investigate the attributes that affect the competitiveness of tourism destinations. A general conceptual model of destination competitiveness was used to assess judgments made on thirty six competitiveness attributes by conducting online surveys on destination managers and tourism researchers. Crouch (2010) integrated and analysed these judgments using the analytic hierarchy process (AHP). AHP results were further analysed to produce measures of attribute determinants[9] and then the measures were statistically tested to identify which attributes were judged to exert more impact on destination competitiveness. The study found that ten out of thirty six attributes were found to have measures of attribute determinants, statistically significantly greater than average. However, Crouch (2010) states that the results from the study have limitations because the study was based on the collective judgment and experience of "experts". Additionally, by evaluating the "expert" judgement, the results are largely subjective. The researcher further concluded that since the study examined the determinants of destination competitiveness in general, it is also important to investigate the relative importance of attributes as they apply to particular segments of the tourism market.

In another study, Cracolici *et al.* (2008) used dataset from 103 regions for the year 2001, to measure tourist site destination competitiveness using parametric (stochastic production frontier) and non-parametric (DEA) methods. The study found that stochastic and DEA frontier models show that technical efficiency varied significantly between regions in Italy because of heterogeneity. Moreover, comparison between the two models indicates that efficiency coefficients from DEA frontier models are usually relatively lower than the stochastic frontier coefficients. The DEA model is more sensitive to heterogeneity than the stochastic frontier analysis method. Cracolici *et al.* (2008) concluded that the DEA and stochastic frontier analysis are appropriate methods to show how regions transform resources into tourist flows, and therefore, recommend the use of parametric and non-parametric methods in a complementary manner.

Hudson *et al.* (2004) conducted a study on tourism destination competitiveness for ski areas in Canada. The study was done to develop operational measures for each of these ski areas in Canada. In addition, the study was conducted within a destination competitiveness framework developed by Crouch and Ritchie (1999). Thirteen ski areas were surveyed using a detailed

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[9] Attribute determinants are features of products and services that determine consumer choice for a specific product (Crouch, 2010).

stakeholder questionnaire. The results of the study indicated different areas of strength and weakness for each destination, and further showed that the opinions of key stakeholders were useful in indicating such attributes, and provides a basis for developing a comprehensive and standardized model for measuring the competitiveness of tourism resorts around the world. The model can be used for planning and development of resorts that operate in highly competitive markets.

In a study by Dwyer *et al.* (2000), the researchers compared the price competitiveness of the 19 countries by developing a price competitiveness index, taking account of both travel cost to and from destinations as well as costs incurred within a destination. To calculate the price competitiveness indices they attached weights to different goods and services consumed by tourists to reflect purchasing patterns. In the study, destination competitiveness was determined by both price and non-price factors (socio-economic, demographic, and qualitative factors that determine the demand for tourism). The method used to construct price competitiveness in this study can be used to compare price competitiveness of tourism destinations globally, as it allows for a quantitative assessment of how one destination compares to another in its tourism price competitiveness. Oyewole (2004) computed the price competitiveness index for 22 African countries in the international tourism industry. The results from the study suggested that relative price competitiveness of a country differ from one sector of the international tourism basket to another.

There have been studies conducted on PPAs in KwaZulu-Natal that have touched on the theme of performance or competitiveness in ecotourism (e.g. Porter *et al.,* 2003; Flanagan, 2014). Porter *et al.* (2003) conducted a study to determine the profitability of nature-based operations in North-Eastern KZN by means of a cross-sectional survey of three PPAs and twenty seven private protected areas. They found that protected areas varied significantly in business capital structures, revenues, costs, and profits. The study highlighted that property area for PPAs was larger and that the average number of beds[10] was higher. Furthermore, their research indicates that large private protected areas employ a large proportion of their staff in accommodation and security services, and that number increases with property size. However, they do not indicate employment intensity for PPAs. Porter *et al.* (2003) found that stocking rates in private protected

[10] Number of tourist beds determines the physical size of nature-based operations (Porter *et al*., 2003)

areas were severely high compared to PPAs, which suggested that private protected areas were overstocking to offer photographic and hunting opportunities, while PPAs were concerned with objective of biodiversity conservation. Hunting was the most prevalent and high revenue generating operation for protected areas. Furthermore, game viewing contributed the second largest share of revenue to total revenue followed by retail operations and tourist related products. The sale of live game generated more revenues for PPAs than private protected areas because varieties of species are sourced from EKZNW game auctions. The study also found that the average total costs were higher for PPAs than private protected areas with tourism and game sales receiving the largest share of total revenue for PPAs studied.

In another study on competitiveness in KwaZulu-Natal PPAs, Flanagan (2014) conducted a study that focused on the role of competitive advantage in tourism. The study examined financial statements collected from different EKZNW protected areas with a variety of accommodation types, sourcing data on market attributes of destinations from EKZNW"s website. Flanagan (2014) used multiple linear regressions to quantify the competitive advantage gained by KwaZulu-Natal nature-based tourism destination because of macro environmental and locational factors. Tobit regression was used to identify the effects of changes in attributes of destination on competitiveness. Price, occupancy percentage, and revenue per available room were used as proxies for competitiveness. Furthermore, Tobit regression was used to rank the relative competitiveness and order conservation priorities for numerous potential locations considered for tourism by EKZNW. The result showed that the most influential macro-environmental factors influencing the competitive advantage of destinations are their location beside the ocean, the presence of the big five animals (Elephant, leopard, lion, rhinoceros and buffalo), the size of the destination area and distance from Johannesburg. Moreover, the study found that the quality of the resorts, especially star-rated resorts, increased competitiveness. Accommodations that offered breakfast decreased destination competitiveness, whereas, accommodations that offered self-catering facilities were preferred. The results from the study can be used to predict the relative competitive advantage of numerous potential conservation locations presently considered in EKZNW.

2.6 Summary

The development of ecotourism can be traced back to the 1980s, from the ideas of Miller. Ecotourism is one of the submarkets for nature-based tourism. However, ecotourism as a term has many definitions and rests on three pillars that are in line with sustainable use of the environment, enhancement of ecosystems and community participation. Furthermore, ecotourism can be classified into deep and shallow ecotourism. As an industry, ecotourism is the largest and rapidly growing sector in the world. Ecotourism provides incentives for the preservation of species. It can also be economically rewarding as it brings foreign exchange earnings and enhances the quality of life for many communities.

Most developing countries are well endowed with natural and cultural capital, and South Africa is ranked third amongst the countries with the highest biodiversity in the world. This has caused a surge in the tourism industry since 1994, creating thousands of jobs in South Africa. Ecotourism requires traditional business skills in areas such as marketing, finance, and human resources. Activities that typically accompany ecotourism operations in protected areas include accommodation, admissions, rentals, and concessions. In South Africa, KwaZulu-Natal is the province with the highest abundance of biodiversity and thus, a favourite destination for many tourists, domestic and international. EKZNW is a conservation agency that oversees biodiversity conservation in PPAs in KZN. It also runs ecotourism operations and receives funding from the government to achieve most of its objectives. Operational competitiveness (performance) measures a businesses‟ efficiency in running its operations. It provides information that can be used by EKZNW to monitor performance trends of its ecotourism (commercial operations) operations.

Studies on operational competitiveness in ecotourism are scarce, and limited to destination competitiveness and performance of accommodation. In general, there has been little research conducted in KZN, except a few that have focused on competitiveness in EKZNW. The review has shown that there is dearth of literature on operational competitiveness in ecotourism. In the next chapter, empirical methods used are presented.

CHAPTER 3. RESEARCH METHODOLOGY

The methodology adopted for this study is presented in this chapter. The chapter begins with the conceptual framework for the study followed by a discussion of the empirical model utilised. Furthermore, the description of the study area is presented with a brief discussion of the data used in this study.

3.1 Conceptual framework

In the 1980s, Michael Porter conducted a study to investigate the reasons why some countries only succeed in specific industries (Spies, 1999). He found that there were four determinants of competitiveness that shape the national environment in which firms compete and from this, developed a framework of competitive advantage, a diamond model of the factors of national competitive advantage (Porter, 1990 cited in Spies, 1999). Figure 3.1 illustrates the four determinants of national competitiveness and two external variables that form the basis for Porter"s diamond framework.

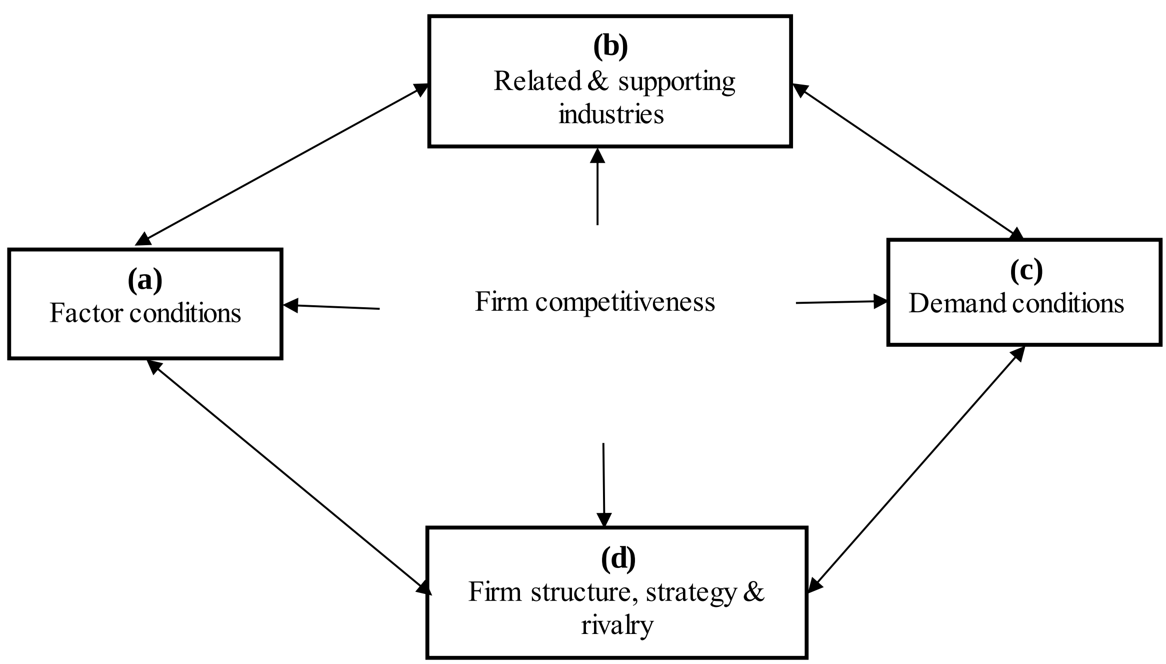

Figure 3.1 Porter"s Diamond Framework.

Source: Adapted from Porter (1990)

The four determinants are presented below:

a) **Factor conditions**: This refers to the level of skills and resources that support the functions of that particular industry, and the barriers that affect that industry negatively (Spies, 1999). According to Porter (1990), cited in Dennis (2011), factors such as highly skilled labour, capital and infrastructure are created and improved through reinvestment and innovation which form the basis for sustainable competitive advantage of a country.

b) **Related and supporting industries**: This refers to clusters of supporting industries, expertise and services, which sustain a certain industry or sector creating a conducive climate for innovation (Spies, 1999). Porter (1998) states that the external economies of related and support industries, such as specialized input providers, institutional and the impacts of local rivalry become the true source of competitive advantage. He further states that the cluster should represent an environment in which learning, innovation and productivity can be enhanced (Porter, 1998).

c) **Demand conditions***:* This refers to the contribution of strong, demanding, and sophisticated domestic customers, which refines the competitiveness of a specific industry (Spies, 1999). According Dennis (2011), this composition of domestic demand shapes the perceptions and response of businesses to the needs of customers. As a result, businesses are forced to innovate and improve their competitive positions by increasing the standards and features of products and services offered (Dennis, 2011).

d) **Firm strategy, structure and rivalry**: This refers to "the contribution of strong domestic rivalry in an industry towards its international competitiveness" (Spies, 1999; pg.479). These are conditions in a country that control how companies are created, organized, and managed, along with the nature of domestic rivalry (Esterhuizen, 2006). Rivalry is the most critical driver of competitive advantage for businesses (Smit, 2010).

According to Porter (1990), these determinants create an interactive system, and the relationship between these determinants leads to the competitive advantage of countries. The interactions between these variables will vary for each country and competitiveness will depend on the quality of interactions. In addition to the determinants of competitiveness, chance and government variables have an indirect impact on the competitiveness of a nation (Porter, 1990).

Chance events such as inventions, wars, shifts in the financial markets and technologies can change the sources of competitive advantage. These are chance events because they can occur unexpectedly by disrupting once good sources of competitive advantage for firms and countries. Even though the Porter‟s diamond model was designed to compare competitiveness at a macroeconomic level, a similar group of factors are appropriate at provincial, regional and firm level (Crouch and Ritchie, 1999). Furthermore, Siggel (2006) suggests that the microeconomic concept and indicators of competitiveness have a strong theoretical base than the macroeconomic view because it emphasizes the important characteristics of competitive producers. Therefore, this suggests that competitiveness of protected areas in KwaZulu-Natal can be analysed within this framework and at firm-level.

Depperu and Cerrato (2005) proposed a framework of analysis of competitiveness at firm-level. Their suggested framework was summarized in a 2×2 matrix in Figure 3.2.

Nature of competitiveness \ Approach	Static (Assets/Resources)	Dynamic (processes)
Driver	1. Resource-based view	2. Competence-based view
Outcome	4. Financial ratios, market share & other non-financial parameters	3. Trend of profitability, market-based & other indicators

Figure 3.2 Framework for the analysis of firm-level competitiveness.

Source: Depperu and Cerrato (2005)

Depperu and Cerrato (2005) treat competitiveness as a dependent or independent variable. The first approach in the vertical side of the matrix looks at competitiveness as a driver of a firm‟s performance while the second approach takes competitiveness as an outcome of firm‟s competitive advantages. Once competitiveness is treated as a driver, it takes into account the sources of a firm‟s competitiveness advantage. These sources are classified as internal and external. Internal sources arise from a firm, and external sources arise from industry and country-based factors. Depperu and Cerrato (2005) also report that internal sources are categorized as tangible and intangible, and employee-related and firm-related. Furthermore, the internal sources of competitiveness can be considered through the static or the dynamic approach (Figure 3.2). The static approach focuses on resources and assets, and considers these the source of a firm‟s competitiveness. However, the dynamic approach considers management processes that transform and utilize resources and assets (essentially the capacity of a firm to work more effectively and efficiently) as a source of competitiveness. External sources comprise of all the variables that are related to the structural arrangement of a particular industry and competition.

When competitiveness is considered as an outcome, superior financial performance is taken as an indicator of competitive success. In that case, profitability becomes a measure of financial performance and can be determined through profitability ratios. Furthermore, Depperu and Cerrato (2005) stated that the indicator of competitiveness is a relative concept that cannot be based on single period measurement of competitiveness. A framework of analysis for this study was developed from the diamond model and firm-level framework of competitiveness to measure the operational competitiveness/performance of commercial operations in PPAs managed by EKZNW. This is illustrated in Figure 3.3 in the next page.

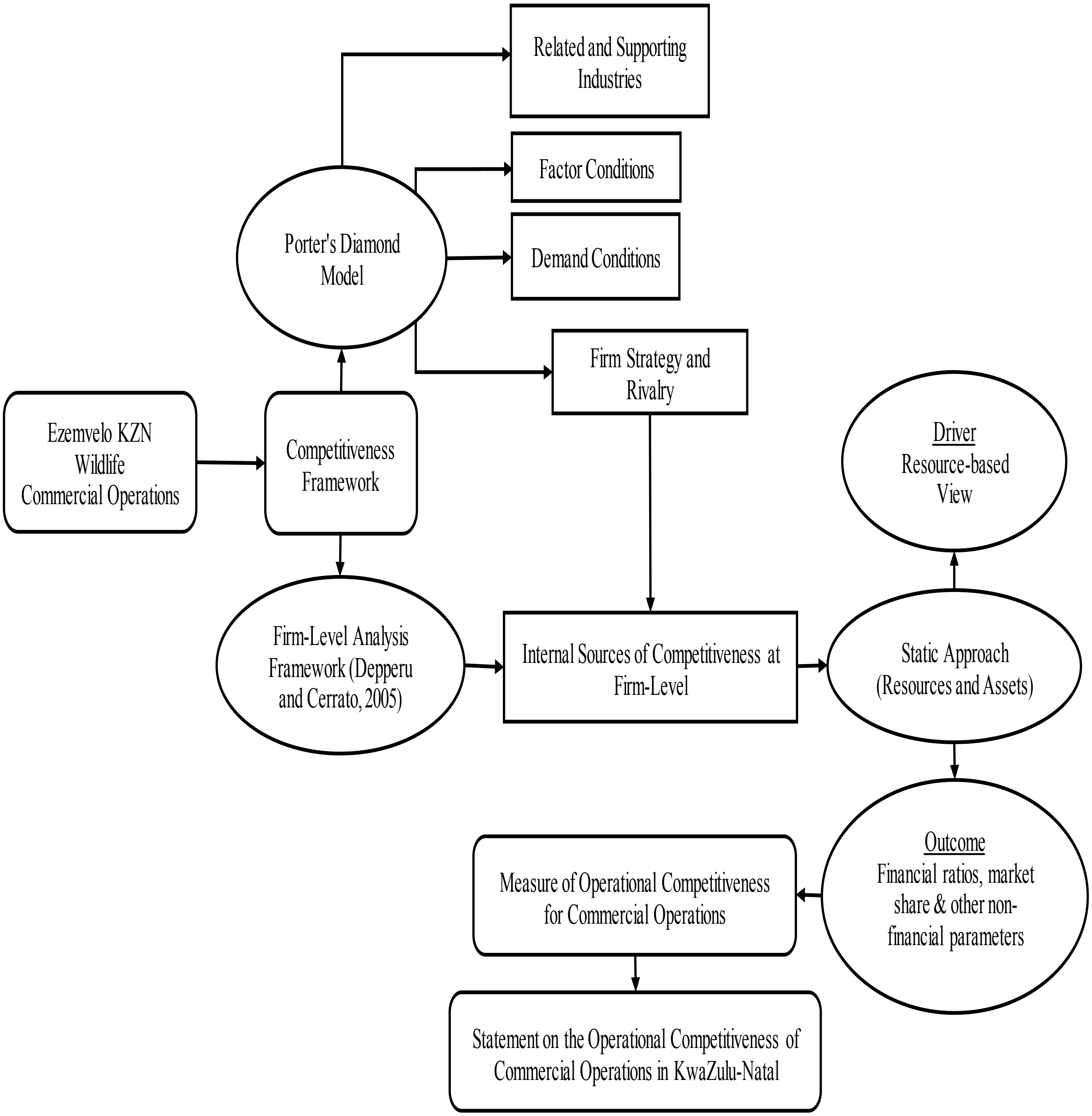

Figure 3.3 A Framework for analysing the operational competitiveness of commercial operations in public protected areas in KwaZulu-Natal.

Source: Own schematic presentation

3.2 The empirical models

Researchers have developed various methods of measuring competitiveness or performance. The measurement procedures developed so far can be classified into three groups viz. (a) Ratios and index numbers, (b) Econometric models and (c) Non-parametric methods (Parkan and Wu, 1999a). The most widely used measures of competitiveness or performance are financial ratios. These ratios are used to determine and control the financial position of a firm (Van Zyl *et al.*, 1999). However, even though ratios are useful in identifying performance problems in certain areas, combining them to reflect overall performance can be challenging (Parkan and Wu, 1999b). Index-based measurement methods require detailed data on prices and quantities, and are mainly designed for time series data (Parkan and Wu, 1999b). Econometric models require a functional form that is assumed to describe a firm‟s operations. It is an assumption that can be limiting in practice because it is challenging to determine a function that represents the operations of a firm well (Parkan and Wu, 1999a). Therefore, in the study, a non-parametric approach has been used. A competitiveness analysis method called OCRA was used to construct a competitiveness profile for each PPA in KZN.

3.2.1 Operational competitiveness rating analysis (OCRA)

OCRA is a relative performance method used to measure the performance of operating entities called production units. Production units are purposeful entities that convert resources into goods and services (Parkan, 1991). The method has properties that make it appropriate to evaluate the operational competitiveness of commercial operations in EKZNW. Ratings obtained by OCRA are not sensitive to the amount of inputs or outputs or the number of protected areas used in the study (Parkan and Wu, 1999b). The model aggregates resources and products, and allows for the incorporation of management perceptions of the relative importance of resource use and the generation of revenues into the ratings (Parkan, 1996). OCRA is suitable for financial value data, time series data, and data on quantities and unit prices, and has been used in different industries to measure operational competitiveness. The model‟s popular use in numerous sectors (Parkan, 1996, Parkan *et al.*, 1997, Parkan, 1999, Parkan and Wu, 1999a, Parkan and Wu, 1999b, Parkan, 2003) makes it suitable to use in the ecotourism sector to analyse operational competitiveness at firm level.

The OCRA procedure involves simple ratio-type, non-iterative computations that measure the production units (PUs) relative to operational competitiveness (Parkan *et al.*, 1997), and consists of three phases. The first phase is the development of a resource consumption or cost inefficiency model. Second phase, involves the development of the output generation or revenue inefficiency model. The last phase, involves combining the last two sets of models to obtain the operational competitiveness rating model. Figure 3.4 shows the procedure for computing OCRA on data that is separated and not aggregated.

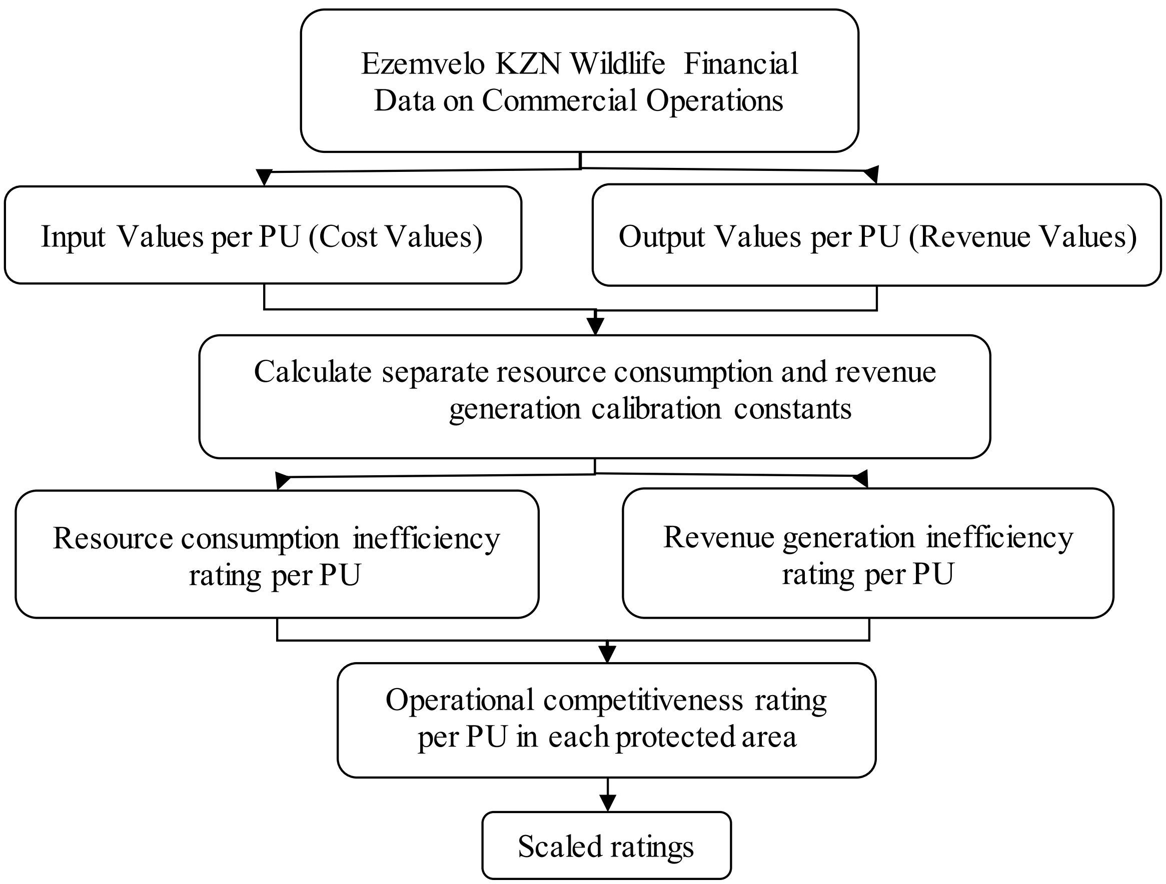

Figure 3.4 Computational procedure of operational competitiveness ratings

Source: Adapted from Parkan *et al*. (1997)

3.2.2 The operational competitiveness ratings procedure

Following Parkan (1996), the model is described as follows: In the model a comparison of *k* PUs is done to obtain the firm‟s operational performance. *I* is identified as different types of resources and *J* as different types of revenue items. Consumed resources are called inputs, and products and services are called outputs. Therefore, X^k= (x^k_{1},……, x^k_I) and Y^k= (y^k_{1},…..,y^k_J) represent the *k* *th* PU‟s input and output quantities, respectively. For instance, the i^{th} element of X^k, x^k_i shows the quantity of input *i* used by the *k* *th* PU, *i* = 1……, I. While P^k= (p^k_{1},……, p^k_I) and q^k= (q^k_{1},……, q^k_J) is the corresponding input and output unit prices vectors, respectively.

3.2.2.1 Cost inefficiency ratings

The cost inefficiency model or function is calculated to determine whether input quantities would give information about a production unit‟s (PU‟s) relative input inefficiency. For the model to show inefficiency, the value of the model should increase with the quantity of inputs. Therefore, *C* (x; p^k, x^k) = C^k(x) is assumed to be a function of x. Where, C^k_x is defined as the minimum value of C^k(x) over x such that the input cost p^kx is not less than the input cost that has actually been incurred at PU *k*, $p^k x^k$, which implies that x represents an inefficient input consumption at the *k* *th* PU‟s prices, which can be expressed as:

$$C^k_x = \text{Min}_x \left\{C^k(x)\colon p^k x \geq p^k x^k, x \geq 0, x \neq 0\right\}, \qquad k = 1, \dots, K, \tag{1}$$

where p^kx is the scalar product and 0 is the *I*-component vector (0,…,0). Thus, $p^k x \geq p^k x^k$ is called the cost constraint.

