Nature-based Tourism and Environmental Sustainability in South Africa

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Nature-based Tourism and Environmental Sustainability in South Africa

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Assessments of environmental factors contributing to sustainable tourism are described in relation to four photographic wildlife tourism enterprises in South Africa. A series of qualitative and quantitative results are presented to demonstrate how nature-based tourism enterprises in protected areas address their environmental impacts. Field-based evaluations and interviews with local community members show how a new Sustainable Nature-based Tourism Assessment Toolkit (SUNTAT) was used to evaluate enterprise performance. Motivations underlying environmentally responsible activities undertaken by private- and public-sector enterprises are described, in addition to their limitations and constraints. Conclusions are made regarding the need for environmentally responsible activities to utilise commercially appropriate best practice, and to consider both the local level and neighbouring livelihood strategies.

Keywords: sustainable development, environmental impacts, nature-based tourism, protected areas, Delphi consultation

Introduction

The purpose of this paper is to describe the environmental sustainability of four tourism enterprises in South Africa. Data are provided to illustrate how environmental information was obtained through the application of a new holistic Sustainable Nature-based Tourism Assessment Toolkit (SUNTAT). Qualitative and quantitative results from the field studies have been evaluated and presented. Examples of environmentally responsible processes and performance are used to demonstrate how the toolkit may be applied to collect reliable and comparable data. Complementary to the empirical data, this paper also discusses motivations underlying environmentally responsible activities by private- and public-sector enterprises. Limitations and constraints to environmental sustainability that relate to commercial and political forces are also reviewed. The paper highlights the importance of applying commercially and locally appropriate environmental best practice.

The importance of this work rests in four main areas. Firstly, it presents data from the evaluation of sustainable tourism development in developing countries, which tends to be underrepresented in the literature (Tosun, 2001). Secondly, the paper illustrates how progress has been made to move past the debate surrounding what sustainable tourism is or is not, and towards tangibly assessing the constituent factors of sustainability, as defined by regional experts. Thirdly, instead of focusing narrowly on one level of environmental impacts (e.g. wildlife behavioural change), the research demonstrates the importance of eval-

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uating both micro- and macro-level issues to strategically address sustainability. Fourthly, the paper provides examples of benchmarks that may be used to demonstrate how environmentally responsible interventions at the local level have cumulative implications for a sustainable nature-based tourism industry at a strategic level.

Strategies and quantitative data presented will be useful for researchers attempting to assess the environmental sustainability of tourism. The findings will illustrate a range of simple but reliable environmental factors that may be assessed at low cost, over a short time-scale and by one researcher. In addition, the research has practical applications for tourism enterprises with regard to improving their environmental performance and reducing operating costs. By providing tools to tangibly demonstrate their achievements, the paper illustrates how nature-based tourism enterprises may validly promote their environmentally responsible activities in the market-place.

Practical steps taken by commercial nature-based tourism enterprises to improve their environmental sustainability are described. These steps focus on minimising operational environmental impacts within the enterprise infrastructure, promoting sound environmental management within protected areas where self-guided or escorted game drives take place, and also considering the wider environmental context of neighbouring landowners and rural local communities. Practical commercial issues that constrain tourism enterprises in the operation of responsible tourism are reviewed in relation to human resource capacity, turnover, and local politics. Therefore, the theory of environmental sustainability is linked to best practice activities that are feasible in reality.

Background

Research and discussion regarding sustainable tourism development has grown in volume since the Brundtland Report proposed that intergenerational equity could not be achieved unless the environmental impacts of economic activities were considered (WCED, 1987: 43). Concern for sustainable tourism arose from the increasing realisation that mass tourism could have significant detrimental environmental impacts in destinations if it was not controlled. Nature-based tourism, which incorporates the enjoyment of wildlife or undeveloped natural areas (WTTERC, 1993), was of special concern. This was in part because degradation of the environment fundamentally undermines the potential for nature-based tourism to be attractive to visitors (Roe *et al.*, 1997). Researchers have produced comprehensive reviews of sustainable tourism issues that consider the 'triple bottom line' of sustainability (Elkington, 1997): economic, social and environmental factors (e.g. Archer & Cooper, 1994; Bramwell & Lane, 1993; Harris & Leiper, 1995; Mowforth & Munt, 1998).

Although the field studies undertaken addressed the triple bottom line, only the environmental aspects of sustainable tourism are reviewed within this paper. Environmental impact studies attempt to generalise relationships between tourism activities and impacts with respect to specific ecosystems and disturbance characteristics (Knight & Cole, 1995). Evaluation techniques used to predict and avoid development impacts that are detrimental to the environment include the Limits of Acceptable Change (Stankey *et al.*, 1984), Environmental

Table 1 Overview of environmental impacts of tourism (Spenceley, 2003a)

AIR: Impacts of transport activity and facility power include: • air and noise pollution from vehicles (Mathieson & Wall, 1982); and • increased carbon dioxide (CO_2) emissions from fossil fuel combustion which contributes to global climate change (Adams, 1990).
WATER: Impacts of the disposal of waste into water bodies include the: • introduction of minerals, nutrients, sewage, petrol and toxins to the environment (FAO, 1972; Mathieson & Wall, 1982); and • contamination reduces water quality and may lead to potential health hazards to animals (Mathieson & Wall, 1982; Wang & Miko, 1997).
GEOLOGY & SOIL: Impacts of collection, vandalism, erosion include: • removal of minerals, rocks, fossils and items of archaeological interest, and graffiti (Mathieson & Wall, 1982); • physical and chemical changes in soil (Mathieson & Wall, 1982); and • erosion (Sun & Walsh, 1998) and soil compaction, which affects invertebrate fauna (Duffey, 1975).
LANDSCAPE: Impacts of Formal and informal development include: • visual impact of settlements on the landscape (Sindiyo & Pertet, 1984); and • potential improvement in the landscape's appearance (Perdue *et al*. 1990) through preservation of heritage structures (Lui *et al*. 1987).
HABITATS: Impacts of clearing for construction and tourism facility include: • decrease in natural habitat (e.g. wetlands) due to resource use and/or tourism construction (Burton, 1998); • competition between native and invasive plant species from resort gardens; and • increased fire frequency (Buckley, 1991) leading to habitat change (Mathieson & Wall, 1982). Impacts of pedestrian and vehicular traffic include: • changes in germination, establishment, growth and reproduction (Cole & Landres, 1995), species diversity, composition, and plant morphology (Sun & Liddle, 1993); and • disappearance of fragile species (Sun & Liddle, 1993) and replacement by more resilient species (Mathieson & Wall, 1982). Impacts of plants and fungi collection include: • changes in species composition and disappearance of rare species (Rogers, 1981).
WILDLIFE: Impacts of hunting and fishing include: • changes in species composition and social behaviour (e.g. elephants, lions); disappearance of rare species; and • reduction of habituated animals (Sindiyo & Pertet, 1984). Impacts of pollution include: • effects on health including psychological stress, behavioural changes, reductions in productivity due to noise pollution (Bowles, 1995); and • use of waste disposal areas as sources of food (Speight, 1973; Spenceley, 1997). Impacts of wildlife harassment resulting from viewing and photography include: • *behavioural changes*: avoidance, habituation or attraction to humans resulting from interactions (Knight & Cole, 1995); • *physiological changes*: change in heart rate (Gabrielsen & Smith, 1995), effects on growth rates and abundance (Anderson, 1995); • *species composition and distribution*: changes in species composition, diversity and abundance and interspecific interactions (Gutzwiller, 1995; Knight & Cole, 1995). Displacement due to recreational activity (Klein *et al*. 1995); • *disruption of feeding*: found in birds (Hulbert, 1990), rhinoceros (McCoy, 1995), hunting behaviour in lions (Ceballos-Lascuráin, 1996), wolves and bears (Knight and Cole, 1995); and • *effects on breeding success*: direct destruction (Burger, 1981) or abandonment, and increased predation on bird nests (Burger *et al*. 1995), disruption of reproductive behaviour in antelope (Edington & Edington, 1986) and reptiles (Cott, 1969).