The input quantity vector can only assume those values that have been observed at the *K* PUs being analysed, x^n, *n* = 1,……, *K*. If the *k* *th* PU were more inefficient when it used the same quantity of inputs as another PU, then C^k_x assumes the smallest value possible. If it becomes the case, cost constraint $p^k x \geq p^k x^k$ is satisfied for all x = x^n, n = 1,……, *K*, n ≠ *k*. Therefore, if at least one PU‟s input quantities do not satisfy the cost constraint, then equation **(1)** is minimized over fewer input vectors and C^k_x may not assume the smallest possible value.

To obtain the value of C^k_x on the basis of the observed values of p^k and x^k for k =1,……, *K*, since the existence of a non-negative number α^k is necessary and sufficient, therefore, for each *k*, the Lagrangean function for equation **(1)** becomes:

$$L\,(x, \alpha) = -\,C^k(x) + (p^k_N\, x - 1)\alpha \tag{2}$$

and has critical point (x^k, α^k) and

$$L(x, \alpha^k) \leq \mathrm{L}(x^k, \alpha^k) \leq L(x^k, \alpha), \qquad \mathrm{x} \geq 0, \alpha \geq 0. \qquad \textbf{(3)}$$

$p_N^k = {p^k}/{p^k x^k}$ is an *I*-vector of cost-normalized unit prices and α^k is called the Lagrange multiplier in equation **(2)**. However, expanding the inequalities in elevation **(3)** it becomes

$$-C^k(x) + (p_N^k\, x - 1)\alpha^k \leq -C^k(x^k) + (p_N^k\, x^k - 1)\alpha^k \leq -C^k(x^k) + (p_N^k\, x^k - 1)\alpha \qquad \textbf{(4)}$$

since $(p_N^k\, x^k - 1) = 0$, then

$$C^k(x^k) - C^k(x) + \left(p_N^k\, x - 1\right)\alpha^k \leq 0, \;\; k = 1, \ldots\ldots, K. \qquad \textbf{(5)}$$

The increasing property of $C^k(x)$ suggests that $\alpha^k \geq 0$. Moreover, *x* can only be one of x^n, *n* = 1, …., *K*, $k \neq n$. Therefore, equation **(5)** is rewritten as:

$$C_x^k - C_x^n + \left(p_N^k x - 1\right)\alpha^k \leq 0 \qquad \alpha^k > 0 \qquad \textbf{(6)}$$

for *k, n* =1,….., *K*, $k \neq n$. The α^k and C_x^k values satisfying equation **(6)** are found by solving the linear program (LP):

$$\text{Min } S_x = \textstyle\sum_{kn} s^{kn} \qquad \textbf{(7)}$$

Subject to

$$C_x^k - C_x^n + p_N^k(x^n - x^k)\alpha^k - s^{kn} \leq 0$$

$$\alpha^k \geq \alpha^k > 0; \quad c_x^k, s^{kn} \geq 0$$

for *k, n* =1,….., *K*, $k \neq n$. In equation **(7)**, s^{kn} is a penalty variable and $\alpha^k > 0$ allows for the specification of the lower bound of α^k. If the optimum value of S_x is S_x^* = 0, then the optimum solution of the LP, equation **(7)** characterises the solution of the minimization problem, equation **(1)**, as it satisfies equation **(6).** Therefore, the optimum value of c_x^k in the LP **(7)** is C_x^k and it is taken to represent a rating that gauges the relative input inefficiency of the k^{th} PU. However, if $\mathrm{S_x^*} > 0$, then there does not exist an inefficiency function with the properties stated that is compatible with the observed input consumption at the *K* PUs and the LP, equation **(7)**, cannot be used to obtain the rating C_x^k.

If the quantities of inputs used are exogenous but input prices are controllable and we need to rate the inefficiencies of the PUs in relation to input prices, equation **(1)** can be reformulated as:

$$\text{Min}_p = \{C(p; p^k, x^k): x^k p, p \geq 0, p \neq 0\} \quad \textbf{(8)}$$

when the roles of p and x are reversed, the LP, equation **(6)**, can be used to compute the relative inefficiency ratings, C_p^k, of the PUs in relation to input prices. The ratings gauge the PUs" ability to acquire resources at favourable prices.

On the other hand, when $S_x^* > 0$ in the LP, equation **(7)**, especially when there is data only on cost values, then equation **(1)**, can be modified for cost data represented by components of the vector $u^k = (u_1^k, \ldots\ldots, u_I^k)$, where u_i^k is the cost incurred for the i^{th} resource:

$$C_u^k = \text{Min}_u\{C^k(u): 1u \geq 1u^k, u \geq 0, u \neq 0\}, \; k = 1, \ldots\ldots, K, \quad \textbf{(9)}$$

where 1 is the I-dimensional unit vector. Therefore, the LP corresponding to equation **(9)** is

$$\text{Min } S_u = \textstyle\sum_{kn} s^{kn} \quad \textbf{(10)}$$

Subject to

$$c_u^k - c_u^n + u_N^k(u^n - u^k)\alpha^k - s^{kn} \leq 0$$

$$\alpha^k \geq a^k > 0; c_u^k, s^{kn} \geq 0$$

for $k, n = 1, \ldots\ldots, K$, $k \neq n$. In the model above, $(u_N^k u^n)$ is the I-vector of normalized costs at the nth PU, where $u_N^k = \left(\frac{1}{1u^k}\right)$. The optimum value obtained for c_u^k, *is* C_u^k, and it is a rating that gauges the relative cost inefficiency of the k^{th} PU.

If resources are organized into M categories, the quantity, price, and cost vectors become $x^k = (x_1^k, \ldots\ldots, x_m^k, \ldots\ldots, x_M^k), p^k = (p_1^k, \ldots\ldots, p_m^k, \ldots\ldots, p_M^k)$ and $u^k = (u_1^k, \ldots\ldots, u_m^k, \ldots, u_M^k)$.For instance, $u_m^k = (u_{1(m)}^k, \ldots\ldots, u_{I(m)}^k)$ is the cost vector for the m^{th} category of resources and the cost items in this category are indexed as $1(m), \ldots\ldots, I(m)$, $m = 1, \ldots\ldots, M$. Equation **(1)** and **(9)** are written to consider the M input categories separately, for example:

$$C_u^k = \text{Min}_u\{C^k(u): 1u_m \geq 1u_m^k, \; m = 1, \ldots\ldots\ldots, M; u \geq 0, u_m \neq 0\}, \quad k = 1, \ldots\ldots, K, \quad \textbf{(11)}$$

where $u = (u_1, \ldots\ldots, u_M)$**.** The LP for equation **(11)** is the modification of the LP in **(10)**.

$$\text{Min } S_u = \textstyle\sum_{kn} s^{kn} \quad \textbf{(12)}$$

However, it is subject to

$$c_u^k - c_u^n + \sum_{m=1}^{M}\left[u_{Nm}^k(u_m^n - u_m^k)\alpha_m^k\right] - s^{kn} \leq 0$$

$$\alpha_m^k \geq a_m^k > 0, \qquad m = 1, \dots \dots, M; \quad c_u^k, s^{kn} \geq 0$$

for *k, n* =1,….., *K*, *k* ≠ *n* and $u_{Nm}^k = \frac{1}{1u_m^k}$. A similar modification can be done on equation **(7)** to formulate the multiple input-category case. Moreover, if $S_u^* = 0$, the optimum value of c_u^k, C_u^k, in the LP **(12)** is the relative cost inefficiency rating of PU *k.* The lower bound a_m^k on the value of α_m^k essentially acts as a weight that defines the importance of the resource consumption difference between PUs *n* and *k*,$(u_m^n - u_m^k)$, *n* = 1,…, *K*, for category *m* cost items. It makes it possible for the calibration of the model to produce a specific optimum solution. Hence, a_m^k is called a calibration constant and its value must be determined in a way that represents the perceived relative importance of category *m* costs. Inefficiency ratings obtained as the solution of the LP **(12)** model show greater contrast than those obtained by the LP **(10)** model because any inefficiencies in the cost categories considered are revealed without the obscuring effects of aggregation.

According to Parkan (1996), if all the PUs assign the same degree of relative importance to each cost category, that is, if $a_m^k = a_m$, *k* = 1,…., *K*, then rating C_u^k, can be obtained more efficiently by a two-step ratio-type computational procedure. The first step is to compute the relative cost inefficiency rating of the *k*th PU in relation to the *m*th cost category:

$$C_{um}^k = \left[\text{Cost}_m^k - \text{Min}_{n=1,\dots\dots,K}\{\text{Cost}_m^n\}\right]a_m / \text{Min}_{n=1,\dots\dots,K}\{\text{Cost}_m^n\} \qquad \textbf{(13)}$$

where $\text{Cost}_m^k = 1u_m^k$, cost of category *m* total cost items at PU *k*, and *m* = 1,….., *M*; *k* =1, …., *K*. $C_{um}^k \geq 0$ and only the least inefficient PU will receive a rating of zero. In equation **(12)**, it is the case that the optimum value of α_m^k is $\left[\text{Cost}_m^k / \text{Min}_{n=1,\dots\dots,K}\{\text{Cost}_m^n\}\right]a_m$. The second step, involves summing C_{um}^k and scaling the sum so that its minimum is zero:

$$C_u^k = \sum_{m=1}^{M} C_{um}^k - \text{Min}_{n=1,\dots\dots,K}\left\{\sum_{m=1}^{M} C_{um}^n\right\} \qquad \text{for k =1,……,}K. \qquad \textbf{(14)}$$

3.2.2.2 Revenue inefficiency ratings

The same approach can be adopted to determine revenue inefficient ratings for related PUs. A function showing a relationship between the levels of output created by PUs was created. The relationship between the values of this function and the quantity of output should be such that as more output is created the value of the function decreases. It is assumed that the convex and increasing function $R\ (-y; q^k, y^k) = R^k(-y)$ of $-y$ is such a function. Therefore, as output quantities decrease, $-y$ increases and the value of R also increases. R_y^k is defined as the minimum value of $R^k(-y)$ over y such that the corresponding output value, $q^k y$, is not greater than the revenue actually generated at PU k, $q^k y^k$, suggesting inefficient output creation. The minimization problem below is the revenue-side complement of equation **(1)**:

$$R_y^k = \text{Min}_y\{R^k(-y): q^y y \le q^k y^k, y \ge 0, y \ne 0\},\ k = 1, \dots \dots, K. \qquad \textbf{(15)}$$

$q^y y \le q^k y^k$ is referred to as the revenue constraint. Following an approach similar to the one used earlier, a linear programming model whose optimum solution characterizes the solution of the minimization problem was developed, equation **(16)**.

$$\text{Min}\ S_y = \sum_{kn} s^{kn} \qquad \textbf{(16)}$$

subject to

$$r_y^k - r_y^n - q_N^k(y^n - y^k)\beta^k - s^{kn} \le 0$$

$$\beta^k \ge b^k > 0;\ r_y^k, s^{kn} \ge 0$$

for k, n = 1, …, K, $k \neq n$. In the LP equation **(16)**, $q_{Nm}^k = {q^k}/{q^k y^k}$. The calibration constant, b^k sets the lower bound for multiplier β^k. If, in the optimum solution, $S_y^* = 0$, then the optimum value of r_y^k, R_y^k, represents the relative output inefficiency of the k^{th} PU. Equation **(16)** can be reformulated for output prices: $Min_q\{R(-q; q^k, y^k): y^k q \le y^k q^k, q \ge 0, q \ne 0\},\ k = 1, \dots \dots, K$. The LP equation **(16)** can be adapted by reversing the roles of y^k and q^k to obtain the R_p^k, the relative inefficiency rating of PU k in relation to output prices. Thus, when these ratings are available, they gauge the PUs" relative ability to charge favourable prices for their output. However, when only revenue data are available, equation **(17)** is modified as

$$R_v^k = \text{Min}_v\{R^k(-v): 1v \le 1v^k, v \ge 0, v \ne 0\},\ k = 1, \dots \dots, K \qquad \textbf{(17)}$$

where $v = (v_1, \dots \dots, v_J), v^k = (v_1^k, \dots \dots, v_J^k)$, and $R^k(-v)$ is a convex, increasing function of $-v$. The optimum solution of the linear program corresponding to equation **(17)** provides the relative revenue inefficiency ratings of the PUs. To consider multi-revenue categories, equation **(18)** below is:

$$R_v^k = \text{Min}_v\{R^k(-v): 1v_h \leq 1v_h^k, h = 1, \dots, H; v_h \geq 0, v_h \neq 0\},\ k = 1, \dots\dots, K \quad \textbf{(18)}$$

where $v = (v_1, \dots., v_h, \dots\dots, v_H)$. The LP equation **(19)** below was developed in a similar manner to the earlier LPs to compute the relative revenue inefficiency ratings for the PUs considered:

$$\text{Min } S_v = \sum_{kn} s^{kn}$$

(19)

subject to

$$r_v^k - r_v^n - \sum_{h=1}^{H}\left[v_{Nh}^k\left(v_h^n - v_h^k\right)\beta_h^k\right] - s^{kn} \leq 0$$

$$\beta_h^k \geq b_h^k > 0, \qquad h = 1, \dots., H;\ r_v^k, s^{kn} \geq 0$$

for $n = 1, \dots\dots, K,\ k \neq n\ and\ v_{Nh}^k = {}^{1}\!/_{1v_h^k}$.

Still, if all the PUs assign the same degree of relative importance to each revenue category so that $b_h^k = b_h$, $k = 1, \dots\dots, K$, then the rating R_v^k can be obtained more efficiently by a two-step ratio-type computational procedure. The first step is to compute the relative inefficiency rating of the k^{th} PU in relation to the h^{th} revenue category:

$$R_{vh}^k = \left[\text{Max}_{n=1,\dots,K}\{\text{Revenue}_h^n\} - \text{Revenue}_h^k\right] b_h / \text{Min}_{n=1,\dots,K}\{\text{Revenue}_h^n\}, \quad \textbf{(20)}$$

where $Revenue_h^k = 1v_h^k$, total revenue of category h revenue items at PU k, and $h = 1, \dots\dots, H; k = 1, \dots., K. R_{vh}^k \geq 0$ and only the least inefficient PU will receive a rating of zero. The optimum value of β_h^k in equation **(19)** is $\left[\text{Revenue}_h^k / \text{Min}_{n=1,\dots,K}\{\text{Revenue}_h^n\}\right] b_h$. R_{vh}^k is summed and that sum is scaled so that the least inefficient PU receives a rating of zero

$$R_v^k = \sum_{h=1}^{H} R_{vh}^k - \text{Min}_{n=1,\dots,K}\left\{\sum_{h=1}^{H} R_{vh}^k\right\} \text{ for } k = 1, \dots\dots, K. \quad \textbf{(21)}$$

3.2.2.3 Operational competitiveness ratings

The convex and increasing function $E(u, -v: u^k, v^k) = E(u, -v)$ of $(u, -v)$ represents the combined relative cost and revenue inefficiency of PU k, $k = 1, \dots\dots, K$, this makes it possible to define E_{uv}^k as its minimum value such that the cost of resources consumed in any cost category is not less than the cost actually acquired at the k^{th} PU and the revenue generated in any revenue category is not more than the revenue actually realized at the k^{th} PU.

$$E_{uv}^{k} = Min_{u,v}\{E^{k}(u,-v): 1u_m \geq 1u_m^k, m = 1, \ldots, M; 1v_h \leq 1v_h^k, h = 1, \ldots, H; u_m, v_h \geq 0, u_m, v_h \neq 0\},\ k = 1, \ldots, K. \quad \textbf{(22)}$$

The LP whose optimum solution characterizes the solution of the minimization problem, equation **(22)** is given as

$$\text{Min } S_{uv} = \sum_{kn} s^{kn} \quad \textbf{(23)}$$

subject to

$$e_{uv}^{k} - e_{uv}^{n} + \sum_{m=1}^{M}\left[u_{Nm}^{k}(u_m^n - u_m^k)\alpha_m^k\right] - \sum_{h=1}^{H}\left[v_{Nh}^{k}(v_h^n - v_h^k)\beta_h^k\right] - s^{kn} \leq 0,$$

$$k, n = 1, \ldots, K \ \&\ k \neq n$$

$$\alpha_m^k \geq a_m^k > 0, m = 1, \ldots, M;\ \ \beta_h^k \geq b_h^k > 0,\ \ h = 1, \ldots, H;$$

$$e_{uv}^{k}, s^{kn} \geq 0, k, n = 1, \ldots, K \ \text{ and } k \neq n$$

Parkan (1996) suggests that the LP equation **(23)** has multiple optima. Further conditions have to be imposed to obtain a unique and sensible optimum solution. The first condition is based on the observation that, by adding the sums of the multipliers to the objective function, the impact on the ratings of the cost and revenue differences between the PUs is minimized. Secondly, linearity of $E^k(u,-v)$ is introduced. By imposing linearity on the increasing function $E^k(u,-v)$ leads to an optimum solution, which can be obtained using a computationally simple procedure that has intuitive appeal, on the condition that calibration constants remain invariant across the PUs. The linearity condition on $E^k(u,-v)$ causes the constraints of the LP equation **(23)** to be equality, and the penalty variables s^{kn} to be unrestricted in sign. Then, the modified linear program turns out to be:

$$\text{Min } S = \sum_{kn} s^{kn} + \sum_{km} \alpha_m^k + \sum_{kh} \beta_h^k \quad \textbf{(24)}$$

subject to

$$e_{uv}^{k} - e_{uv}^{n} + \sum_{m=1}^{M}\left[u_{Nm}^{k}(u_m^n - u_m^k)\alpha_m^k\right] - \sum_{h=1}^{H}\left[v_{Nh}^{k}(v_h^n - v_h^k)\beta_h^k\right] - s^{kn} \leq 0, k, n = 1, \ldots, K \ \&\ k \neq n$$

$$\alpha_m^k \geq a_m^k > 0, m = 1, \ldots, M;\ \ \beta_h^k \geq b_h^k > 0,\ \ h = 1, \ldots, H;\quad e_{uv}^{k} \geq 0,$$

s^{kn} unrestricted in sign $k, n = 1, \ldots\ldots, K$ and $k \neq n$.

The optimum value of e_{uv}^k represents E_{uv}^k, this being the combined relative cost and revenue inefficiency rating of PU k as $\sum\sum_{kn} s^{kn} = 0$. However, if all the PUs have the same calibration constant value for each cost and revenue category, $a_m^k = a_m$ and $b_h^k = b_h$, $m = 1, \ldots\ldots, M$ and $h = 1, \ldots\ldots, H$, this means that E_{uv}^k can be obtained quickly by linearly scaling the sum of the cost and revenue inefficiency ratings calculated by equation **(14)** and equation **(21)** in the following manner:

$$E_{uv}^k = \sum_{m=1}^{M} C_{um}^k + \sum_{h=1}^{H} R_{vh}^k - Min_{n=1,\ldots,K}\{\sum_{m=1}^{M} C_{um}^n + \sum_{h=1}^{H} R_{vh}^n\}, \ \ k = 1, \ldots\ldots, K. \quad \textbf{(25)}$$

According to Parkan (1996), the average cost and revenue shares of the turnover can be used to represent the relative importance of cost and revenue categories or provided by management to reflect its supposed competitive priorities. Therefore, to determine the cost share of its category *m* resource items and the revenue share of its category *h* revenue items, computations was done as follows:

$$Cost_m^k = \text{Cost}_m^k \Big/ [\sum_{m=1}^{M} \text{Cost}_m^k + \sum_{h=1}^{H} \text{Revenue}_h^k] \quad \textbf{(26)}$$

$$Revenue_h^k = \text{Revenue}_h^k \Big/ [\sum_{m=1}^{M} \text{Cost}_m^k + \sum_{h=1}^{H} \text{Revenue}_h^k] \quad \textbf{(27)}$$

for $m = 1, \ldots\ldots, M, h = 1, \ldots\ldots, H,$ and $k = 1, \ldots\ldots, K$

Then, $a_m^k = Cost_m^k$ and $b_h^k = Revenue_h^k$. Therefore, if $a_m^k = a_m$ and $b_h^k = b_h$, the average cost category share was used as the value of the calibration constant for that cost category, and the average revenue category share as the calibration constant for that revenue category:

$$a_m = [\sum_{k=1}^{K} Cost_m^k] \Big/ K \ \text{ for } \ m = 1, \ldots\ldots, M. \quad \textbf{(28)}$$

$$b_h = [\sum_{k=1}^{K} Revenue_h^k] \Big/ K \ \text{ for } h = 1, \ldots\ldots, H. \quad \textbf{(29)}$$

It should be noted that $\sum_{m=1}^{M} a_m + \sum_{h=1}^{H} b_h = 1$

The normalization is needed to make sure that the ratings calculated for different calibration constant values are comparable.

3.2.3 Empirical application of the operational competitiveness rating

In this study, each protected area‟s annual operations are viewed as a production unit (PU). Analysis was done on the values of resource consuming and revenue generation operations. As shown in Figure 3.4, the first step in applying the OCRA procedure is to compute calibration constants (a_m and b_h) for each resource category C_{km}, and revenue category R_{kh}, as they reflect the relative importance that the k^{th} PU assigns to the m^{th} resource category and h^{th} revenue category. Therefore, resource and revenue calibration constants were obtained using equation **(26)**, **(27), (28)** and **(29)** as follows, for example:

$$Cost_m^k = \mathrm{Cost}_m^k \Big/ [\textstyle\sum_{m=1}^{11} \mathrm{Cost}_{11}^7 + \sum_{h=1}^{7} \mathrm{Revenue}_7^7] \qquad m = 1,\ldots, 11 \text{ and } k = 1,\ldots,7$$

$$a_m = [\textstyle\sum_{k=1}^{7} Cost_{11}^7] \big/ 7 \qquad m = 1,\ldots, 11$$

$$Revenue_h^k = \mathrm{Revenue}_h^k \Big/ [\textstyle\sum_{m=1}^{11} \mathrm{Cost}_{11}^7 + \sum_{h=1}^{7} \mathrm{Revenue}_7^7] \qquad h = 1,\ldots,7 \text{ and } k = 1,\ldots,7$$

$$b_h = [\textstyle\sum_{k=1}^{7} Revenue_7^7] \big/ 7 \qquad h = 1,\ldots, 7$$

The next step as shown in Figure 3.4 is to compute the cost inefficiency ratings for k^{th} PU‟s with respect to the m^{th} category (resource consumption category). Therefore, relative cost inefficiency ratings were calculated using equation **(13)** as follows, for example:

$$C_m^k = \left[\mathrm{Cost}_m^k - \mathrm{Min}_{n=1,\ldots\ldots,7}\{\mathrm{Cost}_m^n\}\right] a_m / \mathrm{Min}_{n=1,\ldots\ldots,7}\{\mathrm{Cost}_m^n\},$$

$$m = 1,\ldots, 11, \text{ and } k = 1,\ldots,7$$

In equation **(13)** above, Cost_m^k is the total cost of m^{th} category in year k and $\mathrm{Min}_{n=1,\ldots\ldots,7}\{\mathrm{Cost}_m^n\}$ is the lowest cost incurred amongst the PU with respect to the m^{th} category (Parkan, 1996, Parkan and Wu, 1999a). Furthermore, $\mathrm{Revenue}_h^k$ in equation **(20)** is the total revenue of h^{th} category in year k, and $\mathrm{Min}_{n=1,\ldots\ldots,7}\{\mathrm{Revenue}_h^n\}$ and $\mathrm{Max}_{n=1,\ldots..,7}\{\mathrm{Revenue}_h^n\}$ are the minimum and maximum revenues realized with respect to the h^{th} category. Relative revenue inefficiency ratings for k^{th} PU‟s with respect to the h^{th} category (revenue generation category) were computed using equation **(20)** as follows:

$$R_h^k = \left[\text{Max}_{n=1,....,7}\{\text{Revenue}_h^n\} - \text{Revenue}_h^k\right] b_h / \text{Min}_{n=1,.....,7}\{\text{Revenue}_h^n\},$$

$$h = 1,\ldots, 7 \text{ and } k = 1,\ldots,7$$

Thereafter, computed resource consumption and revenue generation ratings will be linearly scaled using equation **(14)** and **(21)** respectively, so that the least inefficient PU receives a rating of zero.

$$C_u^k = \sum_{m=1}^{M} C_{um}^k - \text{Min}_{n=1,......,K}\left\{\sum_{m=1}^{M} C_{um}^n\right\}$$

$$\overset{k}{R_v} = \sum_{h=1}^{H} R_{vh}^k - \text{Min}_{n=1,....,K}\left\{\sum_{h=1}^{H} R_{vh}^k\right\}$$

The last step involved combining the resource consumption and revenue generation ratings (C_{um}^k and R_{vh}^k) to compute the k^{th} PU‟s operational competitiveness rating. Equation **(25)** was used to compute the operational competitiveness.

$$E_{uv}^k = \sum_{m=1}^{M} C_{um}^k + \sum_{h=1}^{H} R_{vh}^k - \text{Min}_{n=1,....,K}\left\{\sum_{m=1}^{M} C_{um}^n + \sum_{h=1}^{H} R_{vh}^n\right\}$$

Thus, E_{uv}^k is the operational competitiveness rating of k^{th} PUs and it measures the relative competitiveness of k^{th} PU operations. Furthermore, the ratings were interpreted as follows: a smaller E_{uv}^k means the k^{th} PU is relatively more competitive and a rating of zero means the PU is the best competitive operation. In conclusion, the OCRA technique has several advantages and according to Parkan (2003), those advantages are: simplicity in its application; ratings differ with cost and revenue variations; ratings for the cost and revenue categories incorporate priorities made by the decision maker; the number of PUs and categories are not restrictive, and it is not necessary for cost and revenue categories to have similar PUs making it possible for the comparison of dissimilar PUs.

3.2.4 Rank transformation approach

The data for this study included 7 operational competitive ratings for each protected area, and this was not adequate enough to fit in the context of normal statistical theory since data are evidently non-normal. Therefore, Wilcoxon-Mann-Whitney rank test (WMW test) was applied to the averages of operational competitiveness ratings and rankings of commercial operations to establish whether there was a statistically significant difference between regions managed by EKZNW. The WMW test is a non-parametric method used to transform data which do not follow a normal distribution, and uses ranks of the data to perform parametric tests (*t* test, *F* test, *etc*.) (Conover and Iman, 1981). Prior to the application of the WMW test, operational competitive ratings for 32 protected areas were calculated simultaneously. The sample size had to be adequately large to satisfy the normality condition for the WMW test, therefore the number of protected areas were multiplied by PUs (years) of commercial operations. This made the sample size $N= 32\times7 = 224$ ($N_{Ukhahlamba} = 98$, $N_{Zululand} = 49$ and $N_{Coastal} = 77$).

3.3 Description of the study area

The KwaZulu-Natal province is located on the east coast of South Africa. It is South Africa"s most vibrant and popular tourist destination. The province offers predominantly nature-based tourism products. This is due to the natural endowments of the province and a strong commitment to conservation from EKZNW (Aylward and Lutz, 2003, Dube, 2011). EKZNW manages 110 PPAs that cover over 675 000 hectares (Aylward and Lutz, 2003). Moreover, about 8.4 percent of the province is under protection relative to 5.4 percent for the whole country (Aylward and Lutz, 2003).

According to Dube (2011), KZN protected areas are located in three administrative regions: Ukhahlamba, Zululand and Coastal region (Figure 3.5). The Ukhahlamba region comprises of Ukhahlamba-Drakensburg Park World Heritage Site which is 260 000 hectares in size. Moreover, the region has networks of hydrological systems that produce water for urban and rural areas in KwaZulu-Natal. The Zululand region consists of Hluhluwe-iMfolozi Park, game reserves and other smaller protected areas. The world heritage site, Isimangaliso Wetland Park, is located in the coastal region. This region consists of other protected areas namely Umlalazi Nature Reserve, Beachwood Mangrove, and Oribi Gorge Nature Reserve.

Table 3.1 Administrative regions of EKZNW and protected areas considered in the study

Ukhahlamba Region	Zululand Region	Coastal Region
Kamberg	Ndumo	Rugged Glen Stables
Lotheni	Mpila	Sodwana Bay Resort
Didima	Hilltop	Kosi Bay
Mantuma	Centenary Centre	Cape Vidal
Thendele	Injesuthi	St Lucia Estuary
RNNP Mahai	Phongolo Controlled Hunting Area	Santa Lucia
Giants Castle	Umkhuze Controlled Hunting Area	Maphelana
Midmar		Charter's creek
Ntshondwe		False Bay
Spioenkop		Oribi Gorge
Wagendrift		Umlalazi
Chelmsford		
Weenen		
Monk's Cowl		

Source: EKZNW (2014)

Figure 3.5 Protected areas, conservation districts and regions managed by Ezemvelo KZN Wildlife.

Source: EKZNW (2009)

3.4 The data

To evaluate the trends in the competitiveness of commercial operations in PPAs, financial data were collected from EKZNW for the period 2007-2013. Data were granted only for 32 PPAs. The financial data consisted of values of costs and revenues of commercial operations on an annual basis. Cost and revenue values for each protected area were in nominal terms. Therefore, the South African consumer price index was used to deflate the cost and revenue values for the 2007-2013 period taking 2005 as the base year.

Cost and revenue items for each protected area were disaggregated and measured separately. Each cost and revenue item was considered a category. As a result, eleven cost categories and seven revenue categories were analysed annually between 2007 and 2013. In this study, cost categories are described as resources consumed (inputs) and revenue categories as revenues generated (outputs) (see Table 3.2 below). Moreover, protected areas considered in the study are listed in Table 3.1 and shown in Figure 3.6.

Table 3.2 Categories for resource consumption and revenue generated for commercial operations in each public protected area

Category	Revenue Generated (Outputs)	Category	Resources Consumed (Inputs)
R1	Accommodation	C1	Permanent Staff-Fixed Costs
R2	Admissions	C2	Permanent Staff-Variable Costs
R3	Permits and Licenses, or Hunting	C3	Temporary Staff
R4	Rentals, hire and concessions	C4	Administration
R5	Sales	C5	Operations-Maintenance & Repairs
R6	Sundry Income	C6	Operations-Services
R7	Trails, rides and tours	C7	Operations-Supplies
		C8	Operations-Transport
		C9	Operations-Utilities
		C10	Assets, Infrastructure and Ring-Fenced Work
		C11	Cost of Sales

Source: EKZNW (2014)

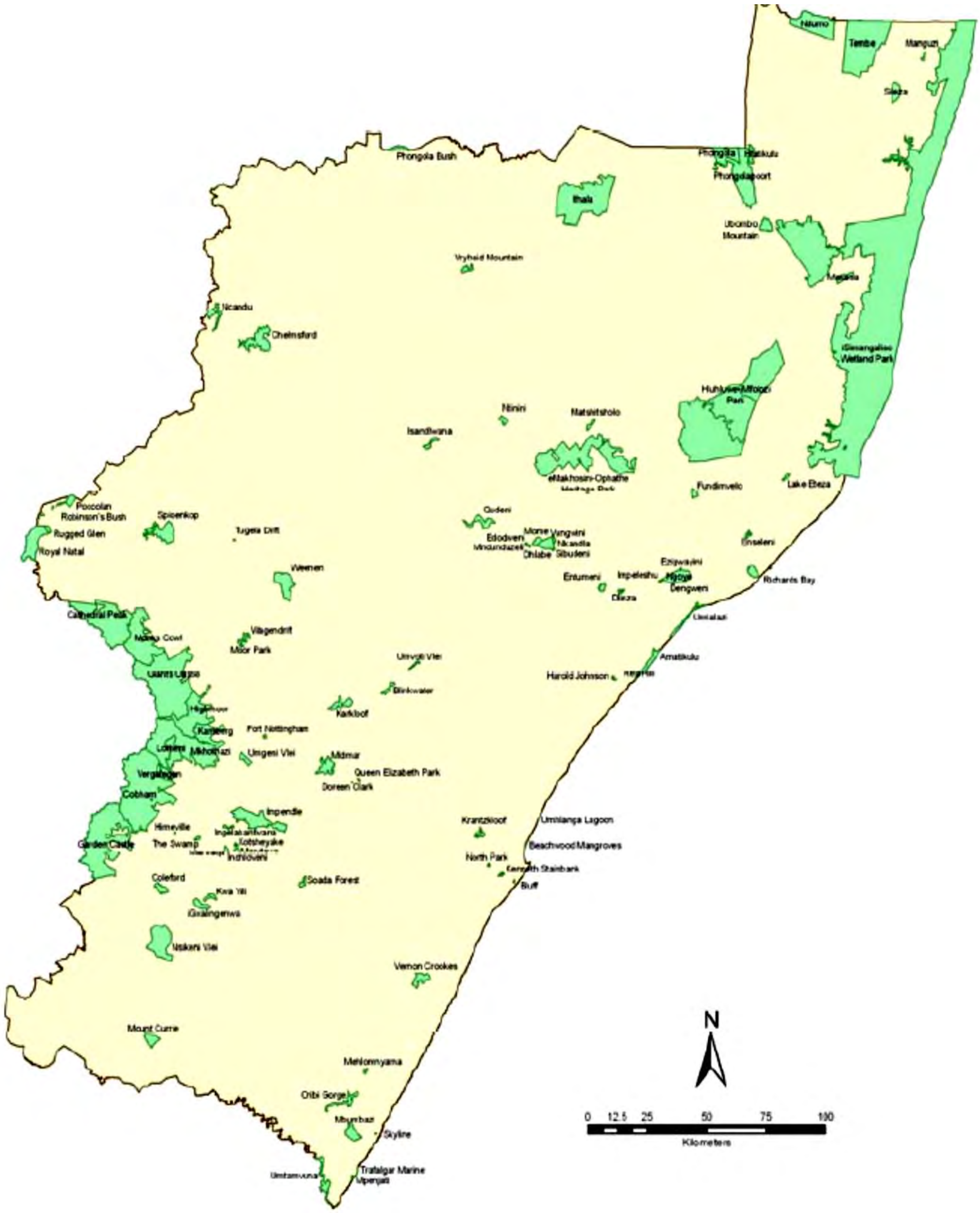

Figure 3.6 Ezemvelo KZN Wildlife public protected areas.

Source: EKZNW (2009)

3.5 Summary

Ezemvelo KZN Wildlife (EKZNW) is situated in the province of KwaZulu-Natal, one of South Africa‟s popular tourist destinations. EKZNW manages several PPAs in the province under 3 regions. Publicly accessible financial data from EKZNW were collected. A non-parametric technique called OCRA was used in the study. The method was used to measure the operational competitiveness of commercial operations for each public protected area under EKZNW. Moreover, the WMW test was used to test for operational competitiveness differences between PPAs in across three management areas. The next chapter introduces the results of the operational competitiveness of commercial operations in the PPAs considered in the study.

CHAPTER 4. RESULTS AND DISCUSSIONS

In this chapter, the results of the study are presented. In the following section, the operational competitiveness profiles is presented and discussed for each public protected area. This is followed by the results for the comparison of PPAs. Obtaining ratings from separate cost and revenue data provides decision makers with the opportunity to gather and identify strengths and weaknesses of activities within commercial operations in the PPAs considered. As a result, this made it possible to construct individual competitiveness profiles for each protected area between 2007 and 2013. As stated previously, commercial operations from each protected area had 11 resource consuming and 7 revenue generating categories.

4.1 Resource consumption calibration constants for public protected areas in the Ukhahlamba region

In the application of OCRA, the values of resource consumption calibration constants (a_m) were obtained for each public protected area by equations (26) and (28), and are presented in Table 4.1 (pg. 52-53). Calibration constants for resource consumption categories of PPAs (a_m) were obtained as the average cost shares and they indicate the relative importance assigned by management to the operations.

In evaluating the resource consumption calibration constants for Kamberg, the „Permanent Staff-Fixed Cost‟ category (C1- *basic salary, Unemployment Insurance Fund (UIF), housing subsidy, pension, medical aid, and service bonus*) had the highest calibration constant or average share of total costs at 4.8 percent. Moreover, the „Permanent Staff-Variable Cost‟ category (C2-*overtime, subsistence, danger, night shift, and standby allowance*) had the least average share of total costs at 0.18 percent. This suggests that Kamberg allocates more funds to paying their permanent staff members. According to Eagles *et al.* (2002), staff members in PPAs are poorly remunerated and in addition, Goodman (2003) found that numerous staff members in EKZNW thought that there were disparities between remuneration and the levels of responsibility granted. This created a higher staff turnover rate, with EKZNW losing highly skilled and experienced staff (Goodman, 2003). Therefore, EKZNW should continue creating incentives for the retention of highly skilled personnel so as not to compromise and undermine the primary mandate of biodiversity conservation. To do this, EKZNW managers need to increase operating funds by appealing to international donors, NGOs or international assistance programmes to cover the costs of retaining skilled staff and conservation.

Furthermore, results in Table 4.1 (pg. 51-52) indicates that in Giants Castle, the calibration constant for the „Cost of Sale"[11] category (C11-*resale other and fuel resale*) was 0.91 percent. Giants Castle sells unleaded petrol at the main entrance of the reserve (EKZNW, 2014). Since Giants Castle is 34 638 ha in size, a petrol service station near the entrance was a strategic idea in that it allows customers to fill up petrol tanks before going into the reserve. However, the results indicate that they spent a large proportion of their funds on purchasing unleaded petrol and this could increase their carbon footprint which would contradict the core tenet of their operations, biodiversity conservation. Giants Castle should discontinue the selling of fossil fuels and find innovative ways to improve the visitor experience whilst reducing the impact on the environment. This will also reduce its running costs and free-up funds for priority conservation operations. Moreover, the „Maintenance and Repairs" category (C5-*roads, tools and computer equipment, furniture and fittings, buildings and structures*) had an average share of total costs of 0.7 percent. This is high relative to other operational categories in Giants Castle, which suggests that management placed a higher importance on infrastructure improvement. According to Bovarnick *et al.* (2010), capital investments to improve infrastructure for conservation and ecotourism play a major role in the long-term sustainability of PPAs. Therefore, management in Giants Castle should continue doing the necessary repairs and maintenance but should take caution and monitor expenditure incurred as these can be expensive in the long run (Bovarnick *et al.*, 2010, Cowan *et al.*, 2010).

The category with the highest average share of total costs for Midmar was the „Permanent Staff-Fixed Cost" category (C1-*basic salary, UIF, housing subsidy, pension, medical aid and service bonus*) at 3.5 percent, followed by the „Temporary Staff" category (C3-*short term contractual work*) since its average share of total cost was 0.64 percent. The use of temporary staff or contractual work has several benefits such as reduction in recruitment costs and reduction of employee costs (David *et al.*, 2006). Therefore, Midmar should continue using contractual work and possibly relegate some permanent workers to temporary personnel since this could help Midmar cut the costs of paying overtime, service bonuses, allowances etc., thereby reducing

[11] The „Cost of Sale" category means: the cost of merchandise in its beginning inventory *plus* the net cost of merchandise purchased *minus* the cost of merchandise in its ending inventory (Pfister and Tierney, 2008).

funds allocated to labour. The „Utilities" (C9-*gas, water, and electricity*) and „Maintenance and Repairs" (C5-*roads, tools and equipment, furniture and fittings, buildings and structures*) category each had an average share of total costs of 0.55 and 0.53. High utility costs can dent the revenue maximization of any organization significantly (Hassanien and Dale, 2013). Midmar has chalets and campsites. Chalets are fitted with refrigerators, electric stoves and cable TV (DSTV), and with running cold and hot water (EKZNW, 2014). Campsites have electrical plug point facilities (EKZNW, 2014). Furthermore, Midmar hosts sporting and music events during weekends and peak periods (EKZNW, 2014). Therefore, to reduce the high utility bill, Midmar needs to consider limiting the facilities they offer in their accommodation. However, this option might have negative consequences such as reducing the quality and desirability of Midmar thereby affect its revenue generation negatively. According to Flanagan (2014), the provision of electricity or plug-in points at EKZNW has a positive effect on the desirability of a PPA site. In that case, could introduce cheaper and greener alternatives such as solar panels to reduce the cost of utilities. According to Lai and Yik (2008), cited in Hassanien and Dale (2013), the maintenance of building structures, furniture, and equipment can have a strong impact on customer satisfaction, therefore, affecting tourism operation"s revenue and resources available to perform the maintenance. Therefore, Midmar"s spending on maintenance and repairs are high and commendable, as this would increase resources available for management to achieve its objectives. Moreover, the „Services" category (C6-*security expenses, security bank expenses, and fire extinguisher services*) had an average share of total costs of 0.41 percent. This implies that Midmar also spent more on security aimed at ensuring the enforcement of the law within the PPA to prevent poaching and other negative threats. Considering the scourge of crime in South Africa, Midmar and EKZNW management are advised to increase funds allocated for security purposes to ensure the safety and integrity of its conservation area.

For Ntshondwe, the „Permanent Staff-Fixed Cost" category (C1-*basic salary, UIF, housing subsidy, pension, medical aid, and service bonus*) had the highest calibration constant and thus the highest average share of total costs at 4.1 percent. This result is consistent with several studies that have shown that salaries and wages are the largest costs for tourism operations (Eagles, 2002, Bovarnick *et al.*, 2010). The implications of high cost of salaries and wages could undermine Ntshondwe"s ability to generate adequate revenues. According to Goodman (2003), EKZNW has large number of staff. This suggests that management in Ntshondwe can adopt a few strategies to reduce its labour costs. For instance, management can review salaries and wages, reduce week day hours, remunerate employees based on their level of expertise, and eliminate redundant positions that add no significant value to Ntshondwe and EKZNW. The „Cost of Sale" category (C11-*fuel resale and other*) had the second largest average share of total costs at 0.9 percent. The cost in this category is high relative to other categories and this has implications for management (see Section 4.1). The „Utilities" (C9-*refuse removal, gas, water, diesel electricity and Eskom-electricity*), „Supplies" (C7-*camp supplies, sanitary products, cleaning materials, herbicides and audio-visual supplies*), and „Maintenance and Repairs" category (C5-*roads, furniture and fittings, buildings and structures, and vehicles*) stand at 0.53, 0.52 and 0.48 percent, respectively. As stated before (see Section 4.1), high utility costs can have implications for revenue generation (Hassanien and Dale, 2013). One way management can reduce the high cost of utilities is by going-green (Pfister and Tierney, 2008). Ntshondwe and most PPAs can adopt energy conservation practices to reduce the cost of electricity and other forms of energy (Pfister and Tierney, 2008). Moreover, management should also review the maintenance strategies (reactive, preventive, predictive and proactive) it employs as this could be exacerbating costs in this category (PlantWeb, 2003). According to PlantWeb (2003), the most basic and common maintenance strategy is the reactive maintenance ("fix it when it breaks" strategy) and the main disadvantage of this strategy is that repair costs for infrastructure and equipment are higher than most strategies. Therefore, management in Ntshondwe could utilise the preventive, predictive, and proactive maintenance strategies interchangeably depending on the scale and costs of the maintenance required at the resort. Preventive maintenance strategy can be used to deter further deterioration (PlantWeb, 2003). By monitoring and using such information to schedule for maintenance on items that require it (PlantWeb, 2003), the predictive maintenance strategy can be adopted by Ntshondwe management. Furthermore, management can also use the proactive maintenance strategy to analyse the reasons equipment perform poorly and taking measures to correct the source of the problems (PlantWeb, 2003).

4.2 Resource consumption calibration constants for public protected areas in the Zululand region

From the results presented in Table 4.1 (pg. 51-52), the average share of total costs in Ndumo for the „Permanent Staff-Fixed Costs" category (C1-*basic salary, UIF, housing subsidy, pension, medical aid and service bonus*) was 5.8 percent. This result is supported by empirical studies

(Eagles *et al.*, 2002, Bovarnick *et al.*, 2010) that have shown that high labour costs are characteristic of public protected area management, though these costs could vary depending on the size of the PPAs (Porter *et al.*, 2003). These high labour costs could be justified because EKZNW is incentivising the retention of skilled staff, since highly skilled and experienced staff are prone to leave EKZNW due to remuneration issues (Goodman, 2003). However, EKZNW runs ecotourism business operations, thus Ndumo has to economise on costs in order to maximise returns. The implication of this result is that further increases in staff numbers and associated incentives would increase costs and undercut the profitability of operations in Ndumo. Therefore, management can adjust these figures by reducing costs incurred on perks. It can reduce the amount granted in housing subsidies, opt for cheaper medical aid, and institute performance bonuses which are related to productivity instead of service bonuses. However, there is a chance that a reduction in such perks could cause a drastic decline in performance of employees, and prevent EKZNW from retaining and recruiting highly skilled personnel. Therefore, in the long run, Ndumo and EKZNW need to find alternative means to raise funds to cover high labour costs (see Section 4.1). The „Maintenance and Repairs" category (C5-*roads, tools and computer equipment, furniture and fittings, buildings and structures*) had the second highest average share of total costs of 1.2 percent, followed by the „Transport" (C8-*vehicle lease expenses, fuel and oil costs, and license and registration costs*) and „Utilities" (C9-*gas, electricity and sewage reticulation*) category at 0.3 and 0.4 percent, respectively. The high average share of total costs for the „Maintenance and Repairs" category indicates the high relative importance Ndumo placed on this category. According to Goodman (2003), management in EKZNW considers the facilities and infrastructure adequate to run their ecotourism operations. Therefore, management should continue making this category a priority (see Section 4.1). Goodman (2003) further states that this category suffers from limited funding, thus management should allocate adequate funding for maintenance operations to improve product offering and customer satisfaction. Transportation is necessary in this line of work but Ndumo and EKZNW can limit transportation costs by investing in energy efficient vehicles in the long-term and by encouraging staff to be as economical as possible when using vehicles. Utility costs were also high and management can take several steps to decrease this bill (see Section 4.1).

In Mpila, the relative importance of the „Cost of Sale" category (C11-*bar, restaurant and fuel resale*) comes second to the „Permanent Staff-Fixed Costs" category (C1-*basic salary, UIF,* *housing subsidy, pension, medical aid and service bonus*) because the average share of total costs for the former is 2.4 percent and 0.84 percent for the latter. Still, the „Assets, Infrastructure and Ring-Fenced Work" category (C10), the „Maintenance and Repairs" category (C5-*roads, tools and computer equipment, furniture and fittings, buildings and structures*) and the „Utilities" category (C9-*sewage, refuse removal, gas, water, diesel electricity and Eskom-electricity*) had an average share of total cost of 0.7, 0.5 and 0.47 percent, respectively. It appears that Mpila incurred higher costs from its bar and restaurant and the sale of fuel. Mpila can reduce the relatively high average share of total costs in the „Cost of Sales" (C11) category by offering concessions to private enterprises to operate these activities. This is beneficial because private enterprises are motivated by profits and may have the management skills and operating procedures to run such operations efficiently (Guasch, 2004) and therefore, reduce costs in the C11 category. The C10 and C5 category also acquired higher costs in Mpila. The high cost in „Assets, Infrastructure and Ring-Fenced Work" category (C10) and the „Maintenance, and Repairs" category (C5) was somewhat necessary because this is one way to make sure that Mpila and EKZNW offer quality ecotourism products and that a high level of customer satisfaction is retained. According to Beerli and Maertin (2004) cited in Mmopelwa *et al.*(2007), the image of a tourist destination is essential in influencing the satisfaction of tourists and the possibility of there being repeat visits. Moreover, tourists have indicated that they are willing to pay increased fees if services are improved and funds invested in conservation (Mmopelwa *et al.,* 2007). Therefore, management needs to ensure that adequate funds are available to conduct maintenance operations on the infrastructure and necessary equipment. Utilities were also high and these are mostly driven up by electricity obtained from Eskom. Eskom electricity tariffs for areas such as farms and game reserves are expensive because of the long distances involved to distribute electricity and setting up transformers (DME, 2008). Therefore, the best alternative for Mpila to reduce utility costs in the long-run is to invest in sustainable and energy efficient technologies such as solar panels (see Section 4.1).

At Hilltop, the „Permanent Staff-Fixed Costs" (C1-*basic salary, UIF, housing subsidy, pension, medical aid and service bonus*) had an average share of total costs of 1.6 percent and „Cost of Sale" category (C11-*bar, restaurant and fuel resale*) had the second highest average share of total costs of 1.5 percent. The calibration constant for the C1 category was high and if management wants to decrease or prevent further increases in costs in this category, it could opt to freeze salary and benefit increases or decrease pay rates, benefits or work hours (Heathfield, 2015). It is best to decrease these labour expenses on non-performing or less skilled employees to avoid negative impacts on operations (Heathfield, 2015). Moreover, management at Hilltop needs to institute stricter cost control in the C11 category to achieve desired financial outcomes. Most high costs incurred in bar and restaurant operations are caused by over-pouring, over-portioning, spoilage of food caused by unsuitable stock rotation and possibly theft from employees (Erickson, 2015). Therefore, management should ensure that the liquor inventory is counted periodically, preferably every week. Hilltop management can either use reliable employees for this practice or invest in an inventory management and loss prevention system (e.g. Microsoft Dynamics GP software).

Results presented in Table 4.1 show that at the Phongolo Controlled Hunting Area (PCHA) the „Temporary Staff" (C3-*contractual work*) had a higher calibration constant or average share of total costs at 0.8 percent. The „Assets, Infrastructure and Ring-Fenced Work" category (C10) had the second highest average share of total costs of 0.76 percent, followed by the „Supplies" (C7-*camp supplies, cleaning materials, herbicides and equipment*) category at 0.42 percent. These results are consistent with the findings of Hudson *et al.* (1989) that live animal capture which entails animals being driven by helicopter into a boma, loaded immediately onto a truck and transported. This expensive task is routinely conducted by professionals. Moreover, Hudson *et al.* (1989) states that fencing work is a major development cost with different species of animals requiring fences with different heights, number of strands and types of poles to hold the fence. The implications is that although temporary staff and work on infrastructure are necessary as far as hunting operations are concerned, increases in costs in these categories might impact the ability of PCHA to generate significant revenues. Therefore, management at PCHA is needed to ensure that these operations are as cost-effective as possible by utilising different contractors and investing in quality standard fencing with better installation specifications.

4.3 Resource consumption calibration constants for public protected areas in the Coastal region

Results presented in Table 4.1 show that Rugged Glen Stables, Sodwana Bay Resort, and Kosi Bay had average shares of total costs of 6.5, 2.44, and 5.2 percent, respectively for the „Permanent Staff-Fixed Cost" (C1-*basic salary, UIF, housing subsidy, pension, medical aid, and service bonus*) category. The high cost of the C1 category seems to be a common recurrent cost across all EKZNW administrative regions and PPAs and consistent with Eagles *et al.* (2002) and Bovarnick *et al.* (2010). There are serious implications associated with such high labour costs as highlighted in Section 4.1 and 4.2. In Rugged Glen Stables, the „Services" (C6-*stableman services*) category had the second highest average share of total costs at 0.95 percent, followed by the „Utilities"(C9-*gas and electricity*) category each with average share of total costs at 0.34 percent. The high cost of stableman services in the C6 category relative to other categories associated with Rugged Glen Stables is not surprising because horse and stable management has been found to be a costly activity (Knight, 2010). In general, horses in stables are fed several meals a day that consists of a high forage-based or cereal-based diets supplemented with vegetable oil, and this can be the most costly part in horse stable management (Harris, 1999, Knight, 2010). Therefore, management at Rugged Glen Stables can reduce stableman service costs by allowing horses to graze free on grasslands which Harris (1999) found to be a less costly activity for horse stable management. Moreover, management could explore cheaper and safer feed additives and supplements that can be given to their horses to reduce costs. The results also show that utilities were high for Rugged Glen Stables, thus, management should try and reduce high utility costs as this could have implications for cost control and revenue generation (see Section 4.1 and 4.2).