Table 1 (*contd*)

Impacts of the development of highways and trails in natural areas include: • species-specific disturbance caused by roads, buildings and plantations (van der Zande et al. 1980); • barrier effects to carnivores, collisions, increased accessibility to wild areas by poachers (Noss *et al*. 1986); and • vehicles kill and/or maim wildlife during collisions, from which scavengers profit (Mathieson & Wall, 1982).

Impact Assessment (Bagri *et al*., 1998), Strategic Environmental Assessment (Therivel *et al*., 1992), Ecological Impact Assessment (Beanlands & Duinker, 1984) and Cumulative Effects Assessment (Peterson *et al*., 1987). Aspects of these and other tools were incorporated within the research where appropriate to the SUNTAT.

There have been a number of reviews of environmental impacts research (e.g. Knight & Gutzwiller, 1995; Mathieson & Wall, 1982; Speight, 1973). A summary of environmental impact research in Table 1 highlights the dominance of interest in tourism assessments linked to habitats and wildlife, rather than issues regarding air, water, geology and landscape. Given the diversity of environmental issues that may be evaluated, this research focused on environmental factors that were prioritised by regional stakeholders.

Environmental impact research has a number of limitations, which include (Briassoulis, 1991; Mathieson & Wall, 1982; van der Duim & Caalders, 2002; Whittaker & Knight, 1998):

- tourism involves linked activities, making it difficult to distinguish between impacts arising from different activities (including other industries, and natural changes) and therefore to connect cause and effect;
- cumulative, synergistic, indirect and long-term impacts are difficult to identify and assess;
- changes in wildlife behaviour may be species-specific and may not actually be detrimental to their survival; and
- the extent to which ecosystems can recuperate following impacts is poorly understood.

The development of the new assessment toolkit addressed these issues by incorporating a mixture of simple and practical techniques that addressed activities both inside and outside tourism enterprises. Appreciating that ecosystems are complex and poorly understood, tools from process- and performance-based environmental management systems were combined with expert stakeholder opinion and baseline ecological information to provide practical approaches to address aspects of environmental sustainability (Spenceley, 2003a).

Historically, the lack of responsibility shown by tour operators towards environmental and cultural resources in destinations has been attributed to the lack of ownership and control over ground operations (Ashworth & Goodall, 1990), coupled with intense competition between tour operators and low profit margins (Evans & Stabler, 1995). However, evidence suggests that tour operators are increasingly requiring that their ground handlers report on their environ-

Table 2 Consumer attitudes to the environment and sustainable tourism (Spenceley, 2003a)

Issue	*Proportion of sample*	*Source*
Importance of environmentally sensitive policies and practices		
More likely to book hotels with a good environmental attitude	87% British 60% Australians 54% Americans	IHEI study, cited in Anon, 2002 (n = 300 travellers at airports in UK, Australia and US)
It was important that their holiday did not damage destination environments	71%	Stueve *et al*. 2002. (n = 4300 adults in the USA)
Importance that the holiday should not damage the environment	2000 – 85% 2002 – 87%	MORI study for ABTA, cited by Goodwin and Francis, 2003 (n = 963 British public in 2000; n = 713 in 2002)
At least fairly important to deal with a company that took into account environmental issues when arranging holidays and business trips	1995 – 52% 1997 – 61%	MORI, 1995, 1997, cited in Martin & Stubbs, Undated (British Public)
Importance of socially responsible policies and practices		
More likely to book a holiday with a company that had a written code guaranteeing good working conditions, protection of the environment and support of local charities in the tourist destination	1999 – 45% 2001 – 52%	Tearfund, 2001; 2002 (1999: nationally and regionally representative sample of n = 2032 adults in the UK; 2001 n = 927)
Knowing that they had booked with a company with good ethical practice made their holiday enjoyable	24%	Mintel, 2001 (n =2028; UK holiday makers = 1636) July 2001
Importance of the holiday benefiting people in the destination (e.g. through jobs and business opportunities)	2000 – 71% 2002 – 76%	MORI study for ABTA, cited by Goodwin and Francis, 2003 (n = 963 British public in 2000; n = 713 in 2002)
Respect towards the ways of living and the traditions of the local host population was the most important criterion for them when booking a holiday	95%	*Forschungsinstitut für Freizeit und Tourismus* (*FIF*), Müller and Landes, 2000 (German tourists)

Note: The sample size is indicated, where known.

mental performance (e.g. the Association of Independent Tour Operators (AITO)). This is in part due to the growing market demand from consumers for environmentally sensitive holidays (see Table 2).

Although most tourists make purchasing decisions based on price, climate, facilities and quality, it is clear from the Tearfund and Mori surveys (see Table 2)

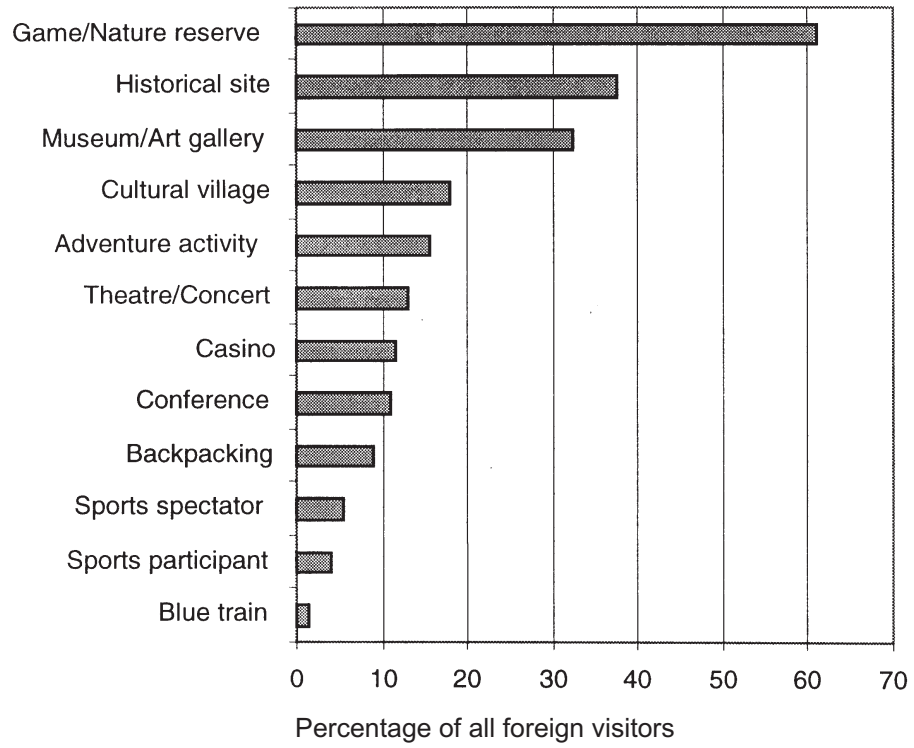

Figure 1 Activities experienced by foreign visitors in South Africa (adapted from DSI, 1999a, 1999b

that the sustainability of their travel experiences are becoming *increasingly* important. Therefore, it is the responsibility of the tourism industry to transparently demonstrate that they are operating responsibly and making progress towards environmental sustainability: an objective that the new SUNTAT may facilitate.

Research addressed within this paper concerned the environmental sustainability of nature-based tourism enterprises in South Africa. South Africa provided the ideal context for the work given the nation's rich biodiversity, its established nature-based tourism industry, and the strong national policy basis for responsible tourism development.

Biodiversity has been acknowledged by the South African Government as one of the mainstays of economic sectors such as tourism, recreation, agriculture, forestry, horticulture and fisheries. In cognisance of this, South Africa ratified the Convention on Biological Diversity in 1995 (DEAT, 2000) within the 1997 National Policy on the Conservation and Sustainable Use of South Africa's Biological Diversity (DEAT, 1997). South Africa has 422 formally protected areas and 160 privately owned reserves covering approximately 6% of the land surface area (DEAT, 1999). There is a major demand for nature-based tourism, and approximately 60% of all foreign visitors experience wildlife in a game or nature reserve during their visit (DEAT, 1996) (see Figure 1).

The South Africa Government aims to manage the nation's tourism industry in the interests of sustainable development in such a way that it contributes to the improvement of the quality of life of all its citizens. The White Paper on the *Development and Promotion of Tourism in South Africa* (DEAT, 1996) proposed that tourism development should be underpinned by responsible environmental practices and should encourage the conservation and sustainable use of tourism resources. Specifically, the White Paper promoted the:

- maintenance and encouragement of natural, economic, social and cultural diversity;
- sustainable use of local resources;
- avoidance of waste and overconsumption;
- assessment of environmental, social and economic impacts of tourism developments; and
- monitoring of tourism impacts with open disclosure of information.

South Africa, like many other countries, has not reported on the progress made by tourism enterprises towards achieving responsible tourism. This has largely been due to the lack of availability of appropriate tools that reliably measure environmental performance. Therefore, this research aimed to address the shortfall by developing and testing a range of performance- and process- based tools that could be used to gauge the environmental sustainability of nature-based tourism. Existing information regarding sustainable tourism development has predominately been produced within developed countries (Tosun, 2001), and therefore this research emphasised that stakeholders from developing countries should be active participants in the process. Consulting southern African experts and stakeholders regarding factors that they considered essential to sustainable nature-based tourism ensured the regional relevance of the new toolkit.

Method

The research process consisted of three key phases: literature review, Delphi consultation and case studies.

Literature review

Objectives of the literature review were to (Spenceley, 2003a):

- elicit the nature and range of factors that had been internationally and regionally identified as pertinent to tourism development;
- identify existing assessment techniques; and
- identify southern African stakeholders who could be invited to participate within the Delphi consultation.

Literature searches were used to identify academic, consultancy and newspaper articles that would allow these objectives to be met. Searches were mainly undertaken through search engines, institutional libraries, databases and websites. By the time that the research process was concluded, the collection had reached over 2100 references (Spenceley, 2003a).

Delphi consultation

A range of consultation techniques may be used to solicit opinions from stakeholders. These include questionnaires, surveys, advertisements, interviews, community liaison, public meetings, community advisory committees, simulation exercises (Wood, 1995), focus groups (Berry & Ladkin, 1997), the Panel Evaluation Method (Stauth *et al.*, 1993), the Delphi technique (Pill, 1971), Rapid Rural Appraisal (Conway & Barbier, 1990), and Participatory Rural Appraisal (Chambers, 1981). The Delphi technique was applied as the primary consultation method within this research, due to its capacity to address the primary objectives of the consultation phase in a cost-efficient and practical manner.

The objectives of the Delphi consultation were to (Spenceley, 2003a):

- identify factors relevant to the development of sustainable tourism that had not been previously described in the literature;
- list factors from the literature review that were linked with sustainable tourism;
- determine the relative importance of these factors in generating sustainable nature-based tourism, as rated by southern African stakeholders; and
- evaluate the degree of consensus on the relative importance of sustainability factors among the regional consultees.

The Delphi technique was developed as a tool for technological forecasting by the RAND Corporation (Dalkey & Helmer, 1963). It is an accepted method of gathering information on issues that are not easily quantifiable, and provides a rapid, effective way of collecting expert opinion and gaining consensus from a group of knowledgeable people on various unknown factors or complex problems (Green *et al.*, 1990; Linstone & Turoff, 1975; Pill, 1971). Green *et al.* (1990) state that three rounds are sufficient to achieve group consensus in Delphi consultations against declining response rates, which was the approach used in this research. An overview of the Delphi consultation process is depicted in Figure 2.

The Delphi consultation was initiated with an anonymous survey of selected individuals who possessed relevant skills. Wheeller *et al.* (1990) highlight the need for a 'balanced' panel when applying the Delphi technique, and note that there must be an element of judgement in achieving such a panel across a spread of experts from different backgrounds (e.g. academics, business representatives and local residents). The choice of consultation panel members here was designed to represent a range of conflicting interests from divergent groups that were relevant to sustainable nature-based tourism. Seventy-five individuals were selected to form the panel in the first round. This scoping round was undertaken to determine factors that southern African stakeholders considered were crucial in achieving sustainable nature-based tourism, and which were unlikely to be reflected in the academic literature (Spenceley, 2003a).

During the second round a larger panel was invited to participate in order to increase the reliability and validity of the process, and to engage with more representatives from different institutions across southern Africa. In the second round, 518 individuals were asked to rate the importance of factors identified during the literature review and the scoping round. A Likert-scale rating system (Likert, 1967) was used by panel members to rate the relative importance of

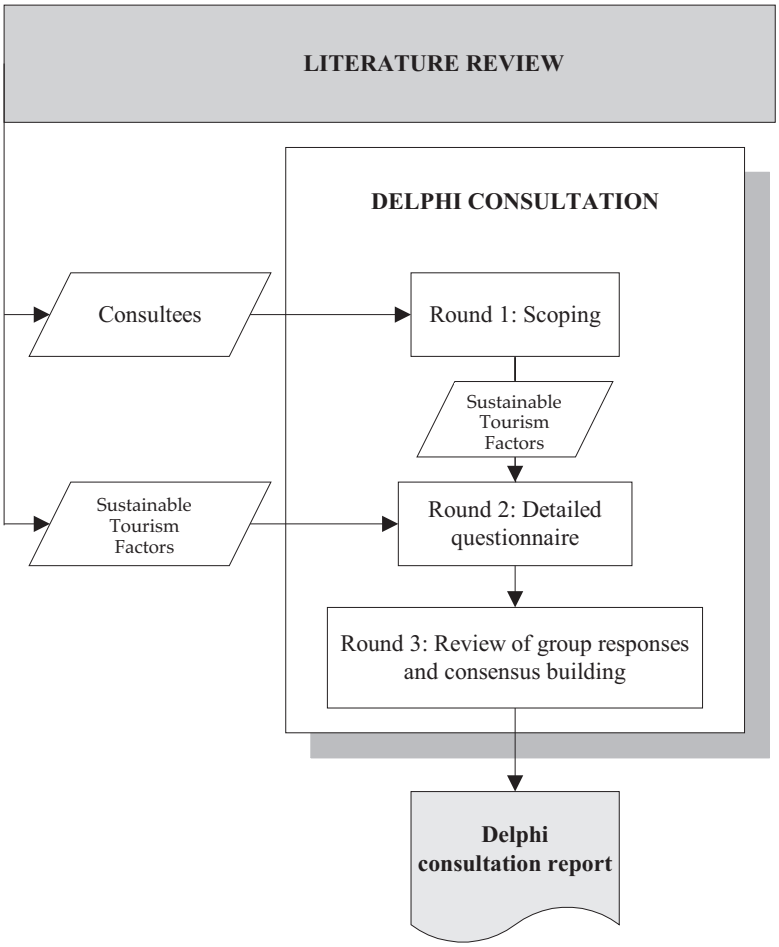

Figure 2 The Delphi consultation process (Spenceley, 2003a)

various factors as either 'essential', 'desirable', 'irrelevant', 'undesirable', or 'incompatible' with sustainable nature-based tourism (Spenceley, 2003a).