Sodwana Bay Resort recorded the second highest average share of total costs in the „Cost of Sale" (C11-*fuel and resale*) category at 2.42 percent, followed by the „Utility" (C9-*gas, water, refuse removal and sewerage*) and the „Maintenance and Repairs" (C5-*roads, tools and computer equipment, furniture and fittings, buildings and structures*) categories at 0.67 and 0.54 percent. In Kosi Bay, the „Utilities" (C9-*refuse removal, gas, diesel electricity and Eskom electricity*) category features prominently amongst resource-consumption categories with an average share of total costs of 0.33 percent. Moreover, the „Maintenance and Repairs" (C5-*equipment, furniture and fittings, fencing, building and structures*) category had an average share of total costs of 0.25 percent. Utility and maintenance costs are high and possible implications for this can be seen in Sections 4.1 and 4.2 for PPAs with higher costs in these categories.

Table 4.1 Resource consumption *(input)* calibration constants (a_m) for each public protected area

Public Protected Area	Resource consumption categories										
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Kamberg	0.04809	0.00181	0.00229	0.00324	0.00371	0.00301	0.00404	0.00265	0.00387	0.00224	0.00605
Lotheni	0.05099	0.00134	0.00209	0.00209	0.00413	0.00087	0.00241	0.00244	0.01350	0.00433	0.00307
Didima	0.02118	0.00081	0.00267	0.00318	0.00620	0.01952	0.00360	0.00129	0.00572	0.00237	0.00404
Mantuma	0.05074	0.00184	0.00172	0.00211	0.00349	0.00049	0.00371	0.00213	0.00336	0.00148	0.01022
Thendele	0.19785	0.00097	0.00264	0.00182	0.00522	0.00229	0.00336	0.00112	0.00269	0.00554	0.00458
RNNP Mahai	0.01902	0.00102	0.00336	0.00120	0.00312	0.00558	0.00134	0.00093	0.00436	0.00064	0.01364
Giants Castle	0.02972	0.00095	0.00291	0.00365	0.00703	0.00195	0.00425	0.00116	0.00566	0.00067	0.00961
Midmar	0.03513	0.00106	0.00639	0.00249	0.00527	0.00407	0.00268	0.00350	0.00547	0.00231	0.00285
Ntshondwe	0.04025	0.00179	0.00228	0.00343	0.00484	0.00139	0.00516	0.00298	0.00532	0.00315	0.00904
Spioenkop	0.04267	0.00066	0.00305	0.00312	0.00353	0.01089	0.00164	0.00030	0.00835	0	0.00268
Wagendrift	0.04089	0.00081	0.00524	0.00151	0.00538	0.00989	0.00233	0.00129	0.00724	0.00160	0.00010
Chelmsford	0.01990	0.00094	0.00269	0.00246	0.00889	0.00518	0.00340	0.00169	0.00763	0.00217	0.00869
Weenen	0.02523	0.00036	0.00064	0.00418	0.00544	0.02113	0.00345	0.00089	0.00009	0.00084	0.00554
Monk's Cowl	0.01772	0.00097	0.00696	0.00346	0.00528	0.00301	0.00181	0.00130	0.00192	0.00194	0.02608
Ndumo	0.05799	0.00149	0.00131	0.00192	0.01217	0.00115	0.00183	0.00302	0.00461	0.00178	0.00258
Mpila	0.02421	0.00108	0.00179	0.00190	0.00500	0.00328	0.00235	0.00241	0.00472	0.00708	0.00835
Hilltop	0.01603	0.00060	0.00074	0.00175	0.00519	0.00432	0.00252	0.00103	0.00283	0.00239	0.01550
Centenary Centre	0.01845	0.00076	0.02832	0.00196	0.00472	0.00031	0.00260	0.00134	0.00748	0.00230	0.02707
Injesuthi	0.03755	0.00096	0.00170	0.00175	0.00549	0.00278	0.00301	0.00135	0.01095	0.00174	0.00555
PCHA	0.00014	0.00107	0.00773	0.00035	0.00309	0.00026	0.00418	0.00012	0	0.00762	0
UCHA	0.01930	0.00021	0.00116	0.00023	0.00223	0.00001	0.00261	0.00044	0.00187	0.00318	0
Rugged Glen Stables	0.06446	0.00341	0.00230	0.00169	0.00292	0.00947	0.00154	0	0.00404	0	0.00071
Sodwana Bay Resort	0.02435	0.00130	0.00114	0.00292	0.00535	0.00178	0.00161	0.00268	0.00669	0.00171	0.02421
Kosi Bay	0.05214	0.00165	0.00047	0.00138	0.00246	0.01117	0.00154	0.00162	0.00331	0.00193	0.00163
Cape Vidal	0.02559	0.00158	0.00502	0.00121	0.00781	0.00189	0.00214	0.00208	0.00939	0.00060	0.00962

Table 4.1 *continued*

St Lucia Estuary	0.05264	0.00178	0.00119	0.00322	0.00512	0.01023	0.00168	0.00481	0.00928	0.00028	0.00069
Santa Lucia	0.01330	0.00063	0.00019	0.00039	0.00777	0.00046	0.00073	0.01599	0.00088	0.00866	0.00519
Maphelana	0.03820	0.00166	0.00216	0.00183	0.00616	0.00453	0.00255	0.00488	0.01082	0.00468	0.00653
Charter's creek	0.06625	0.00050	0.00760	0.00398	0.00820	0.00091	0.00167	0.01478	0.02209	0.00055	0.00015
False Bay	0.08510	0.00188	0.00231	0.00444	0.00540	0.00005	0.00206	0.00132	0.00401	0	0.00008
Oribi Gorge	0.05902	0.00059	0.00482	0.00200	0.01001	0.00036	0.00381	0.00102	0.00321	0.00220	0.00242
Umlalazi	0.07185	0.00085	0.00130	0.00174	0.00561	0.00326	0.00182	0.00097	0.00787	0.00151	0.00260

Source: EKZNW data (2014)

4.4 Revenue generation calibration constants for public protected areas in the Ukhahlamba region

The values of revenue generation calibration constants (b_h) were obtained by employing equations (27) and (29) are presented in Table 4.2. Revenue generation calibration constants (b_h) for revenue generation categories were obtained as the average share of total revenues, and the larger the share of revenue the more the relative importance management places on that revenue generation category.

Table 4.2 Revenue generation (*output*) calibration constants (b_h) for each public protected area

Public Protected Area	Revenue generation categories						
	R1	R2	R3	R4	R5	R6	R7
Kamberg	0.04882	0.00441	0.00314	0	0.00530	0.00003	0.00016
Lotheni	0.04970	0.00041	0.00038	0	0.00508	0.00003	0
Didima	0.05259	0.00345	0.00001	0.00449	0.00682	0.00086	0.00406
Mantuma	0.04399	0.00005	0	0.00000	0.01422	0.00006	0.00325
Thendele	0.07751	0	0	0.00013	0.00667	0.00004	0
RNNP Mahai	0.02723	0.01250	0.00050	0.00001	0.04824	0.00012	0.00006
Giants Castle	0.05510	0.00214	0.00007	0.00125	0.01286	0.00045	0.00342
Midmar	0.05090	0.01148	0.00047	0.00354	0.00391	0.00039	0.00094
Ntshondwe	0.04288	0.00128	0	0.00197	0.01172	0.00064	0.00471
Spioenkop	0.02902	0.02294	0.00045	0.00019	0.00405	0.00001	0.00932
Wagendrift	0.04598	0.01744	0.00079	0.00220	0.00015	0.00001	0
Chelmsford	0.04239	0.02055	0.00309	0.00054	0.01264	0.00000	0
Weenen	0.05310	0.01326	0	0.00027	0.00837	0.00003	0.00006
Monk's Cowl	0.01569	0.01893	0	0	0.03548	0.00027	0.00204
Ndumo	0.03930	0.00144	0	0.00001	0.00379	0.00013	0.00832
Mpila	0.04708	0.01784	0	0	0.01150	0.00003	0.00423
Hilltop	0.04018	0.01857	0	0.00024	0.02364	0.00052	0.00682
Centenary Centre	0	0.00076	0	0.00080	0.04506	0.00093	0
Injesuthi	0.06066	0.00029	0.00009	0.00003	0.00862	0.00004	0.00030
PCHA	0.00154	0	0.11676	0	0	0	0
UCHA	0.00461	0	0.10701	0	0	0	0
Rugged Glen Stables	0	0	0	0.00192	0.00104	0.00001	0.04934
Sodwana Bay Resort	0.03535	0.00006	0.00006	0.00693	0.02639	0.00007	0.00025
Kosi Bay	0.05015	0.00914	0.00093	0.00038	0.00262	0.00034	0.00000
Cape Vidal	0.06345	0	0	0.00015	0.01220	0.00013	0
St Lucia Estuary	0.04802	0.00066	0.00062	0.00187	0.00073	0.00001	0.00000
Santa Lucia	0	0	0.00006	0	0.00830	0	0.08029
Maphelana	0.04497	0.00043	0.00138	0.00309	0.00895	0.00002	0
Charter's creek	0.00904	0.00617	0.00084	0.00006	0.00007	0	0

Table 4.2 *continued*

False Bay	0.01036	0.02441	0.00025	0.00011	0.00103	0.00002	0.00003
Oribi Gorge	0.04422	0.00465	0	0.00011	0.00439	0.00003	0
Umlalazi	0.03519	0.00380	0.00010	0.00038	0.00382	0.00018	0

Source: EKZNW data (2014)

Table 4.2 shows that for most PPAs in the Ukhahlamba administrative region, the main revenue generators came from the „Accommodation‟ (R1), „Admissions‟ (R2), and „Sales‟(R5). For instance, Kamberg‟s main revenue generators are the „Accommodation‟ (R1-*chalets, rustic cottages and rondavels*), „Admissions‟ (R2-*entrance fees*) and „Sales‟ (R5-*Sales revenue from operating retail stores*) categories because the average share of total revenues was 4.8, 0.4 and 0.53 percent, respectively. This means that between 2007 and 2013, the revenue calibration constants indicate that accommodation, admissions, and sales were top revenue generators for Kamberg. The revenue calibration constant or average share of total revenue for the „Trails, Tours and Rides‟ (R7) was low at 0.016 percent. In addition, Table 4.2 indicates that Giants Castle, Midmar, and Ntshondwe in the Ukhahlamba administrative region also derive a large share of their total revenues from the „Accommodation‟ (R1) category with average revenue shares of 5.5, 5.1, and 4.2 percent, respectively. Accommodation in Giants Castle comprises of chalets and lodges; chalets and campsites for Midmar, and chalets, campsites and bush lodges for Ntshondwe. Furthermore, the „Sales‟ (R5) category has the second highest relative importance to Giants Castle and Ntshondwe with average shares of total revenues of 1.3 and 1.2 percent, respectively. Meanwhile, Midmar‟s second highest revenue generator came from the „Admissions‟ (R2) category and the category had 1.2 percent of average shares of total revenues. In Midmar the main activities are boating, yachting and fishing (EKZNW, 2014). Therefore, it was surprising to find that the „Permits and Licenses‟ (R3) category had the second lowest average share of total revenue at 0.047 percent (Table 4.2). Giants Castle and Ntshondwe also received substantial revenues from the „Trails, Tours and Rides‟ (R7) category because the average share of total revenues for each area was 0.34 and 0.47 percent.

According to EKZNW (2014), Kamberg offers tours to ancient San rock art paintings and it is regarded as the best part about visiting the area. However, the results above show that this activity generated very low revenue despite it being one of the centre attractions for Kamberg. Similarly, the „Trails, Tours and Rides‟ (R7) category in Giants Castle and Ntshondwe generated lower revenues relative to other revenue generating categories. These results are consistent with the findings of Flanagan (2014), that cultural or tour areas did not have any significant impact on revenues received. According to a recent study by Ivanovic (2011 cited in Flanagan, 2014), tourists in South Africa rated their cultural and tour experiences as disappointing and below their expectations. This could pose serious problems for management as tourist demand may decline and with that, drastic revenue decreases, which further undermines the capacity of the R7 category to contribute significantly to the cost recovery[12] of each PPA. Moreover, in Midmar, strict regulations around freshwater recreational use could be causing the low revenues generated because for one, boat skippers are required to adhere to strict zoning areas (EKZNW, 2014). This is done to reduce the impact of such activities on marine ecosystems in and around the area by limiting the number of boat or yachts in the dam. Management could reduce the size of the boats and yachts, to allow more boats in the area to increase revenues. Furthermore, the results above suggest that accommodation is the main generator of revenue for Kamberg, Giants Castle, Midmar, and Ntshondwe, and for most PPAs in the Ukhahlamba region. This is also consistent with studies done by Eagles (2003) and a report released by EKZNW (2009). Possible implications are that increases in the provision of accommodation facilities (camping sites, bush lodges, and chalets) could increase revenues received. Flanagan (2014) also found that increases in occupation rates in EKZNW accommodation have significant impacts on revenue, especially when associated with popular tourist activities.

4.5 Revenue generation calibration constants for public protected areas in the Zululand region

As for PPAs in the Zululand administrative region (see Table 4.2), results indicate that Ndumo, Mpila and Hilltop derived a significant proportion of their average shares of total revenues from the „Accommodation" (R1) category at 3.9, 4.7 and 4 percent, respectively. This result is not surprising, as accommodation has been found to be one of the main revenue generators for PPAs (Eagles, 2002, Porter *et al.*, 2003, Flanagan, 2014). Accommodation in Ndumo consists of seven chalets and fourteen shaded campsites, twenty chalets and fifteen tented camps for Mpila, and Hilltop has twenty rondavels, forty nine chalets. According to Flanagan (2014), chalets on average experience more visitor occupation than other accommodation types offered by

[12] Cost recovery refers to the ability of a PPA to generate sufficient revenue to cover part or all of tourism"s financial costs (Lindberg and Halpenny, 2001).

EKZNW. Therefore, PPAs with more chalets should have generated more revenue than PPAs with a lower number of chalets which is the case for Mpila and Hilltop. Furthermore, Ndumo had the second highest average shares of total revenues as 0.83 percent in the „Trails, Tours and Rides" (R7) category, whereas, Mpila and Hilltop derive significant revenues from „Trails, Tours and Rides" (R7) category with an average shares of total revenues of 0.43 and 0.7 percent, respectively. It is surprising to find that Mpila and Hilltop, which are found in the Hluhluwe-iMfolozi Park, a game reserve that boasts an array of wildlife including the „Big Five" (EKZNW, 2014), derive low revenues from the „Trails, Tours and Rides" (R7) category. The „Big Five"[13] animals attract a fair number of visitors to Africa and this is due to the popularity of the animals because of media attention and physical attractiveness (Reynolds and Braithwaite, 2001, Caro and Riggio, 2013, Di Minin *et al.*, 2013). Therefore, it was expected that the PPAs would have generated more revenues from this category. However, the result is consistent with Flanagan (2014), who found that the effect of the presence of the „Big Five" animals on revenues in PPAs was not statistically significant. It could be that instead of paying for guided tours, people prefer to pay entrance fees to such areas and drive themselves around to watch the wildernesses. This also explains why the Mpila and Hilltop had average shares of total revenue of 1.7 and 1.9 percent (Table 4.2), respectively, higher than the „Trails, Tours and Rides" (R7) category. The implications could be lower revenue share derived from this category in the future, hence, management either needs to make guided tours more attractive or increase park fees to generate more income.

PCHA had two categories generating revenues, the „Accommodation" (R1) and the „Permits and Licenses" (R3) categories. The „Permits and Licenses" (R3) category for PCHA had the largest average share of total revenues at 11.7, making this category the best revenue-generator in the commercial operations of EKZNW across all categories considered in each public protected area. „Permits and Licenses" in PCHA are usually granted for hunting and fishing in Phongolo River and Phongolopoort Dam (EKZNW, 2014). This indicates that hunting and fishing contribute significantly to revenues in PCHA. The result is consistent with numerous studies (Mossman and Mossman, 1976, Baker, 1997, ABSA, 2003, Van der Merwe *et al.*, 2004, Damm, 2005) that show that hunting is a highly profitable operation in the nature-based tourism industry. This

[13] Big five species refers to the lion (*Panthera leo*), leopard (*Panthera pardus*), elephant (*Loxodonta africana*), buffalo (*Syncerus caffer*) and the rhino (*Diceros bicornis* or *Ceratotherium simum*) (Di Minin *et al.,* 2013).

result has several implications, one of which is creating perverse incentives, encouraging EKZNW to move away from „deep ecotourism" which is in line with conservation objectives to „shallow ecotourism" which is concerned more with profiteering than biodiversity conservation. As an agency whose primary mandate is conservation, management in the long-run could be forced to enact stricter permit and license regulations to control the quantity of wildlife being harvested. Since land-use intensity is lower in PPAs than in private protected areas (Porter *et al.*, 2003), this indicates that areas of improvement exist in increasing revenues from permits and licenses but with caution.

4.6 Revenue generation calibration constants for public protected areas in the Coastal region

In Rugged Glen Stables, the category with the highest average share of total revenues was „Trails, Tours and Rides" (R7) category at 4.9 percent. According to (EKZNW, 2014), Rugged Glen Stables mainly conducts horse riding operations which was its main revenue generator. Furthermore, it implies that horse riding is an essential part of outdoor activities. Nevertheless, horse riding or equestrian activities are normally activities that largely attract people of European descent (Ollenburg, 2005). In light of the growing African middleclass in South Africa with a consumer spending power of around forty percent (Van Loggerenberg and Herbst, 2010), Rugged Glen Stables and EKZNW needs to tap into this demographic change that results in lucrative markets. This could be an area of revenue growth for Rugged Glen Stables and EKZNW. However, horse riding has negative impacts on the natural environment and can affect the soil by increasing soil erosion and horse hooves can cause vegetation trampling (Newsome *et al.*, 2008). Therefore, further growth could increase these negative impact and reduce the aesthetic value derived by tourists and functional value of the environment (Newsome *et al.*, 2008).

The „Accommodation" (R1) category in Sodwana Bay Resort and Kosi Bay had an average share of total revenues of 3.5 and 5.2 percent, respectively. Furthermore, Table 4.2 shows that Cape Vidal and St Lucia Estuary received most of their revenues from the „Accommodation" (R1) category with average shares of total revenue of 6.4 and 4.8 percent, respectively. Accommodation revenue for Sodwana Bay is derived from log cabins, chalets and camps, whereas Kosi obtained its income from lodges, chalets and camps (EKZNW, 2014). Moreover, Cape Vidal operates and obtains its accommodation revenue from log cabins, chalets, bush lodges, huts and rondavels, while St Lucia generates accommodation revenues from chalets, squaredovels and camps (EKZNW, 2014). These results imply that EKZNW PPAs in the Coastal administrative region derived a large share of their total revenues when PPAs offered more than one kind of accommodation. This further suggests that product differentiation in accommodation confers great advantages in revenue generation for EKZNW. Flanagan (2014) noted that high occupancy of various accommodation types in EKZNW is linked with the type and quality of ecotourism activity offered and that all accommodation codes in the coastal region tended to retain more tourists than inland destinations. Moreover, coastal destinations are popular tourist destinations and attract the largest percentage of tourists mainly due to scenic views, beaches, seafood, and array of water-based leisure activities (swimming, surfing, sailboarding *etc*.) (Davenport and Davenport, 2006). Therefore, the combination of different kinds of accommodation and widely popular coastal destination activities suggests that marketing these destinations in this manner will likely increase revenue performance for EKZNW in coastal regions. Management can offer new products to newly emerging markets (i.e. offer religious groups pilgrimage packages to scenic areas, offer holiday packages to stockvels/societies[14] *etc*.).

The „Sales" (R5) category had the second highest average share of total revenues at 2.6 percent in Sodwana Bay Resort, and in Kosi Bay, the second highest average share of total revenues was in the „Admissions" (R2) category at 0.91 percent. In Sodwana Bay Resort, the „Sales" (R5) category refers to the re-sale of fuel (EKZNW data). The economic benefits of this fuel re-sale is that it provides the finance required to improve environmental management but because it is trading in fossil fuels, high pollution energy source, Sodwana Bay Resort has over the last seven years, indirectly increased EKZNW „carbon footprint". This negates the primary mandate of EKZNW and it is recommended that management either reduce or discontinue with the practice. Instead, EKZNW could trade in carbon dioxide (CO_2) (Dube, 2011). The idea is that firms that release CO_2 into the atmosphere pay for the storage of the CO_2 produced by their activities through a system of carbon credits where they finance ecological restoration projects (EKZNW, 2009). In Kosi Bay, entrance fees are inclusive of accommodation fees (EKZNW, 2014), which means revenue generation from accommodation will always be linked with entrance fees. The advantage of this is that Kosi Bay will generate income for two categories per customer,

[14] Stockvels/Societies are savings groups in South Africa in which members agree to contribute (pool) a certain amount on a monthly basis from which each will receive a lump sum at the end of the year (Shulze, 1997).

reducing revenue uncertainties. However, this exposes their main revenue generating activities to extreme fluctuations in tourist arrivals, especially during the off season. According to Lindberg and Halpenny (2001), increases in park fees do not have any significant impact on park visitors. Therefore, it is recommended that Kosi Bay increase entrance/gate entry fees and charge these day visitor fees separately from accommodation fees for those tourists interested in one day activities. Increases in entrance fees should make it possible for Kosi Bay to cover the cost of collecting them (administration costs).

4.7 Resource consumption and revenue generation inefficiency ratings

Positive or negative operational competitiveness of operating entities can either be investigated from an efficiency or inefficiency perspective, respectively (Parkan, 1999). In this study, similar to Parkan (1999), the negative view of operational competitiveness is adopted and term inefficiency is used. Therefore, if the resource consumption (cost) and revenue generation (revenue) inefficiency ratings have larger values, this means that ratings are more inefficient or less competitive. However, smaller values indicate that a rating for a specific PPA is more competitive or least inefficient. Resource consumption inefficiency ratings C_{um}^{k} were computed and reflect the resource competitiveness of each PU. Resource consumption inefficiency ratings for each PPA were computed using equations (13) and (14). Moreover, the revenue generation inefficiency ratings R_{vh}^{k} were calculated using equations (20) and (21), and reflect the revenue competitiveness of each PU. Resource consumption and revenue generation inefficiency ratings corresponding to each PPA were plotted in appendix 1. Graphs were used to obtain a better sense of relative competitiveness of resources consumed and revenues generated by each PPA between 2007 and 2013.

4.7.1 Resource consumption and revenue generation inefficiency ratings for public protected areas in the Ukhahlamba region

The resource consumption and revenue generation inefficiency ratings were zero in 2007 for Kamberg (Appendix I). This means that relatively, the least inefficient year or more competitive year was 2007. Revenue competitiveness increasingly became less competitive from 2008 to 2013. The majority of the average shares of total revenues come from the R1, R2, and R3 categories (see Section 4.4). This suggests that from 2008 to 2013, these revenue generators did not produce significant returns to offset the increasing inefficiency or decreasing revenue competitiveness. Moreover, this result has the implication that increasing the share of revenue from accommodation, entrance fees, and sales could have significant effects on revenue competitiveness in Kamberg. Therefore, it is necessary that Kamberg implement policies and strategies to improve its revenue competitiveness (see Section 4.4). There were sharp declines and increases in resource competitiveness between 2008 and 2011, and then a gradual decrease in competitiveness in 2012 and 2013. From Table 4.1, staff costs take the largest share of costs incurred by Kamberg followed by utilities, and could have caused variations in resource competitiveness. This result suggests that increased cost control in staff and utility costs could improve Kamberg"s resource competitiveness profile. Thus, Kamberg management needs to ensure that they either reduce the number of staff or staff benefits/perks or find alternative and sustainable energy sources to help reduce the utility bill (see Section 4.4).

Results presented as Appendix I show that Midmar"s resource competitiveness declined from 2007 to 2008. However, the inefficiency ratings increased again to 2009 and declined to 2010. There was gradual increase in the value of the ratings from 2011 to 2013. This implies that resource competitiveness fluctuated a number of times and only improved in 2008 and 2010. This further suggests that categories with high calibration constants (C1, C3, C5 and C9 categories) or higher average share of total costs had minimal impact on the improvement of resource competitiveness due to lack of cost control. Improvement in resource competitiveness will arise if Midmar and EKZNW implement cost cutting strategies as suggested in section 4.1. Revenue generation inefficiency ratings increased slightly from 2007 to 2009, then declined dramatically from 2010 to 2012, and increased again in 2013. The revenue generation inefficiency ratings were still unacceptably high. The main revenue generators came from R1 and R2 categories and these did little to improve revenue competitiveness. This has the important implication that increasing the revenue share of accommodation and entrance fees can impact on the revenue competitiveness positively (see Section 4.4). According to Dube (2011), EKZNW offers products that have not improved over the years. It provides out-dated products that a few clients can relate too, and is stuck in traditional conservation practices that prevent it from taking advantage of new markets such as the African middleclass (Dube, 2011). Therefore, Midmar can improve its revenue competitiveness profile by marketing to a new lucrative demographic group (African middleclass) to increase revenues received in its „Pemits and License" (R3) category since it had the least average share of total revenues.

Revenue generation inefficiency ratings in Ntshondwe gradually increased from 2007 to 2013, suggesting that revenue competitiveness never improved in seven years and only got worse (Appendix I). Since a large share of revenue is derived from accommodation and sales, yet, this share was not enough to improve revenue competitiveness in the seven years. Therefore, managerial implications for Ntshondwe would be that further increases in the share of revenue only in these categories might not improve revenue competitiveness. Moreover, Ntshondwe offers trails, rides, and tours but the share of revenue from these activities was not sufficient to make serious improvements on revenue competitiveness. Thus, it is imperative that management increase the average share of total revenues in other ecotourism activities to capture significant revenues to improve revenue competitiveness. This could be done by aggressively marketing to increase demand which, in turn, according to Barros (2005), will enable greater efficiency. However, resource consumption inefficiency ratings fluctuated numerous times, with improvements and decreases in the ratings. Noticeable inefficiencies for resource consumption were in 2009 and 2011. An improvement in the resource competitiveness profile for Ntshondwe and many other PPAs will arise when resource consumption categories with high average share of total costs have their costs reduced. Therefore, Ntshondwe can employ several strategies to decrease such costs and improve resource competitiveness (see Section 4.1).