Ratings made by respondents during the second round were combined and circulated to panel members. The participants were asked if they wished to revise their ratings in light of the group's responses during the third round. Chi-square analysis was then used to evaluate the statistical significance of agreement on different factors. Here it was assumed that consensus had been achieved when the level of agreement on the mode was at least statistically significant (i.e. $p < 0.05$) (Spenceley, 2003a). This approach differed from previous Delphi consultations, which have predominantly used mean or median scores coupled with standard deviations to reflect concurrence on ratings and the degree of convergence (e.g. Kaynak & Macauley, 1984; Miller, 2001; Seely *et al.*, 1980). Consequently, factors that were rated as 'essential' or 'incompatible' with sustainable nature-based tourism with a statistically significant degree of agreement were included within the assessment toolkit (Spenceley, 2003a).

Table 3 Environmental factors identified as 'essential' or 'incompatible' with sustainable nature-based tourism in transfrontier conservation areas (TFCA) (Spenceley, 2003a)

Essential factors
• Mechanisms to finance integrated management schemes that are agreed by TFCA nations
• Effective, appropriate and simple management procedures
• A multidisciplinary approach to TFCA management
• Long-term management objectives
• Management processes that can adapt to avoid or mitigate negative impacts
• Monitoring of the impacts of policy, planning and implementation on the TFCA
• Management that incorporates ecological and conservation principles
• Monitoring that is strategically and scientifically planned
• Feedback of monitoring results into the planning and policy process
• Adaptive management strategies to cope with unpredictable ecosystems
• Management programmes designed to enhance the long-term conservation of natural resources in the TFCA
• Sustainable levels of natural resource use within the TFCA
• Strategic, integrated poaching control within the TFCA
• Control of invasive species in the TFCA
• A balance between the need for conservation and the economic need for tourism development
• Environmental mitigation plans designed to deal with negative environmental impacts from tourist developments
• Tourist resorts that discourage sales of rare natural products (e.g. animals, plants, and their products)
• A transparent and accountable hunting system
• Regulation and policing of a licensed hunting system
• Remediation of contaminated watercourses and water bodies polluted by tourism
• That organic waste disposal does not exceed the assimilative capacity of natural sinks
• Integrated multilateral TFCA management design and implementation
• Strategic adaptive management processes
• Conservation management plans with standardised, measurable conservation objectives
• Monitoring of waste water quality by tourism developments
• Key champions that oversee development, coordination and implementation of management plans
• Monitoring and auditing mechanisms that are integrated between TFCA countries
• A landscape management approach

Table 3 (*contd*)

Incompatible factors
• Use of non-renewable resources that exceeds the rate at which replacement resources can be created
• That renewable resources are used at a rate higher than their regeneration rates
• The use of invasive plant species in tourist resort landscaping schemes
• Irrigation (or filling in) of wetland areas to develop resorts on dry land
• Vandalism in the TFCA
• Reduction in plant species diversity and composition due to tourism disturbance
• Disappearance of fragile species due to tourism disturbance
• Negative impacts on plant germination, establishment and growth due to tourism disturbance
• Fire caused by tourists
• Changes in wildlife species composition due to disturbance by tourists
• Changes in diversity of wildlife species in tourist areas
• Decreased survivorship of young due to disturbance or destruction by tourism
• Selling more hunting quotas than is appropriate for the population size and regeneration rate of wildlife
• Poaching wildlife for trophies
• Harmful impacts of waste disposal on the environment
• Damage to natural landmarks or heritage sites by tourists or developers
• Changes in community structures of wildlife due to tourism disturbance
• Consumption that exceeds the recharge rate of reservoirs and aquifers from rainfall
• Stocking of non-indigenous species in the TFCA

During the Delphi consultation over 500 individuals, representing nearly 350 organisations within nine southern African countries, were invited to participate, and 197 of the invitees chose to contribute to the study (Spenceley, 2003a). Of the 183 policy, planning, economic, environmental, social and cultural factors that consultees agreed were critical to the sustainable development of nature-based tourism from the Delphi consultation, 47 were related to environmental issues (25.7%) (Spenceley, 2003a) (see Table 3). Further details of the Delphi consultation process results may be found elsewhere (Spenceley, 2000), but the core focus of this paper is to report the environmental findings of the case studies.

Case studies

Case studies are described as strategies of undertaking research that involve empirical investigations of certain contemporary phenomena within their real-life contexts, through the use of multiple sources of evidence (Robson, 1993). Four study sites were selected from a large population of terrestrial nature-based tourism operations based in and around Kruger National Park (KNP) (see Figure

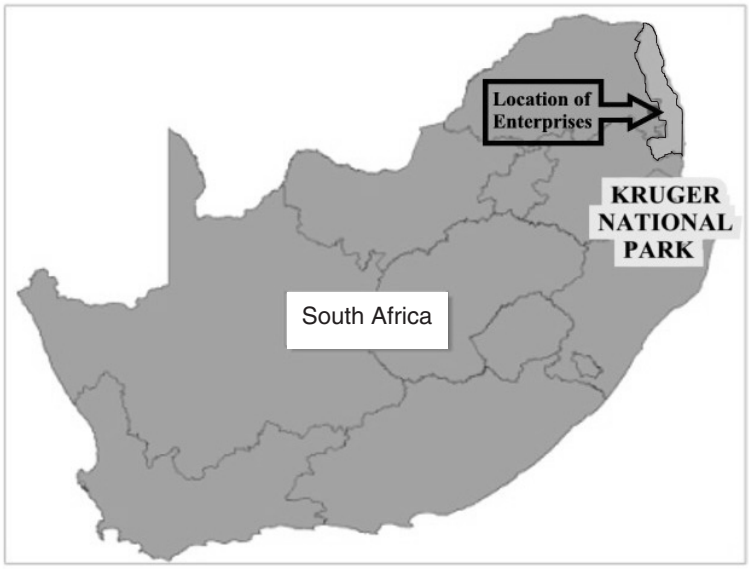

Figure 3 Location map

3). All four enterprises operated photographic safari tourism as their core business, and did so within lowveld savannah habitats where fauna such as elephant, rhino, buffalo, lion and leopard could be found. In all four cases, the enterprises were located within a protected area and had a rural community as an immediate neighbour on one border. Land on other borders of the enterprises was also protected, and either privately or publicly owned. The enterprises of Ngala, Pretoriuskop, Jackalberry and Sabi Sabi were selected for study in order to exhibit differences on a range of independent variables within the toolkit. As Table 4 indicates, the enterprises varied with respect to their land context, ownership, traversing area, land tenure, traversing rights, capacity, price range and the type of interactions with local people. These variations allowed the reliability of the toolkit to be tested under different conditions.

The case studies took place between 23 July 2000 and 4 May 2001. On-site planning of the assessments took place with the enterprise managers, and included familiarisation with the enterprise structure, their staff and contractors, local stakeholders and documentation that was available for review.

Techniques used during the case studies

The 47 environmental factors prioritised during the Delphi consultation were combined within a draft assessment toolkit, and the case studies were used as mechanisms to test the practicality of their evaluation. A variety of simple tools were used to assess the environmental factors at the enterprises, which included literature review, observation and stakeholder interviews (Spenceley, 2003a). Linkages were formed with tools from complementary research programmes to improve the validity of the research. The main sources of associated research lay in the fields of pro-poor tourism (Ashley *et al.*, 2001; Poultney & Spenceley, 2001),

Table 4 Variation of independent variables between enterprises (Spenceley, 2003a)

Ngala	*Pretoriuskop*	*Jackalberry*	*Sabi Sabi*
Land context			
In the Timbavati Private Nature Reserve (PNR) unfenced from Kruger National Park (KNP)	A camp in KNP	In the Thornybush Game Reserve close to KNP	In the Sabi Sands Wildtuin, unfenced from KNP
Conservation status			
National Park	National Park	PNR	PNR
Area land			
~147 km^2 within ~789 km^2 PNR	~620 km^2 for region within ~20,000 km^2 park	~43 km^2 within ~24 km^2 PNR	~32 km^2 within ~750 km^2 PNR
Land ownership			
Privately owned land	Government owned land	Privately owned land	Privately owned land
Land tenure			
Land leased from private owner by management company	Land owned by public management company	Land owned by private management company	Land owned by private management company
Infrastructure ownership			
Privately owned	Publicly owned	Privately owned	Privately owned
Number of other operations managed by same organisation			
22 lodges in six African countries	18 national parks in South Africa. In KNP: 13 rest camps (plus 6 bushveld and 5 private camps)	None	None
Capacity			
1 camp with 21 rooms (42 beds)	1 camp with 136 units (352 beds) and 40 camp sites	1 camp with 5 rooms (10 beds)	3 camps with 46 rooms (92 beds)
Price range (approximate figures given where converted from Rands)			
US$340 to $475 p/p per night. Price includes meals, game drives, game walks	~US$7 to ~$245 per site/room/guest house. Accommodation only	~US$170 to ~$205 p/p sharing. Price includes meals, game drives, game walks	~US$410 to ~$1050 p/p sharing. Price includes meals, game drives, game walks
Closest rural community			
Welverdiend	Numbi	Timbavati	Huntingdon

sustainable livelihoods (Spenceley, 2003b), responsible tourism (Spenceley *et al.*, 2004; DEAT, 2002), and Fair Trade in Tourism.

Literature review

Documentation reviewed during the four assessments varied in relation to the availability of environmental information. Literature included land management policies; enterprise- and conservancy-level environmental management plans; environmental management reports; habitat and wildlife distribution maps; staff training materials; codes of conduct and social development reports (Spenceley, 2003a).

Observation

Direct observation was used for the assessment of a number of factors, including habitat and access management, erosion, and behavioural adaptation by certain species of wildlife. This form of data collection was generally subjective, but was used to confirm information provided within documentation or anecdotally from expert stakeholders (Spenceley, 2003a).

Stakeholder interviews

Semi-structured interviews were undertaken with managers and heads of departments within the enterprises regarding environmental sustainability issues. Semi-structured interviews fall between a fully structured, quantitative approach and an unstructured qualitative approach (May, 1993). The assessment toolkit provided a structured guide to interviews, and the information provided by external environmental and ecological experts was used as data (Spenceley, 2003a).

In 1999, the Seventh Commission on Sustainable Development called upon the tourism industry to, ' . . . promote sustainable tourism development in order to increase the benefits from the tourism resources for the population . . . and maintain the . . . environmental integrity of the host community' (CSD, 1999). This emphasis highlighted the importance of determining whether the environmental integrity of the local area was indeed maintained in light of neighbouring nature-based tourism.

Field assistants from each of the four local communities were trained and paid to carry out structured interviews with members of their village regarding environmental issues, in order to:

- ensure that interviews were carried out in local languages with culturally specific phrases;
- avoid problems with low literacy levels;
- maximise the number of community interviews that could be undertaken during the study period; and
- avoid culturally specific investigator bias (Myrdal, 1973).

Structured questionnaires were written in English and were developed to ensure that the questions were simply and carefully phrased with uniformly accepted meanings; were not ambiguous; were not leading (Hay, 2000); avoided dual-meaning statements (Wilkinson, 2000); and were necessary to include within the assessment (e.g. the questionnaires were no longer than they had to be). Training of the field assistants addressed interview techniques that promoted

Table 5 Community members interviewed (Spenceley, 2003a)

Welverdiend	***Numbi***	***Timbavati***	***Huntingdon***
Population			
7000 (1996 census)	4130 (1996 census)	11,240 (1999 census)	6507 (1999 census)
No. interviewees (and proportion of the community surveyed)			
168 (2.4%)	226 (5.5%)	314 (2.8%)	350 (5.4%)
Numbers of men and women interviewed			
78 men, 90 women	119 men, 147 women	158 men, 156 women	164 men, 186 women
Ages			
19–90 years Average 44 years	18–90 years Average 40 years	18–85 years Average 44 years	18–80 years Average 40 years
Levels of employment			
18% sample employed, 63% of those employed with salary <R1000 p/m	23% sample employed, 78% of those employed with salary <R1000 p/m	36% sample employed, 77% of those employed with salary <R1000 p/m	12% sample employed, 35% of those employed with salary <R1000 p/m
Forms of employment within the sample			
Teaching, retail, transportation, security, housekeeping, and maintenance	Teaching, management, catering, craft, construction, maintenance, and agriculture	Retail, construction, teaching, medicine, security, transportation, and agriculture	Tourism, teaching, construction, and agriculture

the collection of standardised and unbiased data, sampling techniques and confidentiality. All interviewees participated anonymously and their names were not recorded. The sample sizes of community members during each case study are outlined in Table 5.

Between 2.4% and 5.5% of the local community populations participated in the surveys, with roughly equal numbers of men and women represented.

Results

The results presented here focus on information obtained at the case study sites regarding environmental issues. These data are drawn from a selection of the 47 environmental factors that the Delphi consultees concurred were essential to, or incompatible with, sustainable nature-based tourism. Due to space constraints, only the most important environmental results with the most critical implications for sustainability are described, while the economic and social results will be reported elsewhere.

The factors are described here in relation to three levels:

- *the context*: regarding the wider environment; overarching policies and frameworks; management practices by neighbouring landowners; collaboration and conflicts; and environmental costs and benefits to local communities;
- *the land*: in relation to the protected area that the enterprise operated within, and details from management plans; management of water, flora and fauna; infrastructure maintenance; and commercial activities; and
- *the enterprise*: with regard to operational resource use and waste disposal.

While reviewing the results it may be useful to refer back to Table 4 for context.

Environmental context

Factors considered in relation to the environmental context of the enterprises *within* their private nature reserves (PNRs) were:

- overarching policies and plans, including those relating to land management, development, and tourism; and
- cooperation, conflicts and control of activities within the protected area.