In Giants Castle, resource consumption and revenue generation inefficiency ratings began increasing sharply for resource consumption inefficiency ratings and steadily for revenue generation inefficiency ratings from 2007 to 2008. Revenue generation inefficiency ratings decreased gradually from 2011 to 2012, meaning that revenue competitiveness improved in this period. Moreover, resource consumption inefficiency ratings were the least inefficient from 2010 to 2011, which meant that resource competitiveness improved during the period of 2010 to 2011. On closer inspection, improvements in revenue competitiveness coincide with improvements in resource competitiveness. Management can employ several strategies to improve revenue competitiveness from the accommodation, sales, tours, rides, and trails (see Section 4.1). Important management implications for this result are that cost reduction strategies, as noted in Section 4.1, in categories that have higher calibration constants, could improve resource competitiveness.

4.7.2 Resource consumption and revenue generation inefficiency ratings for public protected areas in the Zululand region

Most of the resource consumption inefficiency ratings were relatively low, indicating better resource competitiveness in Ndumo (Appendix I). However, the year 2008 had the most inefficient rating. Revenue generation inefficiency ratings were also low and steady in all the years. The results suggest that some form of cost control which resulted to low costs for personnel and maintenance relative to other cost categories, played a role in improving resource competitiveness. Furthermore, accommodation, trails, rides, and tours had the highest average share of total revenues, and this combination of activities seems to be optimal since it has brought in significant revenues that have improved and maintained revenue competitiveness. According to Cracolici *et al.* (2008), tourist destinations that are able to use inputs at their disposal efficiently or with less inefficiency, attracts a maximum share of tourists" demand and thus improve their competitive position. Therefore, the results above are consistent with this finding and have the management implication that further cost control and increased revenue generation could improve the competitive position of Ndumo amongst PPAs in KwaZulu-Natal.

Revenue generation inefficiency ratings for Mpila increased from 2007 to 2008, but then decreased from 2009 to 2011. However, there was an increase in revenue generation inefficiency ratings from 2012 to 2013. As shown in Appendix I, resource consumption inefficiency ratings decreased from 2007 to 2009, indicating an improvement in resource competitiveness. Then, in 2010, resource consumption inefficiency ratings increased slightly, and in the last three years, resource consumption inefficiency ratings decreased, improving resource competitiveness dramatically. The improvement in resource competitiveness stems from a decrease in personnel, costs of sales, maintenance and utilities in those periods, which means, Mpila used these resources at a lower level than other years. Moreover, the strength of revenue-generation in Mpila lies in trails, rides, tours, sales and admission fees as these were the main revenue generators, thus improved revenue competitiveness for four years. The implication is that these results will enable management to redirect efforts to improve revenue competitiveness focusing on R1 and R2 category. Furthermore, the results also indicate to management that shifting resources away from costs of sales, maintenance, and utilities could also improve resource consumption and the suggested strategies to achieve this are noted in Section 4.1. According to Ma *et al.* (2009), an improvement in the state of operations should not jeopardize the natural environment and biodiversity conservation of species, thus management in Mpila and EKZNW should take caution when seeking ways to improve resource and revenue competitiveness.

Furthermore, Hilltop‟s revenue competitiveness weakened from 2008 to 2012, and significantly improved in 2013 (Appendix I). While resource competitiveness declined from 2007 to 2009, and then improved dramatically from 2010 to 2012 but deteriorated in 2013. This suggests that personnel costs and costs of sales decreased inefficiency from 2010 to 2012, and that sales, admission fees, trails, rides and tours were unable to bring sufficient revenues to improve revenue competitiveness. This shows that Hilltop management can improve revenue competitiveness through various strategies as noted in Section 4.5 but also with marketing to new demographic group about the benefits of some of these activities. Moreover, the results also showed that improvements in revenue competitiveness coincided with increasing inefficiencies. The implication is that high expenditures in some years could be justified to increase income and improve revenue competitiveness.

In the Phongolo hunting area, revenue-generation inefficiency ratings fluctuated considerably between 2007 and 2013 (Appendix I). The revenue generation inefficiency ratings increased from 2007 to 2008, suggesting that revenue competitiveness declined in this period. The least inefficient year for revenues was 2009. The revenue inefficiency ratings increased from 2009 to 2010, and then decreased from 2010 to 2012, increasing again in 2013. This indicates that revenue competitiveness was not stable during the course of the seven years. From 2007 to 2008, resource competitiveness was stable but the resource consumption inefficiency ratings increased from 2009 to 2010, worsening resource competitiveness. Furthermore, resource consumption inefficiency ratings experienced slight fluctuations from 2011 to 2013, indicating that in the last three years cost control was difficult, with resource competitiveness deteriorating. In Phongolo, supplies, infrastructure maintenance, and temporary personnel costs were more influential on resource competitiveness since they had higher calibration constants or average share of total costs (see Section 4.2). Therefore, the instability of resource competitiveness suggests that there are opportunities for improvement in resource management. The main revenue generators in PCHA were hunting and accommodation, and this combination seemed not optimal in improving and stabilising revenue competitiveness. The result is rather surprising because hunting has been reported to be the most lucrative of ecotourism enterprises (Mossman and Mossman, 1976, Baker, 1997, ABSA, 2003, Van der Merwe *et al.*, 2004, Damm, 2005) and thus should have had major influence decreasing revenue inefficiencies. This could be attributed to the lack of intensity of hunting operations in PPAs and there is a possibility that this was done deliberately to avoid over-harvesting of animals which could bring PCHA and EKZNW into conflict with its conservation mandate. This result implies that for PCHA to improve its revenue competitiveness, it should scale up hunting operations (see Section 4.5).

4.7.3 Resource consumption and revenue generation inefficiency ratings for public protected areas in the Coastal region

In Appendix I, Rugged Glen Stables had a revenue competitiveness that fluctuated together with resource competitiveness. Revenue-generation inefficiency ratings were minutely close to resource consumption inefficiency ratings. Revenue generation inefficiency ratings increased from 2007 to 2008, and then remained steady until 2013. However, resource competitiveness worsened from 2011 to 2013. Essential activities such as services and utilities take a considerable share of costs next to personnel-related costs. Therefore, this suggests that there is room for resource competitiveness improvement if cost control is made a priority in Rugged Glen Stables (see Section 4.3). Moreover, Rugged Glen Stables had larger shares of total revenue coming from accommodation, trails, rides, tours, rentals, hire, and concessions. This implies that efforts to improve revenue competitiveness should be directed at these activities to increase their average share of total revenues, which in time will impact positively on the performance of Rugged Glen Stables. The strategies that management can implement and that could be beneficial to Rugged Glen Stables are noted in Section 4.3.

Revenue generation inefficiency ratings for Sodwana Bay Resort were low but increasing from 2007 to 2013 (Appendix I). This trend showed that revenue competitiveness was decreasing gradually from 2007 to 2013. The low values of revenue inefficiency ratings indicate that revenue generating operations performed relatively well, particularly accommodation and sales, since they had the highest average share of total revenues (see Table 4.2) but were unable to maintain the inefficiency ratings at low levels. This suggests that improvements in revenue competitiveness are likely through the provision of various accommodations (chalets, cabins etc.), increased price, or marketing to a new demographic group (see Section 4.5). Resource consumption inefficiency ratings improved from 2007 to 2009. However, from 2009 to 2011, resource consumption inefficiency ratings increased, and then slightly decreased from 2011 to

2013. This shows that Sodwana Bay resort had minor improvements in resource competitiveness in 2008, 2009, 2012, and 2013, which suggest that there is the possibility that better control for costs incurred for personnel, utilities and maintenance could further improve resource competitiveness in the subsequent years.

The revenue generation inefficiency ratings for Kosi Bay were higher than resource consumption inefficiency ratings from 2007 to 2011 (Appendix I). This implies that revenue competitiveness was worse than resource competitiveness. However, revenue generation inefficiency ratings decreased gradually from 2007 to 2012 but increased in 2013. This showed a general improvement in revenue competitiveness from 2007 to 2012. Moreover, resource consumption inefficiency ratings also decreased from 2007 to 2011, remaining constant from 2009 to 2011 and then dramatically increasing from 2012 to 2013. Therefore, resource competitiveness improved between 2007 and 2011, and thereafter declined from 2012 to 2013. On closer inspection, the results show that revenue generation inefficiency ratings declined or improved about the same time when resource consumption inefficiency ratings declined or improved. This result seems to support the findings of an earlier study by Shieh (2012) that cost efficiency has a positive impact on financial performance. The implication is that when management improves resource competitiveness, revenue competitiveness also improves. Therefore, lesser cost inefficiency for resource consumption activities such as personnel, utilities, and maintenance should lead to better resource competitiveness and management can implement various strategies to facilitate such actions as noted in Section 4.3.

4.8 Combined inefficiency ratings for each public protected area

The computation of combined inefficiency ratings (E_{uv}^{k}) is the last phase in constructing the operational competitiveness profile of each PPA. Combined inefficiency ratings are obtained by combining the revenue generation and resource consumption inefficiency ratings of each PPA. Equation (25) in chapter three was used to compute these combined inefficiency ratings, and similar to revenue generation and resource consumption inefficiency ratings, the assessment is such that the smaller the ratings the least inefficient or more competitive operations were in that particular year. The combined inefficiency ratings reflect the operational competitiveness for each PPA. The results are shown in Table 4.3 in the next page.

Table 4.3. Combined inefficiency ratings computed separately for each public protected areas

Public Protected Area	**OCRA combined inefficiency ratings**						
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Kamberg	0.00000	0.09203	0.03126	0.10211	0.04423	0.08624	0.12024
Lotheni	0.00804	0.00882	0.02581	0.00000	0.00936	0.03485	0.11560
Didima	0.00995	0.03685	0.10543	0.02369	0.00000	0.01988	0.05280
Mantuma	0.00415	0.05931	0.08682	0.00000	0.00909	0.02068	0.03112
Thendele	0.08877	0.01887	0.59581	0.00000	0.04829	0.11509	0.07242
RNNP Mahai	0.58862	0.62062	0.00000	0.63044	0.62320	0.63388	0.64870
Giants Castle	0.00000	0.02626	0.12942	0.03911	0.02602	0.03782	0.04333
Midmar	0.26202	0.23558	0.40697	0.27511	0.32062	0.00000	0.04799
Ntshondwe	0.00000	0.02731	0.06990	0.03530	0.10107	0.03112	0.04380
Spioenkop	0.68461	0.22078	0.05224	0.00000	0.04970	0.18135	0.58185
Wagendrift	0.00000	0.34003	0.43446	0.48359	0.44357	0.42126	0.53801
Chelmsford	0.00000	0.17833	0.19581	0.13376	0.24791	0.28509	0.47702
Weenen	0.00000	0.05587	0.00297	0.01565	0.02069	0.06262	0.16033
Monk's Cowl	0.53687	0.54714	0.55728	0.79606	0.55753	0.00000	0.65465
Ndumo	0.03854	0.03664	1.54225	0.00000	0.01097	0.00075	0.15944
Mpila	0.04572	0.04341	0.02564	0.02439	0.00316	0.00337	0.00000
Hilltop	0.00000	0.06164	0.10445	0.07682	0.08004	0.08256	0.07298
Centenary Centre	0.01634	0.04399	0.03764	0.00000	0.05267	0.05528	0.17174
Injesuthi	0.00000	0.00269	0.08992	0.01864	0.01325	0.01668	0.04002
PCHA	0.24544	0.70894	0.00000	0.83394	0.62148	0.71161	0.89267
UCHA	0.28362	0.00000	0.26645	0.97798	0.54085	0.48595	1.03224
Rugged Glen Stables	0.04349	0.10283	0.03169	0.06872	0.00000	0.02912	0.80405
Sodwana Bay Resort	0.22930	0.21215	0.00000	0.25164	0.30495	0.27607	0.27696
Kosi Bay	0.07953	0.04761	0.03426	0.02732	0.01069	0.00000	0.22129
Cape Vidal	0.01056	0.01575	0.04967	0.07761	0.00000	0.02644	0.07214
St Lucia Estuary	1.09526	0.32800	0.09117	0.51303	0.17181	0.00000	0.10481
Santa Lucia	0.10490	0.08848	0.00252	0.00000	0.02547	0.18961	0.02915
Maphelana	0.00000	0.82889	0.44689	2.58721	2.50416	2.17898	3.37832
Charter's creek	0.57356	0.71781	0.38332	0.00000	0.32579	0.34729	0.38051
False Bay	0.23144	0.27209	0.30550	0.04896	0.00178	0.00000	0.26718
Oribi Gorge	0.00000	0.01408	0.01377	0.01545	0.04619	0.03448	0.02098
Umlalazi	0.00445	0.00000	0.08964	0.07406	0.03945	0.01977	0.81221

Source: EKZNW data (2014)

4.8.1 Combined inefficiency ratings for each public protected area in the Ukhahlamba region

Results presented in Table 4.3 show that combined inefficiency ratings were at their lowest in 2007, reflecting better operational competitiveness. However, in 2008, the combined inefficiency ratings declined only to improve again in 2009. From 2010 to 2013, the combined inefficiency ratings fluctuated several times only improving in 2011. The results suggest that disparities in operational competitiveness can be accounted for by the high share of total revenues and costs in accommodation, admissions, and cost of sales, salaries, and wages, items that largely influenced the performance of revenue and resource competitiveness which, in turn, affected operational competitiveness. Furthermore, when the results are closely examined, the fluctuations of combined inefficiency ratings coincide with observed fluctuations in resource consumption inefficiency ratings. This implies that the performance of resource competitiveness had more influence on the operational competitiveness of Kamberg. According to Dwyer and Kim (2003), the quality of management of resources leads to higher levels of competitive advantage for any tourist destination. This means that better resource allocation and cost control by management will improve operational competitiveness and thus competitive advantage.

Midmar"s combined inefficiency ratings declined from 2007 to 2008, but increased again in 2009, only to decline again in 2010. More fluctuations occurred from 2011 to 2013, and but slightly improved in 2008, 2010 and 2012. These improvements coincided with resource competitiveness improvements in 2008 and 2010, while, with revenue competitiveness it was from 2010 and 2012. It is seems that Midmar was able to improve operational competitiveness when revenue competitiveness was low and resource competitiveness higher in 2008 and *vice versa* in 2012. This suggests that in some years, lower operational costs lead to improved operational competitiveness and in other years, improved revenue flows contribute to this improvement. This result seems to confirm the findings by Shieh (2012), that improved financial performance will lead to better competitiveness. Therefore, management should focus on implementing strategies (see Section 4.7.1) that will reduce discrepancies in resource and revenue competitiveness so that the overall improvement of both will contribute significantly in improving the operational competitiveness of Midmar.

Ntshondwe experienced a decline of operational competitiveness from 2007 to 2009, with a slight increase in 2010. Table 4.3 also indicates that there was an increase in the combined inefficiency ratings in 2011, a decrease in 2012, and an increase in 2013. On closer examination, the combined inefficiency ratings were closely linked to the performance of resource consumption inefficiency ratings. Resource competitiveness declined in between 2007 and 2009, then somewhat improved in 2010. Then it decreased in 2011, improved in 2012 and thereafter it declined in 2013 (Appendix I). This suggests that resource consumption inefficiency ratings had greater impact on combined inefficiency ratings and thus operational competitiveness. The implication is that efforts to reduce cost inefficiencies and improve resource competitiveness will significantly improve operational competitiveness. Therefore, management at Ntshondwe should focus on reducing operational costs to improve its operational competitiveness.

Giants Castle"s combined inefficiency ratings increased from 2007 to 2010, declining briefly in 2011. However, inefficiency ratings continued on its upward trend from 2012 to 2013. Revenue and resource competitiveness were high from 2010 to 2012. This suggests that the improvement observed in 2011 was a result of this combination of decreasing inefficiencies in both revenue generation and resource use. This finding is supported by empirical research by Tsaur (2001) who showed that for Taiwan hotels to score high on operating efficiency, inefficiencies in operating expenses and revenues had to be reduced. The implication is that when both revenue generation and resource consumption inefficiency ratings are considered together, they should possibly be able to impact positively on the combined inefficiency ratings of Giants Castle or any other PPA in the long term.

4.8.2 Combined inefficiency ratings for each public protected area in the Zululand region

Results presented in Table 4.3 indicate that the combined inefficiency ratings at Ndumo fluctuated several times from 2007 to 2013, but were improving from 2010 to 2012, starting from a poor level in 2009. This observed improvement in some years was a result of low resource consumption and revenue generation inefficiency ratings, and seems to suggest that the average shares of total costs observed in Section 4.2 were necessary to generate substantial revenues. The implication is that Ndumo can still allocate some funds to resource consuming operations while still generating incomes that will not compromise its operational competitiveness. The results above also confirm findings by Tsaur (2001) that low inefficiencies in revenues and operating expenses leads to better operating performance.

Moreover, at Mpila, combined inefficiency ratings decreased from 2007 to 2010, indicating that operational competitiveness had been improving. It was in 2011 and 2012 that operational competitiveness became worse, and then improved again in 2013. Yet again, on closer inspection, the years that improvements in resource consumption inefficiency ratings occurred, 2007-2009, coincided with the years that improvements in the combined inefficiency ratings occurred (see Section 4.7.2). Furthermore, it was only in the year 2011 that Mpila registered the lowest relative combined inefficiency rating (0.00316), see Table 4.3, and Section 4.7.2, the same year that both resource consumption and revenue generation inefficiency ratings performed better. Firstly, this implies that resource competitiveness had more influence on operational competitiveness since it performed better than revenue competitiveness in some years. Lastly, results also imply that a combination of better performing revenue and resource competitiveness has greater effect in improving operational competitiveness. The results seem to support findings by Shieh (2012) that show that better cost efficiency leads to improved financial performance and Tsaur (2001) that both low inefficiencies in revenue and costs can enhance operational performance. Therefore, management needs to ensure that both cost reduction and high revenue generation are a priority at any one time, to improve operational competitiveness considerably.

In Table 4.3, Hilltop has combined inefficiency ratings that increased from 2008 to 2009. This was followed by improvements in 2010, thereafter, an increase occurred from 2011 to 2012, and in 2013 the combined inefficiency ratings decreased again. Improved revenue competitiveness coincided with an improved operational competitiveness in 2013. This implies that revenue competitiveness had more influence on operational competitiveness, because resource competitiveness was low only in 2013. Thus, management would be advised to seek strategies to control and reduce recurrent costs (see Section 4.2) to improve the resource competitiveness profile Hilltop. This improvement together with revenue competitiveness improvement will significantly enhance Hilltop‟s operational competitiveness profile and increase its capacity to pay for biodiversity conservation.

At the PCHA, the combined inefficiency ratings were very high (Table 4.3). However, there were increases between 2007 and 2008 with 2009 being the least inefficient rating. This was followed by an increase in 2010 and a decrease in 2011. From 2012 to 2013, the combined inefficiency ratings decreased. Revenue competitiveness influenced operational competitiveness more than resource competitiveness because revenue generation inefficiency ratings were more than ten times the size of resource consumption inefficiency ratings (Appendix I). This suggests that high inefficiencies in revenue generation were transferred to the operational competitiveness of PCHA. Therefore, management should implement strategies to improve its revenue position since this has the greatest influence on the operational competitiveness of PCHA (see Section 4.5).

4.8.3 Combined inefficiency ratings for each public protected area in the Coastal region

For Rugged Glen Stables in Table 4.3, the combined inefficiency ratings were lower or least inefficient in 2009, 2011 and 2012. Moreover, the ratings were at their worst in 2007, 2008, 2010, and 2013. Results presented as Appendix I show that resource consumption inefficiency ratings were higher than revenue generation inefficiency ratings between 2007 and 2010. These coincide with the years that operational competitiveness was worse, whereas, revenue generation inefficiency ratings were lower in the same period. Moreover, between 2011 and 2012 resource competitiveness improved while revenue competitiveness declined, again this coincides with better operational competitiveness in this period. This suggests that resource competitiveness had more influence on operational competitiveness. Therefore, it is in this area that management at Rugged Glen Stables can adjust its relative combined inefficiency ratings and thus improve its operational competitiveness (see Section 4.6). However, this study does not suggest that Rugged Glen Stables ignore any improvements on revenue competitiveness, but when both are prioritised, this will have maximum effect on improving operational competitiveness, just in accordance with the findings of Tsaur (2001) and Shieh (2012).

At Sodwana Bay Resort, the combined inefficiency ratings fluctuated several times from 2007 to 2013. The combined inefficiency ratings decreased from 2007 to 2009, thereafter, increased from 2010 to 2011. There was a brief decrease in the combined inefficiency ratings in 2011 and afterwards an increase in 2013. This shows that operational competitiveness improved from 2007 to 2009, and 2011. This suggests that resource competitiveness had more impact in improving operational competitiveness than revenue competitiveness because improvements in resource competitiveness coincided with improvements in operational competitiveness, whereas revenue competitiveness was deteriorating. The important implication from this result is that greater cost control can improve resource competitiveness and therefore, operational competitiveness.

At Kosi Bay, the combined inefficiency ratings decreased from 2007 to 2012, indicating that operational competitiveness was improving for six years except in 2013. Revenue and resource competitiveness improved between 2007 and 2012. The results suggest that improved revenue and resource competitiveness influenced the improvement of operational competitiveness. The implication is that an improved operational competitiveness could put Kosi Bay at a better position to compete against other destinations for tourists. Moreover, the outcome of such improved operational competitiveness is the ability of a destination to create and provide an array of tourism activities and the ability to generate sufficient income (Crouch, 2010, Shieh, 2012).

4.9 Regional comparative analysis of operational competitiveness

In the previous section, the operational competitiveness ratings of commercial operations for PPAs were computed separately to obtain their competitiveness profiles from 2007 to 2013. In this section, a comparative analysis of all the PPAs in the administrative regions of EKZNW was done to generate information relevant for decision makers in the local and national government.

The operational competitiveness ratings were computed simultaneously using different calibration constants of all PPAs in EKZNW management regions (Appendix II). The operational competitiveness ratings of PPAs in the Ukhahlamba, Zululand, and Coastal regions were compared to establish whether some regions had better operational competitiveness than others. The WMW rank test was used to test the rankings of operational competitiveness ratings for significant competitiveness differences between Ukhahlamba, Zululand, and Coastal region. Each region was compared with another, and a hypothesis for each comparative case was as follows: H_0: The average ranking of operational competitiveness ratings for PPAs in the Ukhahlamba, Zululand, and Coastal regions was the same.

The results from WMW rank test reported in Table 4.4 show a Z value of -0.037 and p value of 0.97 at 5% level of significance. The Wilcoxon test statistic was the sum of ranks = 3617 from the Zululand region and the test statistic was more than the Mann-Whitney U critical sum of the rankings. Therefore, there were no statistical differences between the average rankings of

Ukhahlamba and Zululand region. Hence, the null hypothesis is not rejected and it is concluded that there were no statistically significant differences in the competitiveness of commercial operations of PPAs in the Ukhahlamba and Zululand regions. No region operated with less inefficiency than the other for the past seven years.

Table 4.4 Comparisons of operational competitiveness ratings for all public protected areas in the Ukhahlamba and Zululand regions using their rankings

Region	No. of PUs	Mean ranking	Sum of ranks	Mann-Whitney U	Wilcoxon	*Z*	*P*-value
Ukhahlamba	98	74.09	7261	2392	3617	-0.037	0.97
Zululand	49	73.82	3617				

Source: Data from EKZNW (2014)

Furthermore, the results from Table 4.5 indicate that the lowest mean ranking was 86.79 from the Ukhahlamba region which meant that the Wilcoxon test statistic was 8505.5. The Mann-Whitney U critical sum of the rankings was 3654.5. Therefore, the Wilcoxon test statistic was greater than the Mann-Whitney U critical sum of the rankings and the Z value = -0. 356 with a p value = 0.722 at 5% significance level. As a result, the null hypothesis is not rejected because there was no statistically significant difference between the average rankings of Ukhahlamba and Coastal regions. In other words, there were no statistically significant differences in the operational competitiveness of PPAs in the Ukhahlamba and Coastal region. PPAs in the Ukhahlamba region are as inefficient as in the Coastal regions.

Table 4.5 Comparisons of operational competitiveness ratings for all public protected areas in the Ukhahlamba and Coastal regions using their rankings

Region	No. of PUs	Mean ranking	Sum of ranks	Mann-Whitney U	Wilcoxon	*Z*	*P*-value
Ukhahlamba	98	86.79	8505.5	3654.5	8505.5	-0.356	0.722
Coastal	77	89.54	6894.5				

Source: Data from EKZNW (2014)

The results from the WMW rank test in Table 4.6 indicate that the Mann-Whitney U critical sum of the rankings was 1814. Moreover, the lowest mean ranking was from the Coastal region, hence the Wilcoxon test statistic was 3039. The rule of thumb is to reject the null hypothesis when the Wilcoxon test statistic is less than the Mann-Whitney U critical sum of the rankings. In this case, the null hypothesis is not rejected because the Wilcoxon test statistic is more than the

Mann-Whitney U critical sum of the rankings. The *Z* value = -0.363 with a *p* value = 0.717. This means that average rankings of the Coastal and Zululand regions were not statistically different. Therefore, Coastal region did not conduct its commercial operations with less inefficiency than the Zululand region. There were no statistically significant differences in operational competitiveness between the Coastal and Zululand regions. This result is in contradiction with the study by Flanagan (2014), who found that ocean destinations in EKZNW appear to out-perform inland or land destinations in terms of revenue.