Overarching policies and environmental management

Each of the enterprises based within PNRs were signatories to voluntary constitutions that promoted the conservation of flora and fauna. These agreements were needed because the majority of properties within the PNRs were unfenced from one another, and therefore wildlife could move freely between them. The parastatal South African National Parks (SANParks) managed the land that two of the enterprises were based on, while the others managed their land privately. The land around Ngala and Pretoriuskop was managed in line with a detailed masterplan for KNP, which specified fire, water, elephant, recreational zoning, and neighbouring community programmes. The location of Ngala meant that under the constitution of the Timbavati PNR, consumptive wildlife management activities took place on neighbouring properties. The PNRs that Jackalberry and Sabi Sabi lay within had more fragmented environmental management plans. Both the Thornybush Game Reserve (GR) and the Sabi Sands Wildtuin actively managed wildlife populations over the entire reserves, and set hunting quotas based on annual aerial surveys (although neither enterprise hunted itself). The habitat management planning in the Thornybush GR was divided into two sections in relation to the two land management companies contracted by different landowners. There was cooperation between the management parties and an increasing tendency to create consistency between management efforts. However, the Sabi Sands Wildtuin had no strategic environmental management plan and fragmented management practices took place across the PNR. Essentially, each landowner within the Sabi Sands Wildtuin independently employed their own land managers in order to prioritise the management of their land. The majority of landowners focused on maximising the game viewing potential on their own property, rather than strategically by improving the conservation value of the whole reserve. The constitutions of the PNRs provided different limits on density of commercial beds that could be operated by landowners in the PNRs, and in some cases the number of vehicles (see Table 6).

Table 6 Enterprise land and tourism context (Spenceley, 2003a)

Ngala	*Pretoriuskop*	*Jackalberry*	*Sabi Sabi*
Tourism development limits			
Limits on bed density (15 beds per 856 ha) and vehicle density (2 per 856 ha)	Visitors limited by gate day-visitor limits and accommodation capacity at camps	Limit on bed density (15 beds per 1000 ha)	Limit on commercial bed density (1 bed per 150 ha)

Cooperation and conflicts

Cooperation between PNR members consistently took place through formal meetings and committees. Democratic processes, with different systems of determining majority votes, were used to govern PNR issues – such as selecting individual animals for off-take during hunting operations. The PNR constitutions contained provisions for dealing with members who infringed their obligations. Financial penalties could be imposed on members, in addition to the last resort of fencing landowners out of the PNR (e.g. for gross misconduct). Monitoring landowner activities within PNRs was undertaken by members policing one another and also by the PNR wardens.

Factors that were considered in relation to the land and tourism management context *outside* the protected area with members of rural communities were:

- natural resource use;
- human–wildlife conflict;
- environmental education; and
- perceptions of wildlife.

Natural resource use

There were a number of reports from neighbouring community members interviewed that they had been able to access natural resources prior to the creation of the four protected areas. The vast majority of community members (between 61% and 97% of the samples) reported that they could currently access some natural resources within the four protected areas. To different extents the enterprises provided bush-cleared wood, thatch and grass to local community members. There were formal mechanisms that allowed people from the Numbi community to obtain a proportion of the natural resources and revenue generated from annual harvests of thatching material from their land within KNP. Although they also wished to access river water, SANParks was concerned about the potential for disease transmission between wildlife and domestic animals. SANParks therefore arranged pumping and piping systems to divert water from the river into the community (although this infrastructure was subsequently destroyed by vandals).

Subsistence poaching occurred within all four protected areas at low levels, and presumably this allowed some members of the communities to benefit by obtaining meat from wildlife. The poachers used snares and dogs to hunt wildlife, and in the case of Pretoriuskop the most common form of poaching

encountered was, in fact, fishing! Anti-poaching patrols were operated around all four enterprises – either organised by the PNR or the landowner concerned. Wildlife managers used informers within neighbouring communities, and informal communication forums with local tribal authorities, in attempts to control the problems. Poaching of trophy species (e.g. elephant for their tusks; rhinos for their horns) was rare in all four cases, although isolated incidences were reported. Pretoriuskop maintained the most detailed reports of poaching incursions, including the number of alleged poachers caught and their punishment if they were found guilty in a court of law. Only in the case of Jackalberry had antipoaching staff initiated active attempts to create a mutually beneficial relationship with neighbouring tribal groups, and to develop incentives for community policing.

Human–wildlife conflict

Between 31% and 56% of neighbouring community members interviewed reported problems with wildlife from the protected areas. Problems included elephants and baboons raiding their crops; lion and hyena killing livestock; and disease transferred between wildlife and livestock (e.g. *Theileriosis*). There were also isolated incidents reported where lion and leopard had attacked and killed people. Interviewees indicated that the conflict did not appear to take place on a daily basis, but that there were more frequent incidents of crop-raiding around harvest times – obviously the most critical times for the poor people inhabiting these communities. There was overwhelming agreement that there was no compensation for damage to property or person inflicted by wildlife. Only a handful of people reported that they had obtained money or meat as compensation.

Incidents of human–wildlife conflict are rarely compensated in South Africa, because the law states that the *land that it is situated on* dictates the ownership of wildlife. Therefore, wildlife *leaving* a park or reserve is no longer owned nor the responsibility of that park or reserve. This means that landowners who 'lose' dangerous game, which then damage property in neighbouring communities, are not legally obliged to compensate people for those damages. It should also be noted that wildlife not only emanated from the enterprise properties studied, but also from other nearby protected areas. This created some confusion over the source of wildlife causing damage to local property, and was particularly true in the case of Welverdiend (which bordered two other protected areas in addition to Ngala).

Environmental education

Both the private- and public-sector enterprises engaged with local community members to provide environmental education. Ngala channelled donations from tourists and philanthropic institutions to provide academic bursaries, conservation lessons, environmental debates, and educational weekend trips to the reserve. In collaboration with the other landowners in the Thornybush GR, Jackalberry funded conservation education for local children at a nearby environmental centre, while Sabi Sabi supported the rehabilitation of existing infrastructure to create a community environmental education centre and library, using both donations and its own funds. The extent of enterprise assistance depended upon the financial and human resource capacities of the

Table 7 Benefits and costs of wildlife (Spenceley, 2003a)

Welverdiend	*Numbi*	*Timbavati*	*Huntingdon*
Are the benefits of tourism enough to make up for problems with wildlife?			
No – 63%	No – 74%	No – 49%	No – 80%
Are the benefits sufficient to encourage conservation of wildlife or the Protected Area?			
Not asked	No – 81%	No – 55%	No – 17.1%
What would be required to encourage conservation of wildlife and the Protected Area?			
Benefits shared with communities (21%) Resources/money (13%) Development projects (11%) Employment (3%)	Employment (33%) Money (32%) More tourists in the area (4%)	Compensation (9%) Meetings and discussion (9%) More protection (7%) Better opportunities (6%) Environmental education (3%)	Compensation and money (62%) Employment (3%) A committee to deal with problems (3%)

enterprises, and their access to donations and support from other organisations and individuals. Through the extended human resources capacity of KNP, members of Numbi benefited from a variety of environmental education programmes. These provided woodcarvers with ecological information regarding the use of alien tree species for materials; assisted traditional healers with seedlings and the establishment of a cultural centre; and provided courses, workshops, projects and educational trips. Pretoriuskop itself has not promoted these activities, but instead the Social Ecology department within KNP has driven them independently.

Perceptions of wildlife

When asked about the net benefits and costs of living in proximity to wildlife, the majority of local community members interviewed stated that the benefits were not sufficient to offset their costs. Interviewees also made it clear that the benefits were not sufficient to encourage conservation of wildlife or the protected area in question. The majority of the benefits that were desired by the community members were socioeconomic rather than environmental. They desired employment, money, compensation for damages, more tourists and improved communication with protected area stakeholders (see Table 7).

Land management

A series of factors were assessed in relation to the environmental management activities and impacts of the tourism enterprises on their properties. The factors considered were:

- habitat management;
- wildlife management;

- roads and access; and
- control of commercial activities.

Habitat management

There was a stark difference between the habitat management activities undertaken by the public and private sector. In the case of the public-sector land around Pretoriuskop, a 'natural' regime was encouraged in relation to bush clearing and fire management – although in the past both of these tools had been used extensively throughout the park in an almost trial-and-error experimental approach. Experience, and also the geographical scale of KNP, meant that a low level of active management was perceived as viable for biodiversity conservation. In contrast, the three private-sector enterprises undertook more intensive habitat management (although Ngala to a lesser extent). Aerial photographs from the 1940s and 1970s were used by the three private-sector enterprises to indicate the extent of encroachment on grasslands by woody vegetation. Land managers believed that historically unsustainable livestock numbers, before the predominant land use had changed to wildlife, had caused the encroachment. In all cases, regimes of fire management and bush clearing took place, in addition to mowing of some areas around Sabi Sabi. In each case maps were maintained to indicate where and when activities had taken place. Fires caused naturally (e.g. by lightning strikes) were allowed to run their course on the land around Ngala and Pretoriuskop, while human-ignited fires were fought.

All four of the protected areas provided artificial sources of water for wildlife, by pumping groundwater into pans and by constructing dams. Although this practice was motivated to encourage increases in wildlife populations within a semi-arid region, research in KNP had revealed that this strategy had led to declines in sensitive species such as tsessebe, roan, sable and Lichenstein's hartebeest, with associated increases in wildebeest, zebra, elephant and buffalo populations. Therefore, the 1997 water management plan for the park recommended decommissioning some artificial water sites, while retaining others along tourist roads for game viewing purposes. Water management within the three private enterprises, however, continued to provide artificial water *despite* the land manager's appreciation of the negative ecological implications this caused for species diversity. None of the enterprises had access to information regarding groundwater aquifers that they pumped from to their artificial pans, nor did they monitor volumes pumped. In addition, none employed strategies to rotate water resources in order to encourage the movement of game between different areas (and so reduce localised impacts). The financial pressure to create good game viewing opportunities for guests appeared to be greater within the private-sector enterprises than the public sector.

Wildlife management

All four enterprises actively promoted the conservation of wildlife on their land and chose not to stock their properties with domestic livestock. The Thornybush GR had translocated the majority of wildlife onto the reserve over the previous decade, at major financial cost. All three PNRs set hunting quotas annually for various species on the reserve, but Ngala and Sabi Sabi had chosen not to use their quotas. The hunting quotas were set in relation to annual aerial

wildlife counts and revenues generated from hunting in the Timbavati PNR were used finance maintenance on the reserve. Culling of elephant had taken place historically in KNP, but local and international public pressure had stopped the activity. Instead, live translocations of species, including elephant and rhino, took place to stock other protected areas and to reduce local populations. Trophy hunting at Jackalberry was effectively arranged to cull over-populated species and to generate revenue. In all four cases, limited culls of impala (a small, prolific antelope) were permitted in order to provide staff with rations.

Breeding rare wildlife species took place at Pretoriuskop for tsessebe and Lichtenstein's hartebeest, while on the Sabi Sands sable were bred, and reintroductions of locally endangered and extinct species took place. In the case of Pretoriuskop, tourists colliding with wildlife as they drove carelessly on the park's tar roads caused some wildlife mortality. Despite KNP staff's use of speed traps and imposing fines, wildlife deaths still occurred.

Changes in wildlife behaviour were observed across all three protected areas. In addition to the habituation of wildlife to vehicles – which facilitates game viewing – primates consistently caused problems raiding waste food from bins, damaging thatched roofs and vehicles. Even spotted hyena and honey badgers were observed accessing food in bins and fridges. Management strategies to deal with problematic primates involved both the translocation of individual animals, and in serious cases euthanasia. In the case of Pretoriuskop, behavioural change was also observed in amphibians that were observed breeding prolifically in the chlorinated swimming pool rather than in natural wetlands!

Roads and access

All four enterprises maintained roads on their properties in order to facilitate access to different areas during the operation of game drives. The density of game viewing roads varied from ~0.5 km per km^2 around Pretoriuskop to ~6.9 km per km^2 around Sabi Sabi. The extent to which the roads were managed varied in relation to the level of financing and control that enterprises had over the management. In the case of Ngala, considerable levels of sheet and gully erosion had allegedly been caused by limited and poorly timed road maintenance. Due to contractual omissions, lease fees paid by Ngala to the landowner for use of the reserve were not used to finance land management activities undertaken by SANParks. These contractual oversights between the landowner and KNP not only affected the ecological quality of the land, but also had implications for the quality of experience for guests and the cost of maintaining vehicles.

Historically poorly placed roads on Jackalberry and Sabi Sabi's land had led to the need for extensive civil engineering to stabilise and rehabilitate eroded areas. Some roads were closed, rerouted and rehabilitated in cases where they had crossed seeplines or sodic areas. In all four cases, gravel and sand were taken from quarries and rivers within the protected areas to provide substrate for road maintenance.

Control of commercial activities

Predominantly, the commercial activities operated at the enterprises for tourists were non-consumptive photographic game drives, with optional bush walks

and bush barbeques. In the case of Pretoriuskop, self-drive visitors mostly undertook the tours themselves, although escorted safari drives with trained guides were available at extra cost. The three private-sector enterprises operated guided safari tours and visitors were not permitted to take unescorted tours of the reserves. The types of activities undertaken within these areas of high biodiversity, and the potential danger of working with African wildlife, had led to the development of various codes, rules and guidelines for staff and tourists at the enterprises.

The guides at Ngala and Sabi Sabi undertook intensive in-house training with probationary periods before they were permitted to escort tourists on game drives or walks. During these periods they learned about safety for both people and wildlife at sightings, and how to minimise their impacts on the environment. Jackalberry's guides had at least to hold the minimum nationally recognised qualification before they could undertake game drives. At all three private enterprises, guides received codes of conduct and rules that they had to adhere to. Off-road driving was permitted in these cases for the purpose of viewing specific charismatic species of wildlife (e.g. lion and leopard) within certain environmental parameters. For example, driving off-road in wet conditions or over sensitive soils was not permitted, and serious penalties were enforced upon those who did not adhere to the rules. At Pretoriuskop, no off-road driving was permitted by self-drive tourists or staff, and both were required to abide by park rules that were publicly displayed. Guides monitored one another's behaviour in the PNRs, while volunteers and park staff reported any infringements of park rules around Pretoriuskop. At Pretoriuskop, guides were trained to the highest national standard before they were permitted to undertake bush walks, although students training for national conservation diplomas could escort guests on less dangerous game drives. Visual environmental interpretation material was available for tourists at Pretoriuskop and Sabi Sabi, with information regarding local wildlife, management and research activities.