Table 4.6 Comparisons of operational competitiveness ratings for all public protected areas in the Coastal and Zululand regions using their rankings

Region	No. of PUs	Mean ranking	Sum of ranks	Mann-Whitney U	Wilcoxon	*Z*	*P*-value
Coastal	49	62.02	3039	1814	3039	-0.363	0.717
Zululand	77	64.44	4962				

Source: Data from EKZNW (2014)

In conclusion, the results above suggest that operational inefficiencies or poor operational competitiveness at firm-level affected regional competitiveness. This poor state of operational competitiveness has serious implications for ecotourism in the province and the country. According to Depperu and Cerrato (2005), firms represent a country‟s competitiveness in a specific industry. If firm performance/competitiveness is poor, industry level performance is affected which, in turn, affects country level competitiveness.

4.10 Summary

This chapter showed that most PPAs spend more on staff salaries, wages, maintenance of infrastructure and utilities. Furthermore, the average share of total costs for assets and infrastructure was low, and a decrease in government financial support could have exacerbated matters, making it difficult to tap into financial reserves for long-term investment. The results also showed that EKZNW received the majority of its revenues from accommodation, sale of wildlife products and admission fees. The results from revenue generation inefficiency ratings and resource consumption inefficiency ratings were mainly influenced by the share of total revenue and cost of each category. Consequently, high costs from resource consuming activities produced high levels of unacceptable resource competitiveness. Moreover, the results also showed that revenue competitiveness is dependent on revenue generators with high shares of revenue. The best operational competitiveness was linked with improvements in both revenue and resource competitiveness. In addition, the results from the comparison of management regions indicated that there were no statistically significant differences in operational competitiveness between the Ukhahlamba, Coastal, and Zululand regions.

CHAPTER 5. CONCLUSIONS AND POLICY RECOMMENDATIONS

5.1 A brief recap of the study

Despite government ownership of wildlife and strict measures imposed to manage biodiversity, a number of species are still classified as endangered or vulnerable by IUCN. For that reason, conservationists recognize that the preservation of endangered species rests on creating incentives for their protection, and ecotourism is one such tool used for this purpose. In other words, nature has to pay itself. However, nature cannot pay itself when operations are not conducted with better efficiency. Moreover, if one considers the decision from the provincial government to reduce funding EKZNW, it is important to determine the operational competitiveness/performance of ecotourism operations to identify expenditures and income generators that require control and improvements to be able to accomplish the objectives of EKZNW effectively amidst limited resources.

Therefore, the study aimed to measure the operational competitiveness of PPAs in the KZN province. There were two objectives to achieve this aim. The first objective was to generate an operational competitiveness profile for each public protected area, while the second was to compare the operational competitiveness of PPAs across administrative regions of EKZNW. Operational competitiveness estimates would allow EKZNW to identify performing and nonperforming ecotourism activities, and in the long-run facilitate efforts to control and improve operations. The study made use of a procedure called the operational competitiveness rating analysis (OCRA) to measure operational competitiveness across thirty two PPAs in KZN. As for the comparative analysis of the operational competitiveness of administrative regions, the study used WMW test. In the following section, Section 5.2, the main conclusions are presented, and in Section 5.3, policy recommendations drawn from the empirical results are presented. In Section 5.4, future directions for further research are presented.

5.2 Conclusions

The study found that the calibration constants amongst the eleven resource consumption categories for the majority of PPAs were highest in the permanent staff (salaries and wages), maintenance and repairs, and utilities categories. This means that the highest average share of total costs of commercial operations for most PPAs was in the above mentioned categories.

Therefore, it was concluded that most PPAs in EKZNW place a higher importance on salaries and wages, maintenance and repairs, and utilities. Furthermore, amid the seven revenue generation categories, the calibration constants of revenue generating commercial operations such as accommodation, sale of wildlife products and admission fees were high or received a higher average share of total revenue in the majority of PPAs. Furthermore, the study clearly shows that hunting generates more revenue than most of EKZNW"s commercial operations. Ecotourism activities such as trails, rides, and tours generally had the lowest average share of total revenue. Hence, it was concluded that revenue generating operations (such as accommodation, sale of wildlife products and admission fees) were the main revenue generators for PPAs that conducted these ecotourism activities with hunting being the largest contributor of revenue in EKZNW commercial operations.

The study also computed revenue generation and resource consumption inefficiency ratings which determined the revenue and resource competitiveness of commercial operations. The results from Chapter 4 indicated that revenue and resource competitiveness varied erratically throughout the past seven years with minor improvements in some years and a worsening competitiveness for both revenue and resource competitiveness in most of the years. The average share of total revenue or costs was found to have a bearing on either the revenue or resource competitiveness of PPAs. Fluctuations in revenue and resource competitiveness indicate the ability and failure of a PPA to generate and control costs. Thus, for revenue competitiveness, the implication is that fluctuations in revenues could undermine the generation of much needed funds for EKZNW to continue with its primary mandate of biodiversity conservation. However, as was shown, some researchers argued that PPAs could never be profitable nor recover their costs because of their commitment to biodiversity conservation. Similarly, uncertainties in resource competitiveness could also affect this important mandate. Furthermore, this shows that most PPAs under EKZNW need to explore innovative ways to generate sufficient revenues instead of dependence on a few categories for income to improve its revenue competitiveness, and there is need for serious cost control to improve cost competitiveness.

Moreover, the operational competitiveness of each PPA was obtained. The results obtained in Chapter 4 indicate that operational competitiveness varied throughout the past seven years. Observed improvements in operational competitiveness were closely linked with the resource competitiveness of a PPA while revenue competitiveness had little effect on operational competitiveness in some instances. Striking improvements were observed where revenue and resource competitiveness had improved simultaneously. The implication is that if PPAs in EKZNW operated at lower cost and generated higher revenues, its operational competitiveness or performance will significantly improve. Again, there is a need for better cost control, especially resource consumption activities (such as permanent staff, maintenance and repairs, and utilities) that adversely affect operational competitiveness.

The empirical results in the previous chapter show that the differences in operational competitiveness of PPAs located in EKZNW‟s administrative regions were statistically insignificant. Therefore, no administrative region was more competitive or performed better than the other. This poor state of operational competitiveness has implications for ecotourism in the province. Protected areas represent a country‟s competitiveness in the ecotourism industry, thus, if protected area competitiveness/performance is in a poor state at firm level, ecotourism at industry level will be affected negatively. The implication is the erosion of South Africa‟s competitive advantage as a prime ecotourism destination in the Africa and the world, a decline in the quality of biodiversity and increased unemployment.

5.3 Policy recommendations

This study recommends that PPAs under EKZNW:

- ❖ Monitor and control the cost of permanent labour and ensure that personnel are remunerated in accordance with skills sets that add value to PPAs and EKZNW to revise the huge costs incurred on permanent staff.
- ❖ Continue to allocate significant funds for maintenance and repairs. This was found to be a common recurrent cost which, according to several researchers, has the benefit of increasing tourist flows in the long-term.
- ❖ Revise utility expenses and introduce green technologies to reduce costs and the carbon footprint.
- ❖ Increase the share of revenue from main revenue generators such as accommodation, sales (curios, etc.), permits and licenses and admissions. It is recommended, among other things, that PPAs and EKZNW appeal to new lucrative demographic markets to increase

revenues. However, caution should be taken in increasing tourist flows to these areas as this could reduce the aesthetic value and quality of the environment.

- Should somewhat prioritise resource consumption competitiveness since this was found to have, in most cases, the greatest effect on improving operational competitiveness in PPAs and thus competitive advantage.
- Place greater efforts to improve both resource and revenue competitiveness as these were found to have greater effect on overall operational competitiveness. Therefore, to create lesser inefficiencies in overall operations, PPAs and EKZNW should deploy various strategies to increase revenues or reduce costs. For instance, to attract a new market based on demographic changes and thereby increase income. Moreover, PPAs and EKZNW can offer pensioners and disabled people discounts in off peak seasons.
- Allocate budgets according to the operational competitiveness of each PPA. This study has shown that each PPA allocates resources/funds and generates revenue differently. Therefore, there should be some flexibility in the centralized revenue system, meaning PPAs that perform better and manage funds properly should be allowed to retain some fraction of their earnings to pay for staff, maintenance and repairs, utilities and new projects. PPAs with high costs, low revenues, and a poor operational competitiveness should remain under the strict control of EKZNW. In other words, generate incentives for ecotourism in PPAs to be competitive to pay itself and conservation.

5.4 Directions for further research

This study strove to measure the operational competitiveness/performance of ecotourism operations in PPAs using the OCRA procedure. The study was the first of its kind to use the OCRA procedure to measure the performance of ecotourism operations in the KZN province. Thus, to improve knowledge on operational competitiveness/performance in PPAs, other non-parametric methods can be utilised such as DEA. Furthermore, future studies should focus on collecting information on tourism flows, that is, the number of individuals that visit EKZNW PPAs annually to help determine the rationale of capital expenditures and asset acquisitions in these areas. Moreover, PPAs from EKZNW were not compared with the protected areas in the private sector in this study. A study that entails comparing PPAs with private protected areas could be highly valuable for stakeholders to gauge the position of PPAs relative to private protected areas in terms of efficiency of operations.

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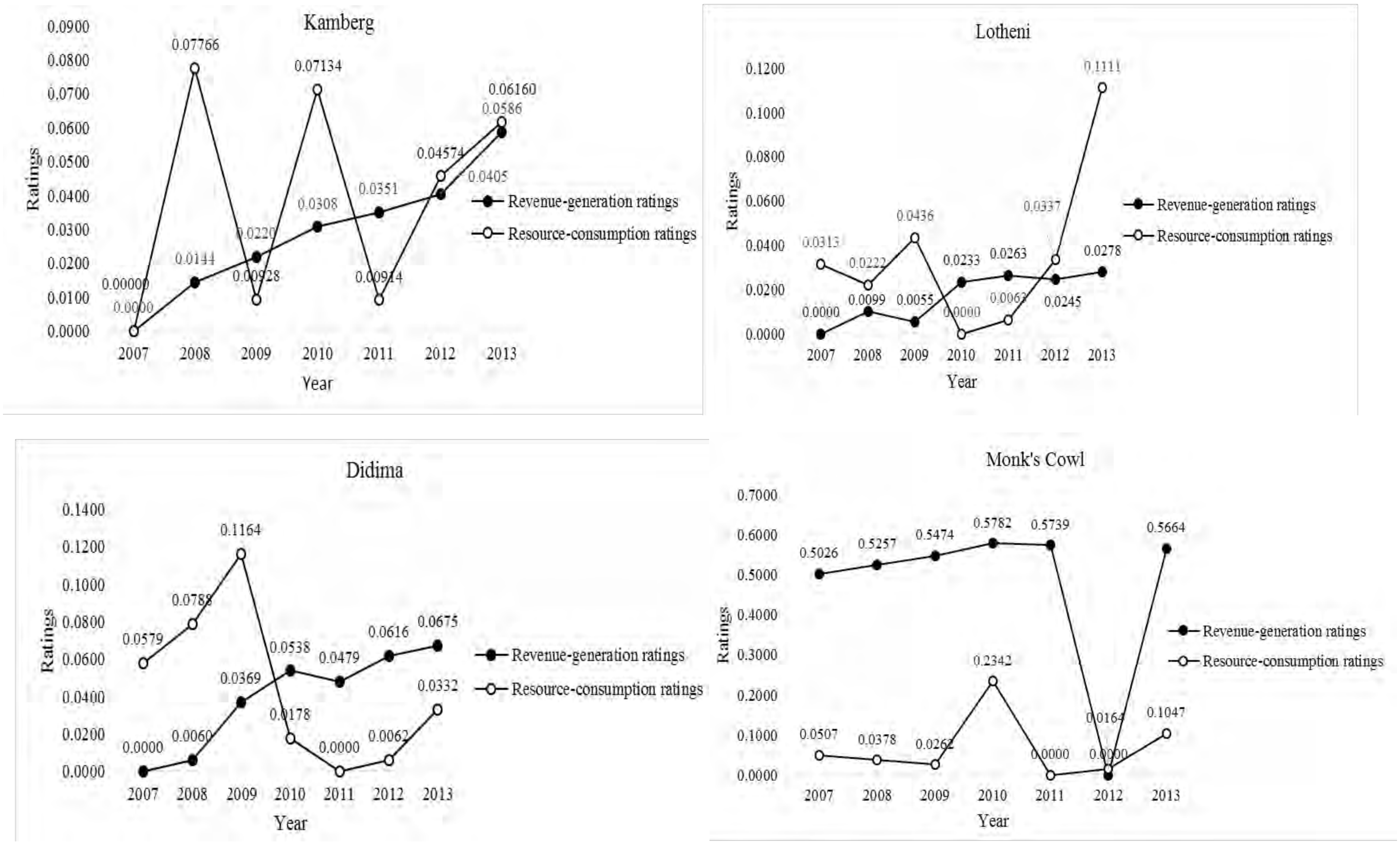
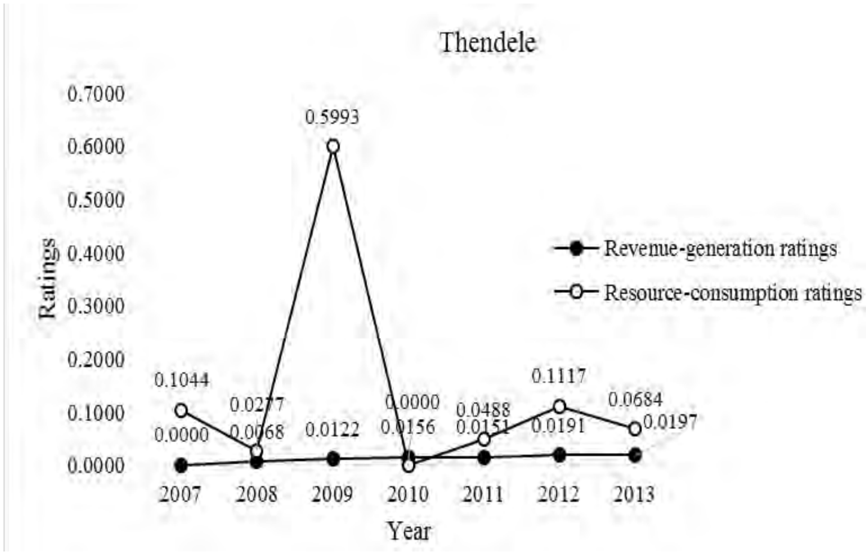
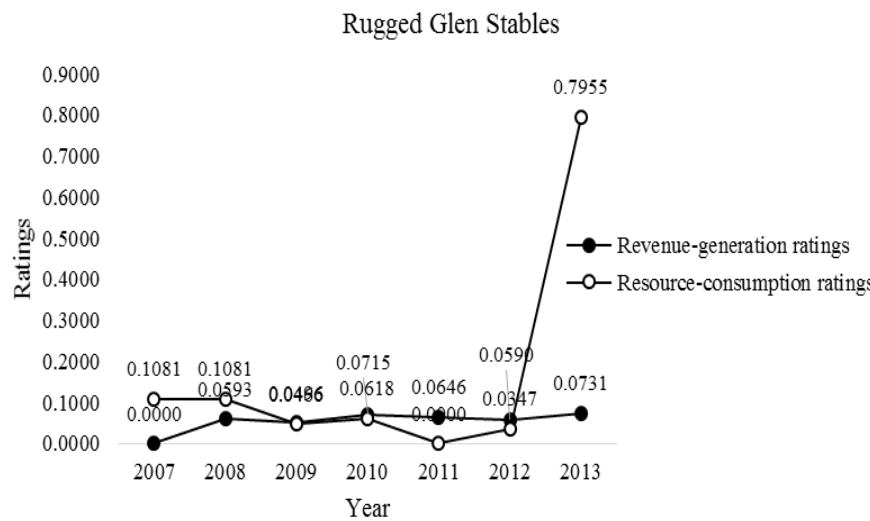
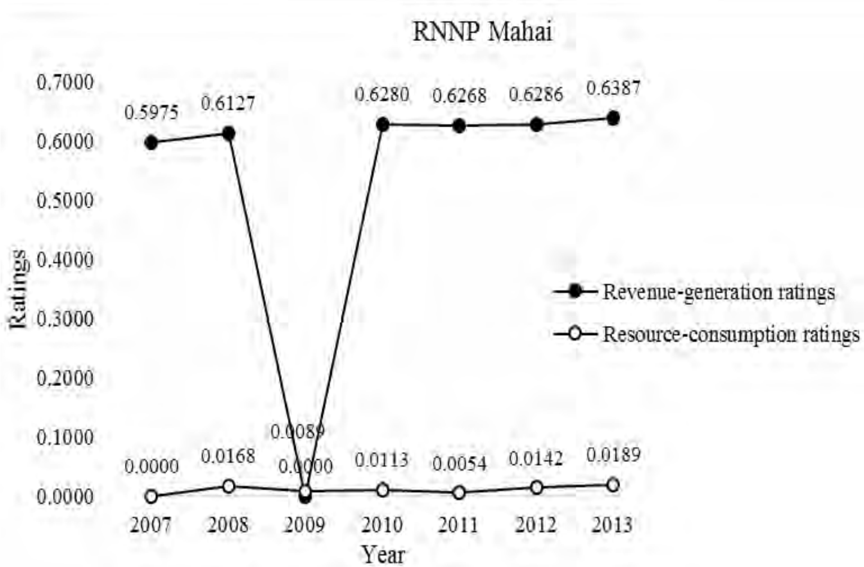
APPENDICES

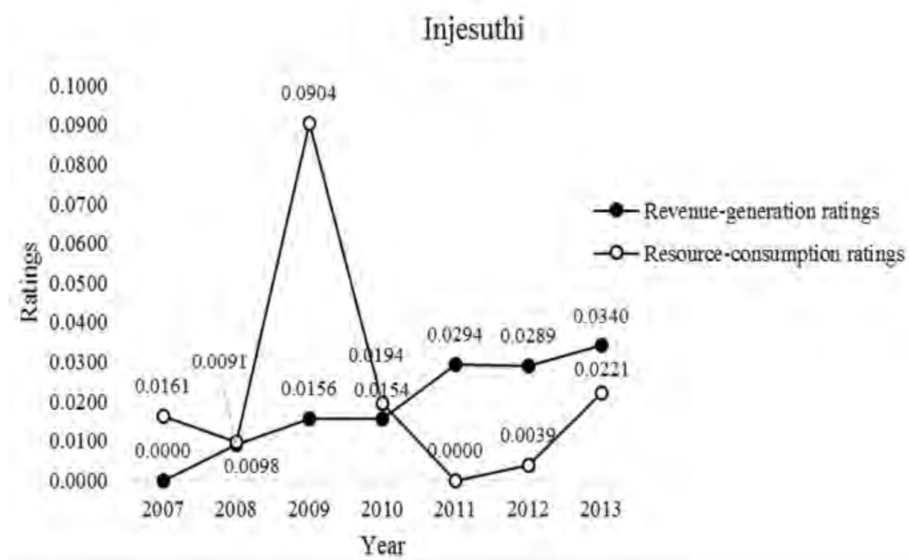
Appendix I. Resource consumption and revenue generation scaled inefficiency ratings for each public protected area

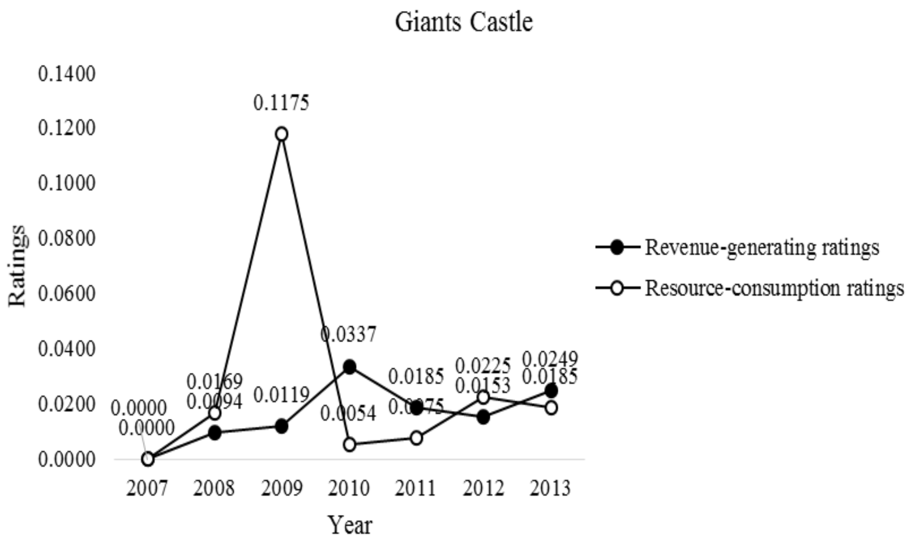


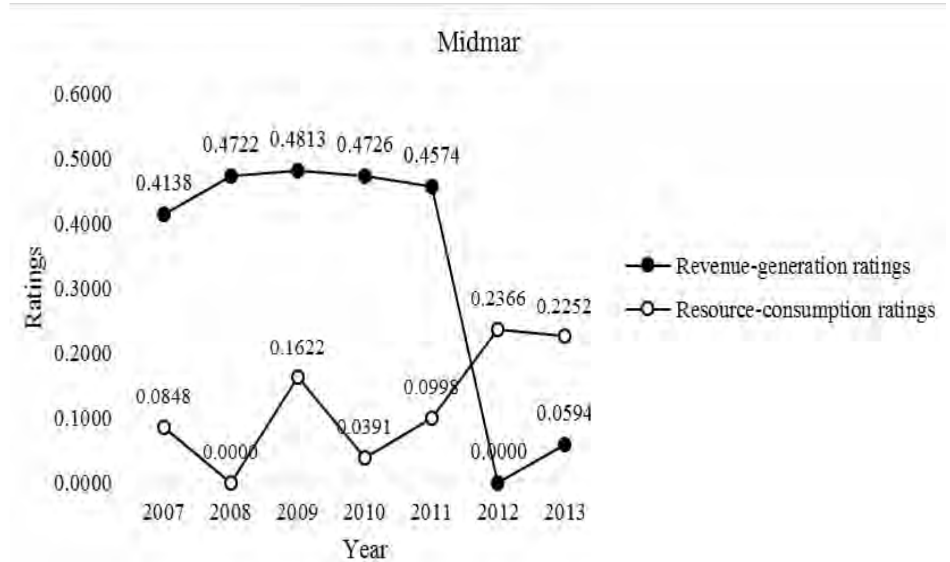

Thendele
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings

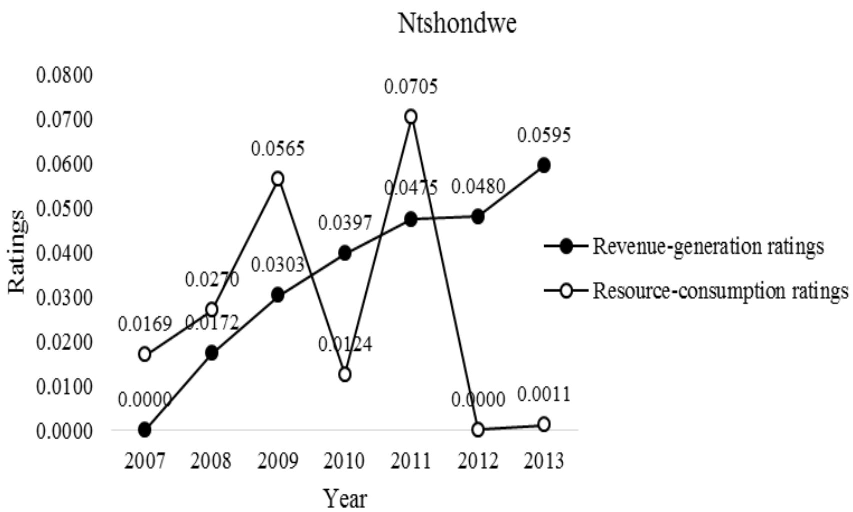

Rugged Glen Stables
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings

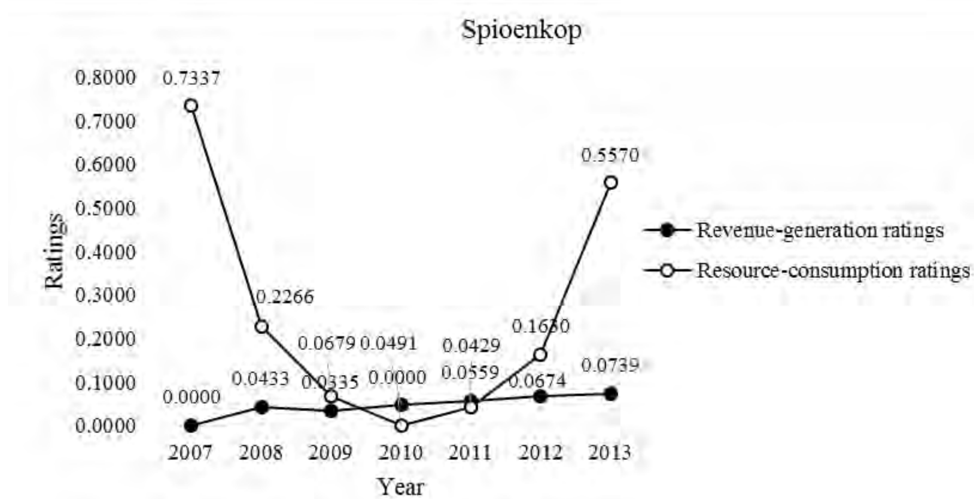

RNNP Mahai
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings


Injesuthi
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings


Giants Castle
Ratings
0.1400
0.1200
0.1000
0.0800
0.0600
0.0400
0.0200
0.0000
0.1175
0.0337
0.0169
0.0094
0.0119
0.0185
0.0225
0.0153
0.0249
0.0185
0.0000
0.0000
0.0054
2007
2008
2009
2010
2011
2012
2013
Year
Revenue-generating ratings
Resource-consumption ratings


Midmar
Ratings
0.6000
0.5000
0.4000
0.3000
0.2000
0.1000
0.0000
0.4138
0.4722
0.4813
0.4726
0.4574
0.2366
0.2252
0.1622
0.0848
0.0998
0.0391
0.0000
0.0594
0.0000
2007
2008
2009
2010
2011
2012
2013
Year
Revenue-generation ratings
Resource-consumption ratings


Ntshondwe
Ratings
0.0800
0.0700
0.0600
0.0500
0.0400
0.0300
0.0200
0.0100
0.0000
0.0705
0.0565
0.0595
0.0475
0.0480
0.0397
0.0303
0.0270
0.0169
0.0172
0.0124
0.0000
0.0000
0.0011
2007
2008
2009
2010
2011
2012
2013
Year
Revenue-generation ratings
Resource-consumption ratings


Spioenkop
Ratings
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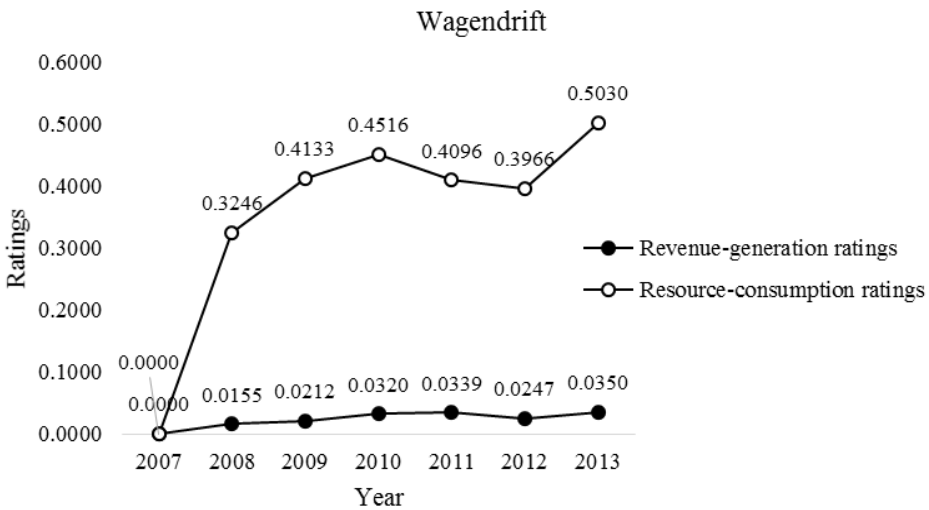
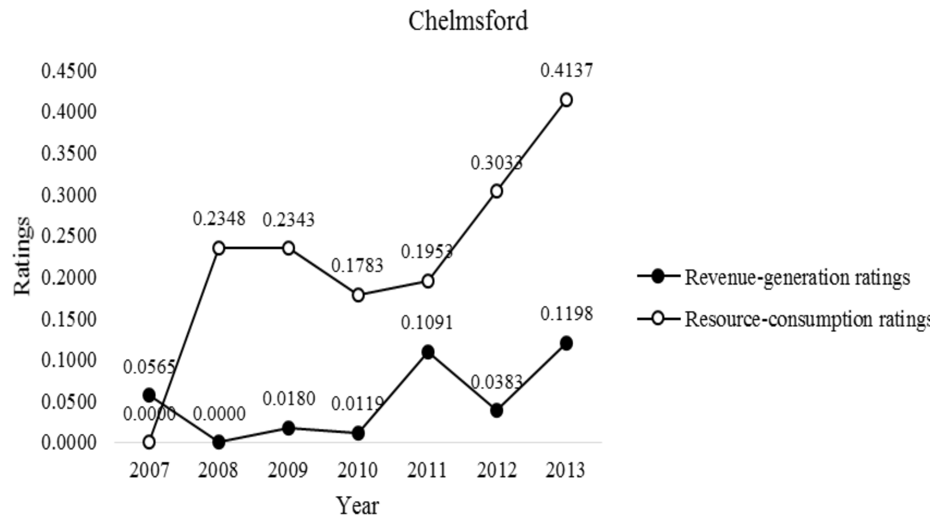
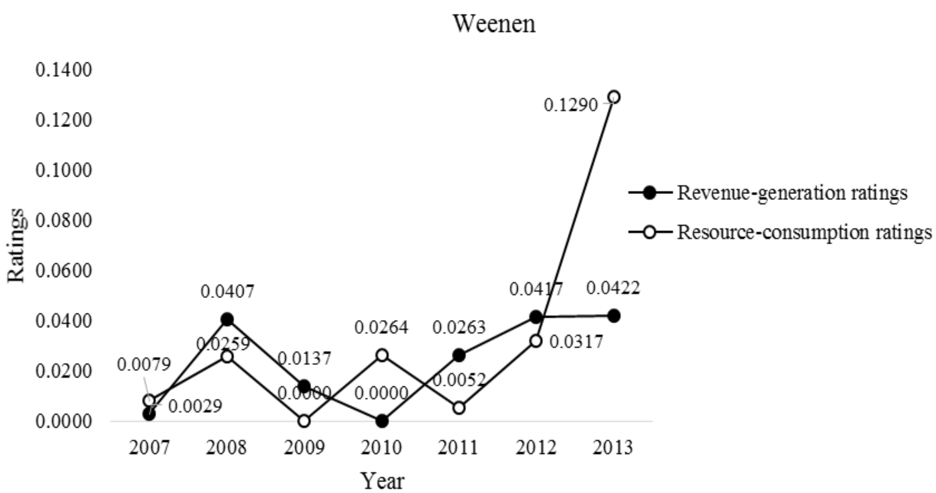
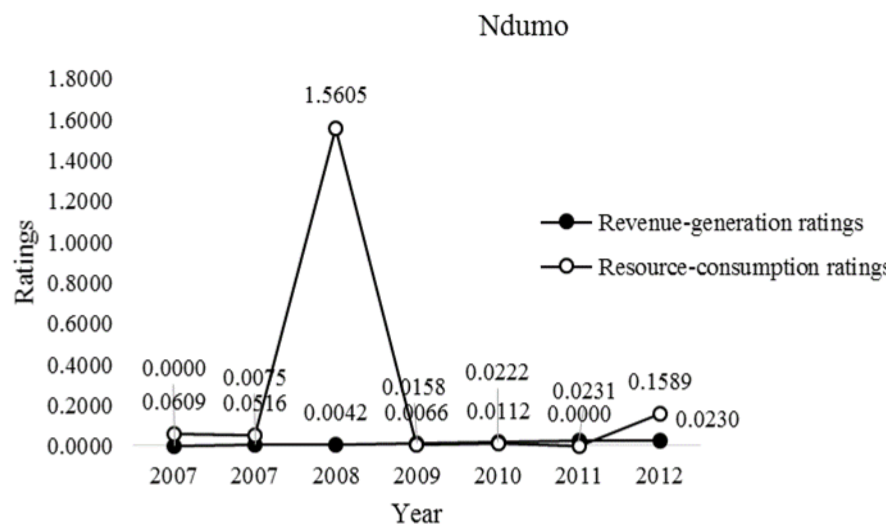
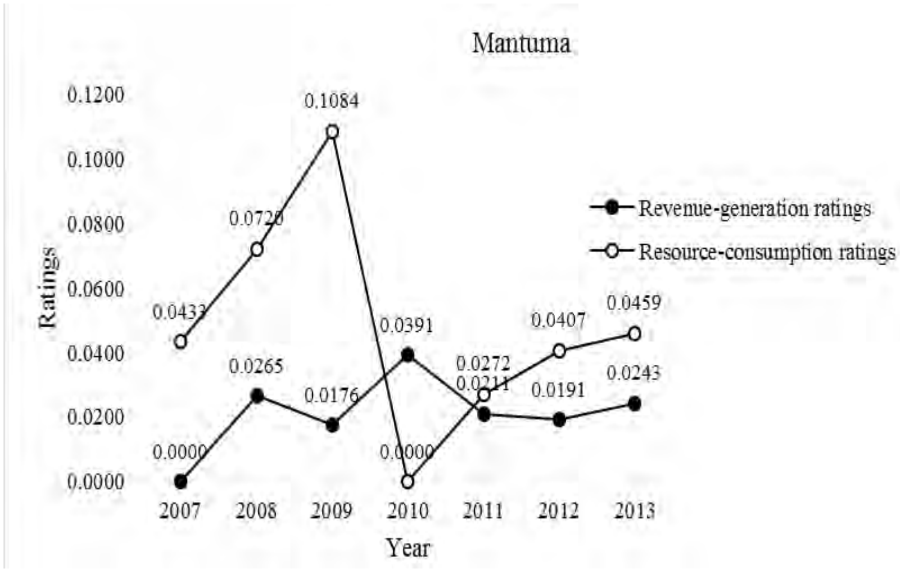
0.7000
0.6000
0.5000
0.4000
0.3000
0.2000
0.1000
0.0000
0.7337
0.5570
0.2266
0.1630
0.0679
0.0491
0.0429
0.0433
0.0335
0.0000
0.0559
0.0674
0.0739
0.0000
2007
2008
2009
2010
2011
2012
2013
Year
Revenue-generation ratings
Resource-consumption ratings

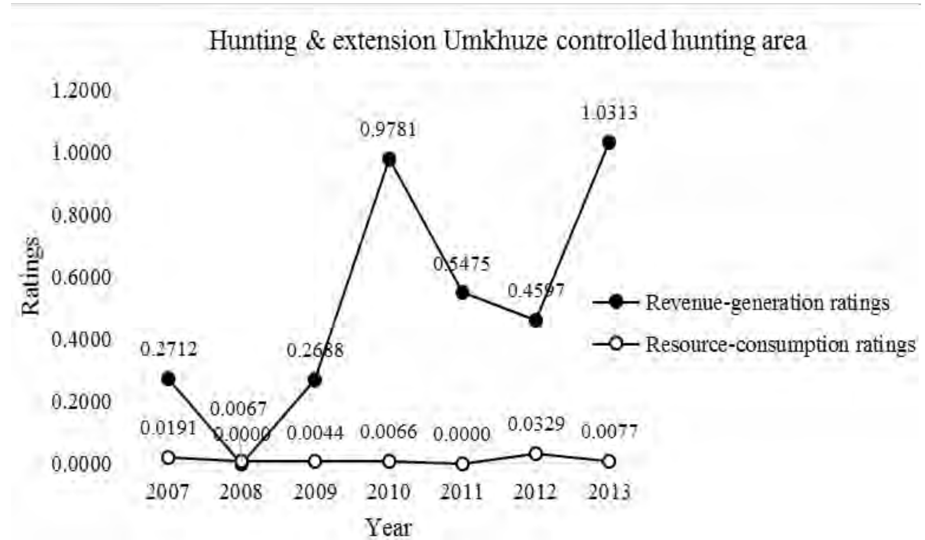

Wagendrift
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings

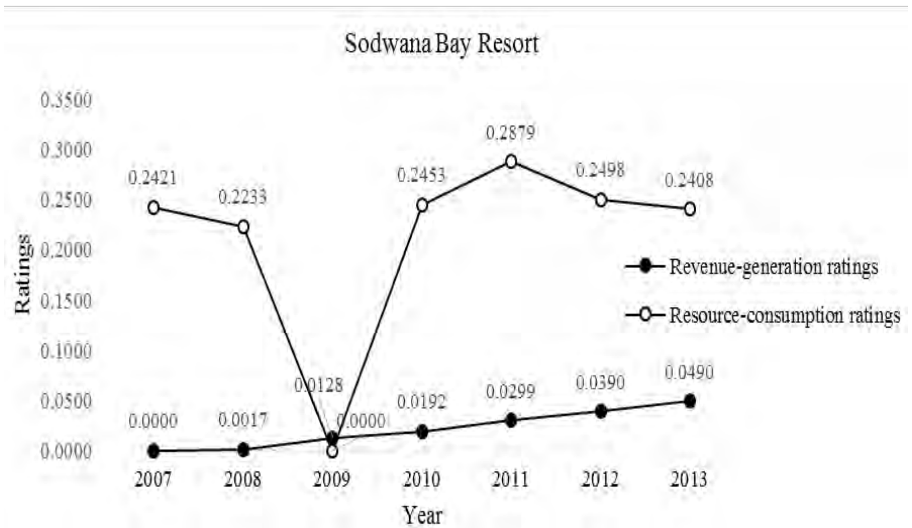

Chelmsford
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings

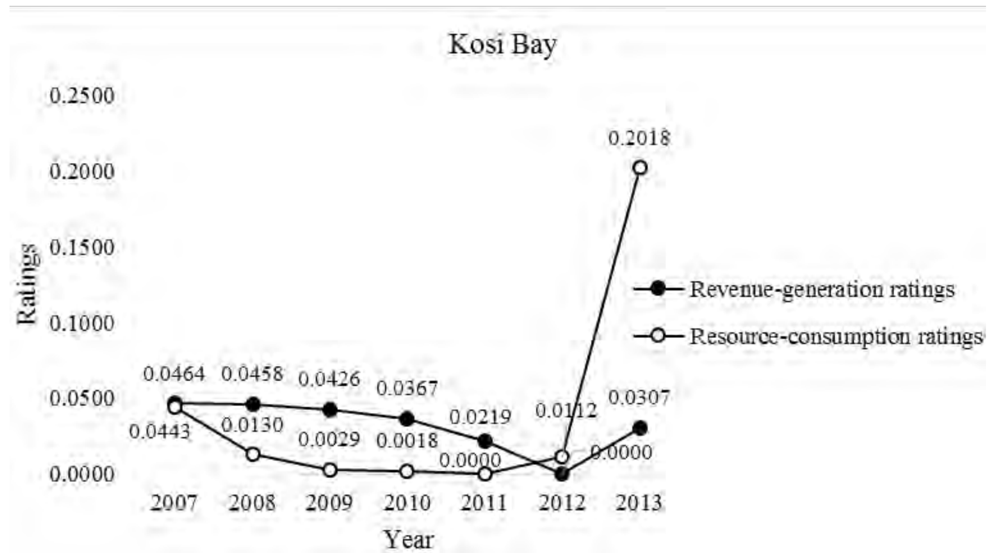

Weenen
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings

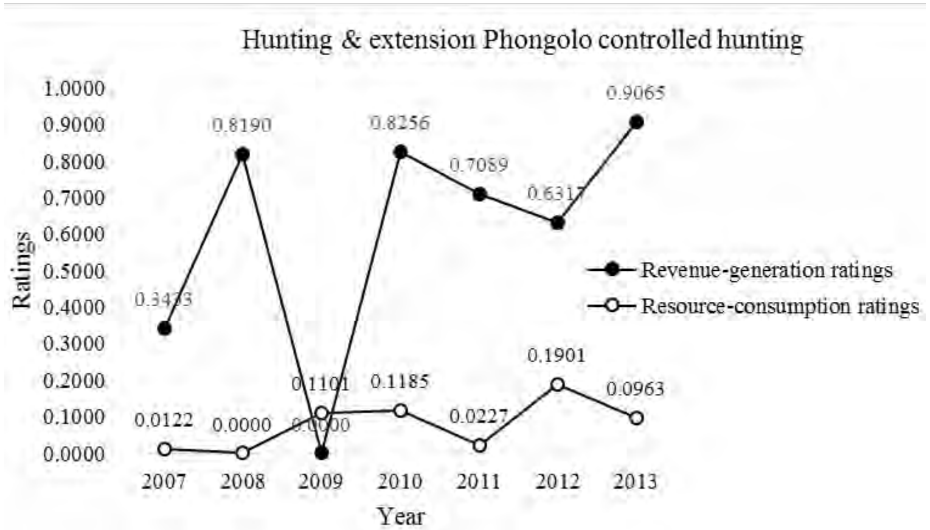

Ndumo
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings


Mantuma
0.1200
0.1000
0.0800
0.0600
0.0400
0.0200
0.0000
Ratings
0.0433
0.0720
0.1084
0.0391
0.0272
0.0407
0.0459
0.0265
0.0176
0.0211
0.0191
0.0243
0.0000
0.0000
2007
2008
2009
2010
2011
2012
2013
Year
Revenue-generation ratings
Resource-consumption ratings


Hunting & extension Umkhuze controlled hunting area
1.2000
1.0000
0.8000
0.6000
0.4000
0.2000
0.0000
Ratings
0.2712
0.0067
0.2688
0.9781
0.5475
0.4597
1.0313
0.0191
0.0000
0.0044
0.0066
0.0000
0.0329
0.0077
2007
2008
2009
2010
2011
2012
2013
Year
Revenue-generation ratings
Resource-consumption ratings


Sodwana Bay Resort
0.3500
0.3000
0.2500
0.2000
0.1500
0.1000
0.0500
0.0000
Ratings
0.2421
0.2233
0.0128
0.2453
0.2879
0.2498
0.2408
0.0000
0.0017
0.0000
0.0192
0.0299
0.0390
0.0490
2007
2008
2009
2010
2011
2012
2013
Year
Revenue-generation ratings
Resource-consumption ratings


Kosi Bay
0.2500
0.2000
0.1500
0.1000
0.0500
0.0000
Ratings
0.2018
0.0464
0.0458
0.0426
0.0367
0.0219
0.0112
0.0307
0.0443
0.0130
0.0029
0.0018
0.0000
0.0000
2007
2008
2009
2010
2011
2012
2013
Year
Revenue-generation ratings
Resource-consumption ratings


Hunting & extension Phongolo controlled hunting
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings
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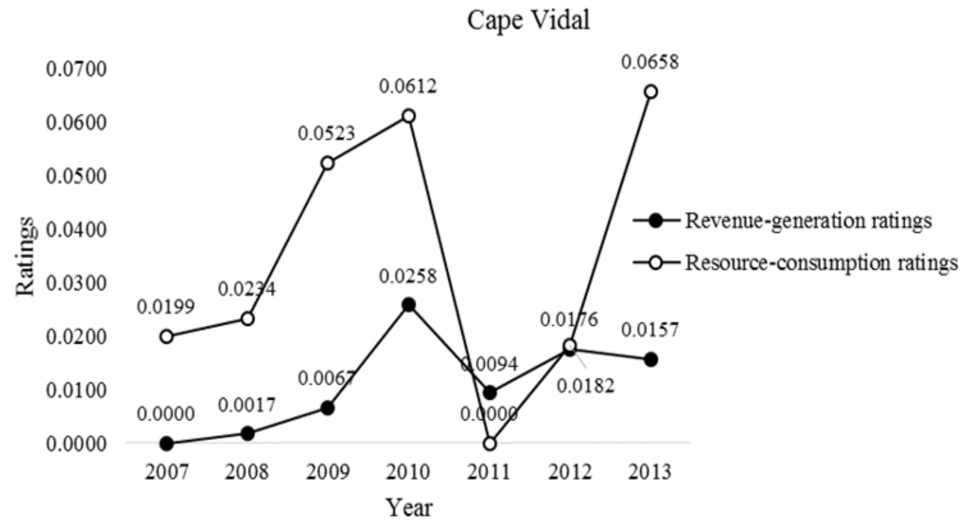
0.8256
0.7089
0.6317
0.9065
0.0122
0.0000
0.1101
0.1185
0.0227
0.1901
0.0963


Cape Vidal
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings
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0.0234
0.0523
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0.0658
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0.0017
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0.0258
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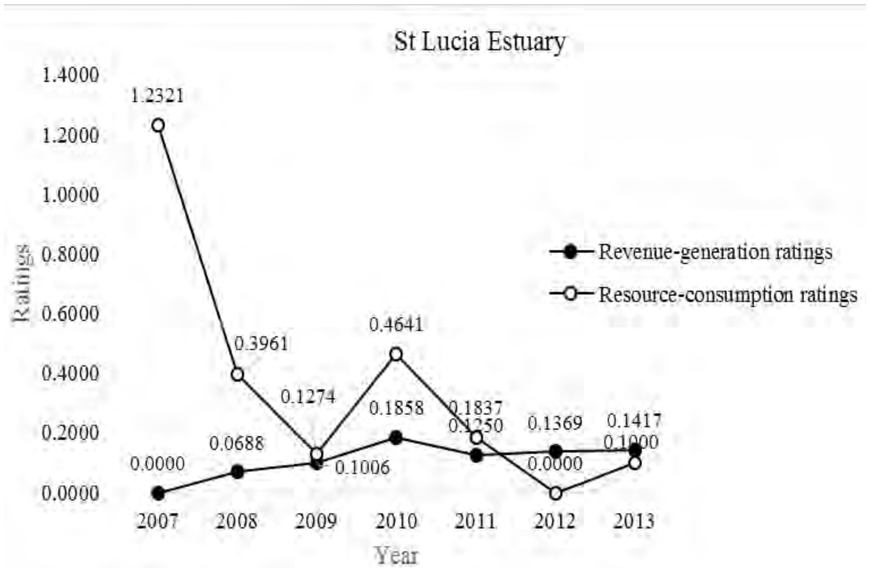
0.0182
0.0157


St Lucia Estuary
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings
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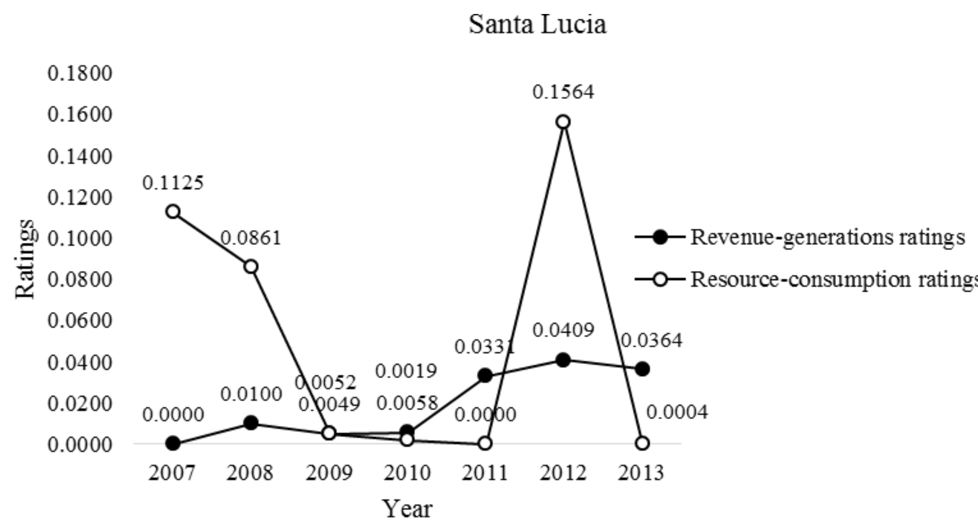
0.1274
0.4641
0.1837
0.0000
0.1000
0.0000
0.0688
0.1006
0.1858
0.1250
0.1369
0.1417


Santa Lucia
Ratings
Year
Revenue-generations ratings
Resource-consumption ratings
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0.0861
0.0052
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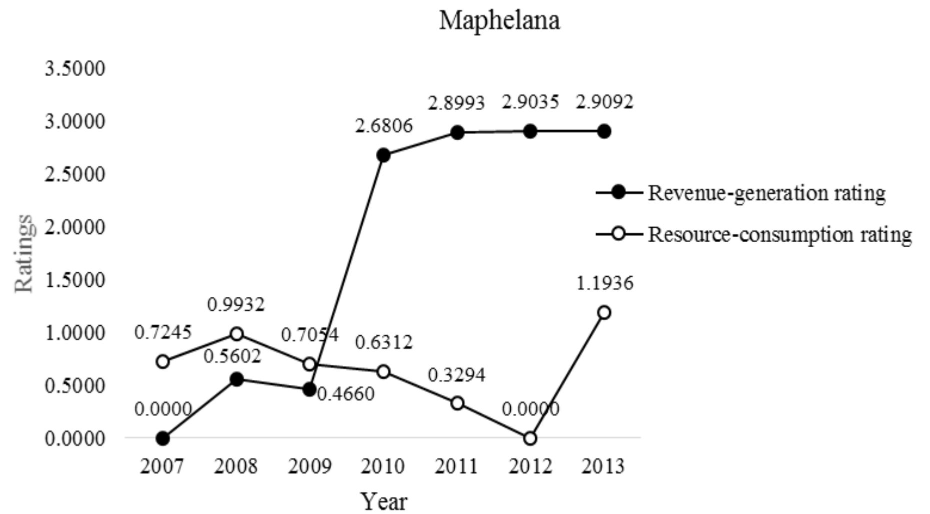
Maphelana
Ratings
Year
Revenue-generation rating
Resource-consumption rating
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3.0000
2.5000
2.0000
1.5000
1.0000
0.5000
0.0000
2007
2008
2009
2010
2011
2012
2013
0.7245
0.9932
0.7054
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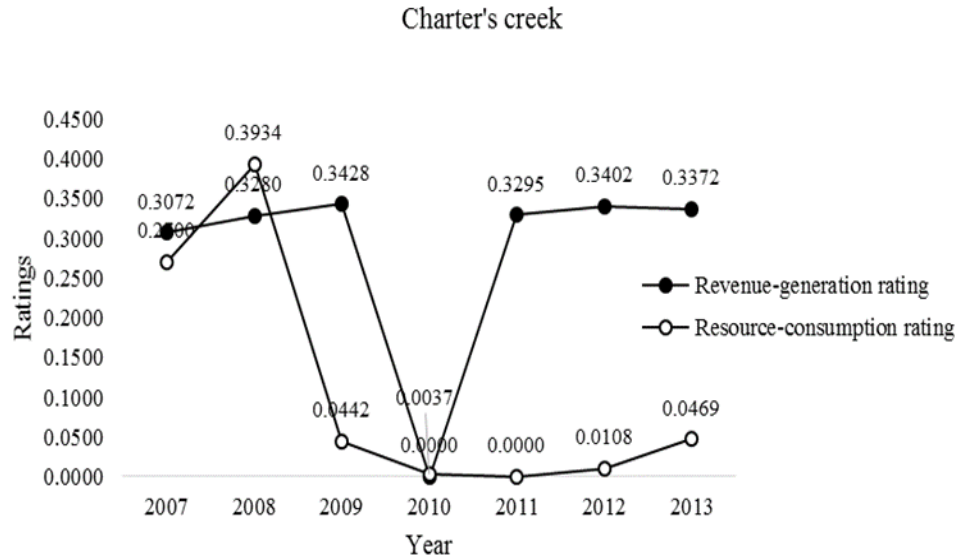
1.1936
0.0000
0.5602
0.4660
2.6806
2.8993
2.9035
2.9092


Charter's creek
Ratings
Year
Revenue-generation rating
Resource-consumption rating
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0.4000
0.3500
0.3000
0.2500
0.2000
0.1500
0.1000
0.0500
0.0000
2007
2008
2009
2010
2011
2012
2013
0.3072
0.3934
0.3280
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0.3295
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0.3402
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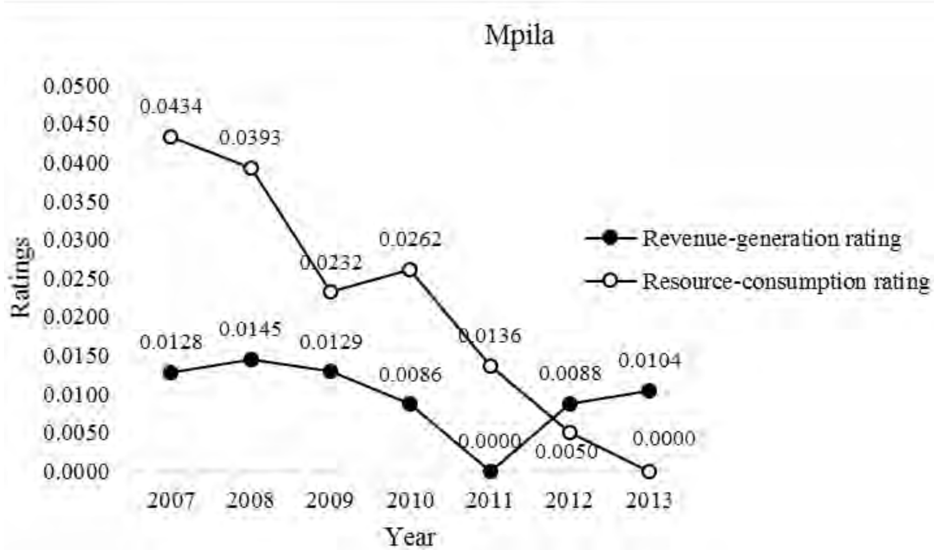
0.3372
0.0469


Mpila
Ratings
Year
Revenue-generation rating
Resource-consumption rating
0.0500
0.0450
0.0400
0.0350
0.0300
0.0250
0.0200
0.0150
0.0100
0.0050
0.0000
2007
2008
2009
2010
2011
2012
2013
0.0434
0.0393
0.0232
0.0262
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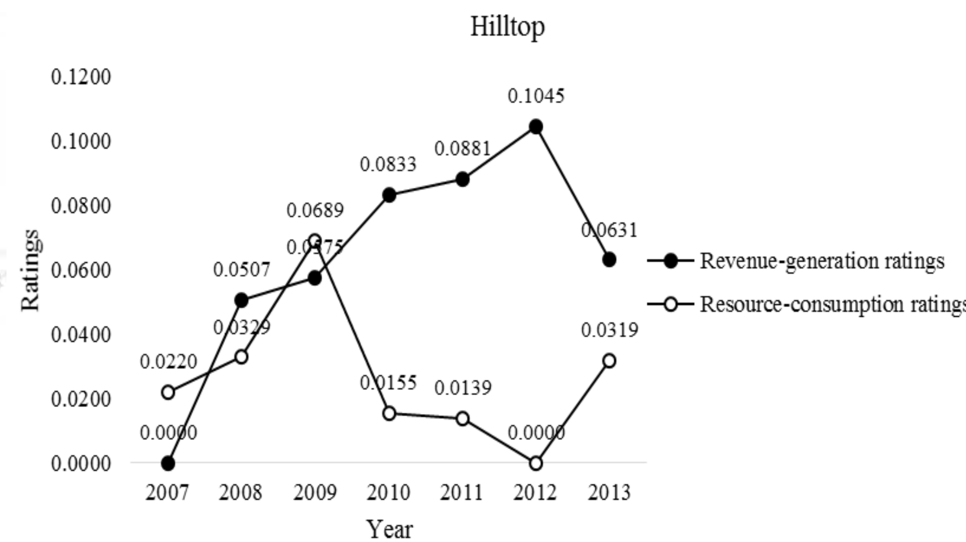
0.0088
0.0104


Hilltop
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings
0.1200
0.1000
0.0800
0.0600
0.0400
0.0200
0.0000
2007
2008
2009
2010
2011
2012
2013
0.0220
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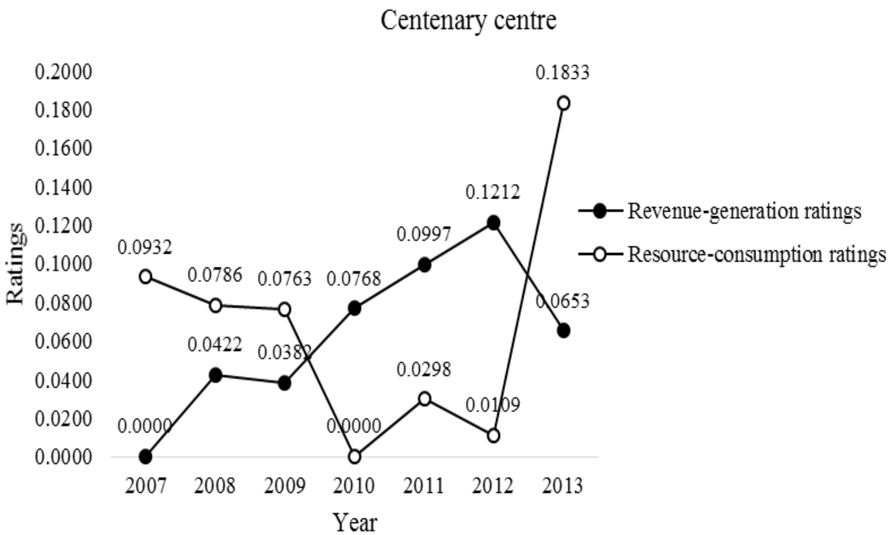
Centenary centre
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings
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0.0786
0.0763
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0.1212
0.1833
0.0422
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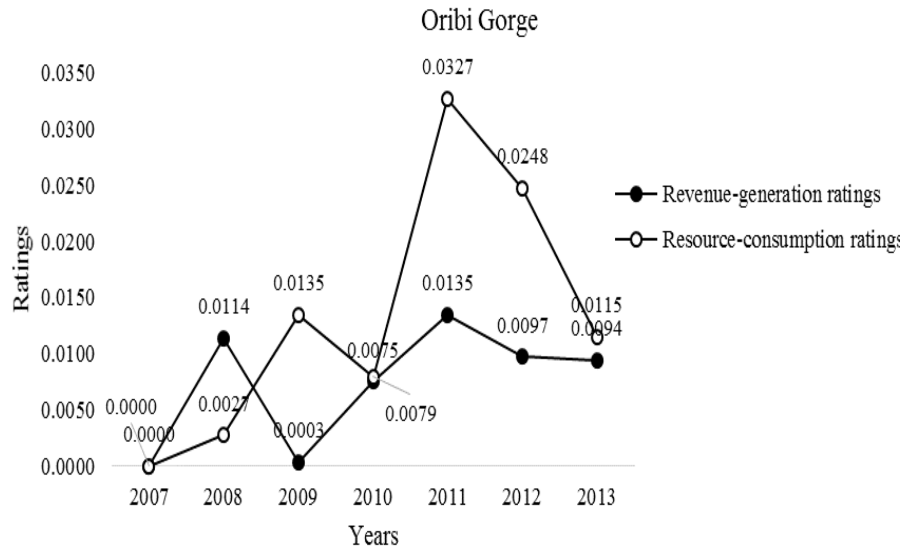
0.0000
0.0000


Oribi Gorge
Ratings
Years
Revenue-generation ratings
Resource-consumption ratings
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0.0248
0.0114
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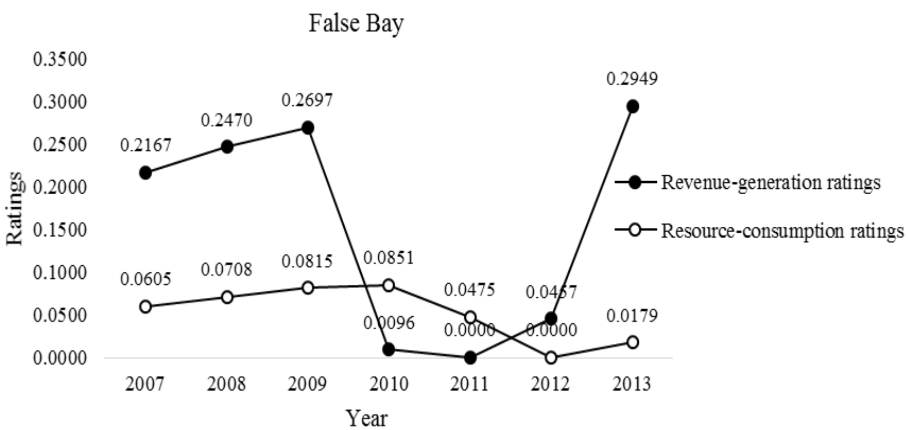
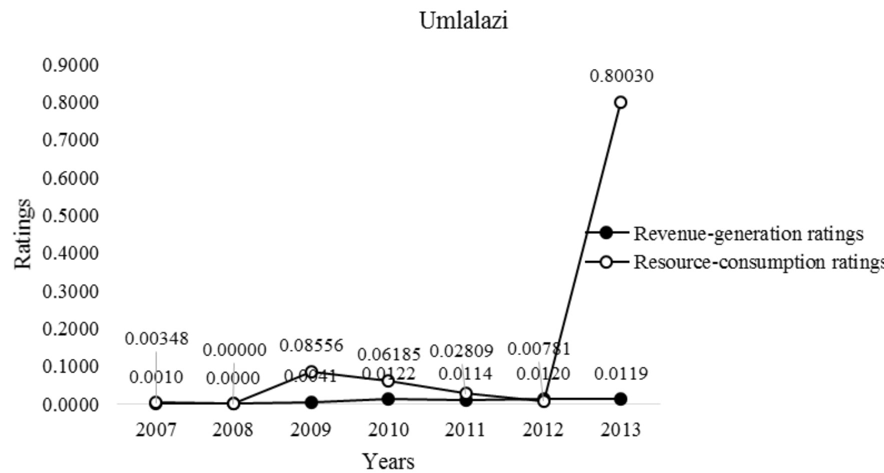
0.0135
0.0097
0.0115
0.0094
0.0075
0.0079
0.0000
0.0000
0.0027
0.0003


False Bay
Ratings
Year
Revenue-generation ratings
Resource-consumption ratings
0.2167
0.2470
0.2697
0.2949
0.0605
0.0708
0.0815
0.0851
0.0475
0.0096
0.0000
0.0000
0.0179


Umlalazi
Ratings
Years
Revenue-generation ratings
Resource-consumption ratings
0.80030
0.00348
0.00000
0.08556
0.06185
0.02809
0.0010
0.0000
0.0122
0.0114
0.0119

Appendix II. Operational competitiveness ratings computed simultaneously using different calibration constants of all public protected areas

Public Protected Area	OCRA combined inefficiency ratings						
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Kamberg	0.00093	0.00357	0.00182	0.00386	0.00220	0.00340	0.00438
Lotheni	0.00109	0.00112	0.00160	0.00086	0.00113	0.00186	0.00418
Didima	0.00241	0.00318	0.00515	0.00280	0.00212	0.00269	0.00364
Mantuma	0.00124	0.00283	0.00362	0.00112	0.00139	0.00172	0.00202
Thendele	0.00303	0.00087	0.01701	0.00024	0.00163	0.00314	0.00249
RNNP Mahai	0.01735	0.01827	0.00046	0.01855	0.01834	0.01865	0.01907
Giants Castle	0.00015	0.00090	0.00386	0.00127	0.00090	0.00124	0.00139
Midmar	0.01933	0.01857	0.02349	0.01970	0.02101	0.01181	0.01319
Ntshondwe	0.00044	0.00123	0.00245	0.00146	0.00334	0.00134	0.00170
Spioenkop	0.02102	0.00771	0.00287	0.00138	0.00280	0.00658	0.01807
Wagendrift	0.00074	0.01050	0.01321	0.01462	0.01347	0.01283	0.01618
Chelmsford	0.00210	0.00722	0.00772	0.00594	0.00922	0.01028	0.01579
Weenen	0.00114	0.00275	0.00123	0.00159	0.00174	0.00294	0.00574
Monk's Cowl	0.01810	0.01840	0.01869	0.02554	0.01870	0.00270	0.02148
Ndumo	0.00193	0.00188	0.04507	0.00083	0.00114	0.00085	0.00540
Mpila	0.00252	0.00245	0.00194	0.00190	0.00130	0.00130	0.00121
Hilltop	0.00112	0.00289	0.00412	0.00333	0.00342	0.00349	0.00322
Centenary Centre	0.00310	0.00389	0.00371	0.00263	0.00414	0.00422	0.00756
Injesuthi	0.00050	0.00058	0.00308	0.00104	0.00088	0.00098	0.00165
PCHA	0.34335	0.81869	0.00281	0.82863	0.70916	0.63676	0.90893
UCHA	0.00887	0.00073	0.00838	0.02879	0.01625	0.01467	0.03035
Rugged Glen Stables	0.00595	0.00765	0.00561	0.00668	0.00470	0.00554	0.02777
Sodwana Bay Resort	0.00686	0.00637	0.00028	0.00750	0.00903	0.00820	0.00823
Kosi Bay	0.00396	0.00305	0.00266	0.00246	0.00199	0.00168	0.00803
Cape Vidal	0.00050	0.00065	0.00162	0.00242	0.00020	0.00096	0.00227
St Lucia Estuary	0.03764	0.01563	0.00883	0.02094	0.01115	0.00622	0.00923
Santa Lucia	0.00408	0.00361	0.00114	0.00107	0.00180	0.00651	0.00191
Maphelana	0.06400	0.06261	0.04672	0.09567	0.10311	0.09177	0.12804
Charter's creek	0.01735	0.02149	0.01189	0.00090	0.01024	0.01086	0.01181
False Bay	0.00831	0.00947	0.01043	0.00307	0.00172	0.00167	0.00933
Oribi Gorge	0.00000	0.00040	0.00040	0.00044	0.00133	0.00099	0.00060
Umlalazi	0.00047	0.00035	0.00292	0.00247	0.00148	0.00091	0.02365

Appendix III. Operational competitiveness ratings for public protected areas in Ezemvelo KZN Wildlife management areas of the Ukhahlamba and Zululand regions and their rankings

Public Protected Area	OCRA combined inefficiency ratings						
	2007	2008	2009	2010	2011	2012	2013
	Ukhahlamba region						
Kamberg	0.00093	0.00357	0.00182	0.00386	0.00220	0.00340	0.00438
Rank	16	83	46	87	55	80	94
Lotheni	0.00109	0.00112	0.00160	0.00086	0.00113	0.00186	0.00418
Rank	19	20	40	11	23	47	92
Didima	0.00241	0.00318	0.00515	0.00280	0.00212	0.00269	0.00364
Rank	56	76	95	66	54	62	85
Mantuma	0.00124	0.00283	0.00362	0.00112	0.00139	0.00172	0.00202
Rank	30	68	84	22	36	44	52
Thendele	0.00303	0.00087	0.01701	0.00024	0.00163	0.00314	0.00249
Rank	72	12	119	2	41	75	59
RNNP Mahai	0.01735	0.01827	0.00046	0.01855	0.01834	0.01865	0.01907
Rank	120	123	4	126	124	128	131
Giants Castle	0.00015	0.00090	0.00386	0.00127	0.00090	0.00124	0.00139
Rank	1	15	88	31	14	29	37
Midmar	0.01933	0.01857	0.02349	0.01970	0.02101	0.01181	0.01319
Rank	132	127	137	133	134	109	111
Ntshondwe	0.00044	0.00123	0.00245	0.00146	0.00334	0.00134	0.00170
Rank	3	28	57	38	79	34	43
Spioenkop	0.02102	0.00771	0.00287	0.00138	0.00280	0.00658	0.01807
Rank	135	102	69	35	65	99	121
Wagendrift	0.00074	0.01050	0.01321	0.01462	0.01347	0.01283	0.01618
Rank	8	108	112	114	113	110	117
Chelmsford	0.00210	0.00722	0.00772	0.00594	0.00922	0.01028	0.01579
Rank	53	100	103	98	106	107	116
Weenen	0.00114	0.00275	0.00123	0.00159	0.00174	0.00294	0.00574
Rank	24	64	27	39	45	71	97
Monk's Cowl	0.01810	0.01840	0.01869	0.02554	0.01870	0.00270	0.02148
Rank	122	125	129	138	130	63	136
	Zululand region						
Ndumo	0.00193	0.00188	0.04507	0.00083	0.00114	0.00085	0.00540
Rank	50	48	141	9	25	10	96
Mpila	0.00252	0.00245	0.00194	0.00190	0.00130	0.00130	0.00121
Rank	60	58	51	49	32	33	26
Hilltop	0.00112	0.00289	0.00412	0.00333	0.00342	0.00349	0.00322
Rank	21	70	90	78	81	82	77
Centenary Centre	0.00310	0.00389	0.00371	0.00263	0.00414	0.00422	0.00756
Rank	74	89	86	61	91	93	101
Injesuthi	0.00050	0.00058	0.00308	0.00104	0.00088	0.00098	0.00165

Continued

Rank	5	6	73	18	13	17	42
PCHA	0.34335	0.81869	0.00281	0.82863	0.70916	0.63676	0.90893
Rank	142	145	67	146	144	143	147
UCHA	0.00887	0.00073	0.00838	0.02879	0.01625	0.01467	0.03035
Rank	105	7	104	139	118	115	140

Appendix IV. Operational competitiveness ratings for public protected areas in Ezemvelo KZN Wildlife management areas of the Ukhahlamba and Coastal regions and their rankings

Public Protected Area	**OCRA combined inefficiency ratings**						
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
	Coastal region						
Rugged Glen Stables	0.00595	0.00765	0.00561	0.00668	0.00470	0.00554	0.02777
Rank	104	113	101	109	98	100	167
Sodwana Bay Resort	0.00686	0.00637	0.00028	0.00750	0.00903	0.00820	0.00823
Rank	110	106	5	112	121	117	118
Kosi Bay	0.00396	0.00305	0.00266	0.00246	0.00199	0.00168	0.00803
Rank	94	82	71	68	59	50	116
Cape Vidal	0.00050	0.00065	0.00162	0.00242	0.00020	0.00096	0.00227
Rank	13	15	47	66	3	24	64
St Lucia Estuary	0.03764	0.01563	0.00883	0.02094	0.01115	0.00622	0.00923
Rank	168	140	120	159	131	105	123
Santa Lucia	0.00408	0.00361	0.00114	0.00107	0.00180	0.00651	0.00191
Rank	95	89	32	26	55	107	58
Maphelana	0.06400	0.06261	0.04672	0.09567	0.10311	0.09177	0.12804
Rank	171	170	169	173	174	172	175
Charter's creek	0.01735	0.02149	0.01189	0.00090	0.01024	0.01086	0.01181
Rank	145	163	134	19	126	130	133
False Bay	0.00831	0.00947	0.01043	0.00307	0.00172	0.00167	0.00933
Rank	119	125	128	83	53	49	124
Oribi Gorge	0.00000	0.00040	0.00040	0.00044	0.00133	0.00099	0.00060
Rank	1	8	7	9	38	25	14
Umlalazi	0.00047	0.00035	0.00292	0.00247	0.00148	0.00091	0.02365
Rank	12	6	79	69	44	22	165
	Ukhahlamba region						
Kamberg	0.00093	0.00357	0.00182	0.00386	0.00220	0.00340	0.00438
Rank	23	88	56	92	63	87	97
Lotheni	0.00109	0.00112	0.00160	0.00086	0.00113	0.00186	0.00418
Rank	27	28	46	17	30	57	96
Didima	0.00241	0.00318	0.00515	0.00280	0.00212	0.00269	0.00364
Rank	65	85	99	76	62	72	91

Continued

Mantuma	0.00124	0.00283	0.00362	0.00112	0.00139	0.00172	0.00202
Rank	36	77	90	29	41	52	60
Thendele	0.00303	0.00087	0.01701	0.00024	0.00163	0.00314	0.00249
Rank	81	18	143	4	48	84	70
RNNP Mahai	0.01735	0.01827	0.00046	0.01855	0.01834	0.01865	0.01907
Rank	144	148	11	151	149	153	156
Giants Castle	0.00015	0.00090	0.00386	0.00127	0.00090	0.00124	0.00139
Rank	2	21	93	37	20	35	42
Midmar	0.01933	0.01857	0.02349	0.01970	0.02101	0.01181	0.01319
Rank	157	152	164	158	160	132	136
Ntshondwe	0.00044	0.00123	0.00245	0.00146	0.00334	0.00134	0.00170
Rank	10	34	67	43	86	39	51
Spioenkop	0.02102	0.00771	0.00287	0.00138	0.00280	0.00658	0.01807
Rank	161	114	78	40	75	108	146
Wagendrift	0.00074	0.01050	0.01321	0.01462	0.01347	0.01283	0.01618
Rank	16	129	137	139	138	135	142
Chelmsford	0.00210	0.00722	0.00772	0.00594	0.00922	0.01028	0.01579
Rank	61	111	115	103	122	127	141
Weenen	0.00114	0.00275	0.00123	0.00159	0.00174	0.00294	0.00574
Rank	31	74	33	45	54	80	102
Monk's Cowl	0.01810	0.01840	0.01869	0.02554	0.01870	0.00270	0.02148
Rank	147	150	154	166	155	73	162

Appendix V. Operational competitiveness ratings for public protected areas in Ezemvelo KZN Wildlife management areas of the Zululand and Coastal regions and their rankings

Public Protected Area	**OCRA combined inefficiency ratings**						
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
				Zululand region			
Ndumo	0.00193	0.00188	0.04507	0.00083	0.00114	0.00085	0.00540
Rank	42	39	113	15	26	16	73
Mpila	0.00252	0.00245	0.00194	0.00190	0.00130	0.00130	0.00121
Rank	50	47	43	40	29	30	28
Hilltop	0.00112	0.00289	0.00412	0.00333	0.00342	0.00349	0.00322
Rank	25	54	69	61	62	63	60
Centenary Centre	0.00310	0.00389	0.00371	0.00263	0.00414	0.00422	0.00756
Rank	59	66	65	51	70	71	83
Injesuthi	0.00050	0.00058	0.00308	0.00104	0.00088	0.00098	0.00165
Rank	10	11	58	23	17	21	34
PCHA	0.34335	0.81869	0.00281	0.82863	0.70916	0.63676	0.90893
Rank	121	124	53	125	123	122	126
UCHA	0.00887	0.00073	0.00838	0.02879	0.01625	0.01467	0.03035
Rank	91	14	89	110	104	102	111
				Coastal region			
Rugged Glen Stables	0.00595	0.00765	0.00561	0.00668	0.00470	0.00554	0.02777
Rank	76	84	75	80	72	74	109
Sodwana Bay Resort	0.00686	0.00637	0.00028	0.00750	0.00903	0.00820	0.00823
Rank	81	78	3	82	92	86	87
Kosi Bay	0.00396	0.00305	0.00266	0.00246	0.00199	0.00168	0.00803
Rank	67	56	52	48	44	36	85
Cape Vidal	0.00050	0.00065	0.00162	0.00242	0.00020	0.00096	0.00227
Rank	9	13	33	46	2	20	45
St Lucia Estuary	0.03764	0.01563	0.00883	0.02094	0.01115	0.00622	0.00923
Rank	112	103	90	106	99	77	93
Santa Lucia	0.00408	0.00361	0.00114	0.00107	0.00180	0.00651	0.00191
Rank	68	64	27	24	38	79	41
Maphelana	0.06400	0.06261	0.04672	0.09567	0.10311	0.09177	0.12804
Rank	116	115	114	118	119	117	120
Charter's creek	0.01735	0.02149	0.01189	0.00090	0.01024	0.01086	0.01181
Rank	105	107	101	18	96	98	100
False Bay	0.00831	0.00947	0.01043	0.00307	0.00172	0.00167	0.00933
Rank	88	95	97	57	37	35	94
Oribi Gorge	0.00000	0.00040	0.00040	0.00044	0.00133	0.00099	0.00060
Rank	1	6	5	7	31	22	12
Umlalazi	0.00047	0.00035	0.00292	0.00247	0.00148	0.00091	0.02365
Rank	8	4	55	49	32	19	108

Appendix VI. Comparison of competitiveness ratings and rankings of public protected areas in Ezemvelo KZN Wildlife management areas: Wilcoxon Mann-Whitney rank test results

Ukhahlamba and Zululand region

Ranks

Group		N	Mean Rank	Sum of Ranks
Regions	Ukhahlamba	98	74.09	7261.00
	Zululand	49	73.82	3617.00
	Total	147		

Test Statistics

	Regions
Mann-Whitney U	2392.000
Wilcoxon W	3617.000
Z	-.037
Asymp. Sig. (2-tailed)	.970

Ukhahlamba and Coastal region

Ranks

Group		N	Mean Rank	Sum of Ranks
Regions	Ukhahlamba	98	86.79	8505.50
	Coastal	77	89.54	6894.50
	Total	175		

Test Statistics

	Regions
Mann-Whitney U	3654.500
Wilcoxon W	8505.500
Z	-.356
Asymp. Sig. (2-tailed)	.722

Coastal and Zululand region

Ranks

Group		N	Mean Rank	Sum of Ranks
Regions	Coastal	49	62.02	3039.00
	Zululand	77	64.44	4962.00
	Total	126		

Test Statistics

	Regions
Mann-Whitney U	1814.000
Wilcoxon W	3039.000
Z	-.363
Asymp. Sig. (2-tailed)	.717