Environmental management within the enterprise

Although Ngala and Sabi Sabi were in the process of developing internal Environmental Management Systems, neither Pretoriuskop nor Jackalberry had addressed the environmental performance of their hospitality establishment in a systematic way. The following activities were assessed at the four enterprises:

- energy use;
- water consumption;
- waste disposal (wet and solid); and
- purchasing activities.

Energy use

Three of the enterprises used electricity from the national grid to supply the majority of their energy needs. The electricity used was generated at coal-burning power stations, and therefore its use had associated environmental costs. The amount of electricity used and the associated pollutants created were calculated for each enterprise and related to the number of commercial bed/nights (see Table 8). This indicated that Pretoriuskop and Sabi Sabi consumed

Table 8 Enterprise resource consumption estimates (Spenceley, 2003a)

Ngala	*Pretoriuskop*	*Jackalberry*	*Sabi Sabi*
Energy consumption estimates			
Diesel generator used 255–292 kilo litres diesel p/a or ~16–19 litres per bed/night	~2118 MWh grid electricity p/a or 17 kWh per bed/night	~370 MWh grid electricity p/a or 101 kWh per bed/night	~561 MWh grid electricity p/a or 16.7 kWh per bed/night
	Associated annual pollutant creation of ~1800 tonnes CO_2, 17 tonnes SO_2, and 17.5 tonnes NO_x.	Associated annual pollutant creation of ~330 tonnes CO_2, 3 tonnes SO_2, and 1.4 tonnes NO_x	Associated annual pollutant creation of ~477 tonnes CO_2, 4.4 tonnes SO_2, and 2 tonnes NO_x.
Water consumption estimates			
~ 31,280 m^3 p/a or 2.0 m^3 per bed/night	~ 44,640 m^3 p/a or 0.4 m^3 per bed/night	~ 4380 m^3 p/a or 1.2 m^3 per bed/night	~ 54,000 m^3 p/a or 1.6 m^3 per bed/night
Of 83.3 million m^3 falling on the reserve p/a, this equated to ~0.04% of available water.	Of 447.6 million m^3 falling on region p/a, this equated to 0.008% of available water.	Of 28.4 million m^3 falling on reserve p/a, this equated to ~0.02% of available water.	Of 20.8 million m^3 falling on reserve p/a, this equated to ~0.03% of available water.

roughly the same amounts of electricity in relation to the number of commercial bed/nights, while Jackalberry had more than five times their comparative consumption. In addition to electricity, the enterprises also used diesel and petrol for vehicles, paraffin for lighting, gas and charcoal for cooking, and wood for ambient fires. Pretoriuskop, Jackalberry and Sabi Sabi used solar power to electrify their fences. At Ngala, solar power had been discarded as an option for major power supply, due to the amount of power required to operate the camp. Ngala used a diesel generator for power, but at the time of assessment proposals had been made to connect the camp to the national electricity grid instead.

There was limited use of natural light in the architecture at the enterprises. All four establishments used a mixture of incandescent light bulbs ranging from 60W to 150W, and one of the lodges at Sabi Sabi was supplied with low-energy bulbs throughout. Office areas were generally lit by lower-wattage fluorescent strip lighting, and there were isolated occurrences of low-energy bulbs at Ngala, Pretoriuskop and Jackalberry. Two enterprises noted that although they had attempted to use low-energy bulbs, their fluctuating power supplies caused the expensive bulbs to fail relatively quickly. One of the enterprises left the lights in guest accommodation on constantly for aesthetic reasons, even when guests were not there.

The climate, and the demands of their international guests, meant that all four enterprises had installed air conditioning units in the guest rooms. In some cases air conditioning was left on constantly, and some air conditioning units were poorly maintained, which needlessly increased their energy consumption.

Laundry took place on-site at Ngala, Pretoriuskop and Jackalberry, while Sabi Sabi outsourced this service to a local sub-contractor. The private sector enterprises changed linen daily and would wash towels between once and four times a day. Although the management of one enterprise stipulated that its policy was to change linen every two days, when dirty, or when new guests arrived, housekeeping staff actually changed all linen daily regardless. Active use of energy-expensive washing machines, tumble dryers and isolated use of washing lines for 'free' drying were observed during the assessments. Pretoriuskop made communal laundry equipment available to self-drive tourists, and enterprise staff changed accommodation linen every other day, or when new guests arrived. Hot water geysers at the enterprises were set at between 50°C and 60°C throughout the enterprises, and in general each guest room had its own geyser. Energy was used to pump water from groundwater through boreholes at Ngala and Sabi Sabi, and was extracted from rivers in the cases of Pretoriuskop and Sabi Sabi. Pretoriuskop needed to pump its water from a river over 37 km away, which required a great deal of energy.

Pretoriuskop sold petrol, diesel, wood and charcoal to self-drive tourists. Wood for ambient fires was predominately sourced from bush-clearing operations, flood damage and alien species. However, Ngala collected indigenous dead wood from the reserve on a regular basis to stock fires. All four enterprises used rechargeable batteries in radios used by staff.

None of the enterprises evaluated the number of 'air miles' used by guests to reach the tourist enterprise, nor did they try to offset the associated carbon dioxide emissions through carbon-neutral schemes.

Water consumption

None of the enterprises practised any form of water conservation, either through limiting use, setting guidelines or targets to reduce consumption, or practising environmental awareness for staff and guests. This was especially interesting given the high water-pumping costs incurred by Pretoriuskop to obtain water from a river 37 km away.

In general, the enterprises had installed nine-litre toilet cisterns, which were sometimes set to lower flush volumes (e.g. six litres in the case of Jackalberry), but no dual-flush systems were observed. None of the taps or showerheads at the enterprises had low-flow water-saving attachments. Two of the enterprises noted that the high levels of calcium carbonate in the water led to serious 'furring' of pipes and water-saving devices, and that they were therefore impractical to use. All rooms at Ngala and Sabi Sabi had baths in guest rooms, while they were fitted in only isolated suites at Pretoriuskop and Jackalberry.

Communal swimming pools were installed at all four enterprises, and one of the lodges at Sabi Sabi provided each guest room with an individual pool. All pools were chlorinated, save one saline pool at Jackalberry, and none used covers for pools to reduce evaporation when they were not in use.

The lawns and plants in landscaping schemes around the enterprises were watered regularly. The best water-saving system for irrigation was found at Jackalberry, where sprinklers were used for two hours in the late afternoon (to minimise evaporation) on six cycles of 15 minutes (to improve infiltration).

Sabi Sabi only permitted lawns to be watered once a week, and all enterprises promoted the use of native, low-water consumption species in their plantings.

Only Pretoriuskop formally monitored the volumes of water it pumped from its source. Although water meters were installed on some of the boreholes at one of the enterprises, not all were functioning. Meter readings had been taken for a period of time when a couple of enthusiastic staff members had promoted monitoring, but this activity had ceased once the individuals left the enterprise. The quality of water used for human consumption was tested at all of the enterprises on a monthly basis. The volumes of water use by the enterprises were estimated and equated to the amount of precipitation on the enterprise property and the number of commercial beds as benchmarks (see Table 8). The public-sector enterprise had the lowest estimated consumption per bed night, while it appeared that Ngala had the highest relative level of use.

Solid waste

All four enterprises operated recycling schemes and separated their waste glass, steel and tin. Considerable investment had been made in the cases of Ngala and Sabi Sabi to set up recycling centres that were wildlife proof. Recyclables were either taken to a central recycling depot by enterprise staff (a community-run depot in the case of Sabi Sabi) or were collected by external agents. Members of staff at Ngala and Sabi Sabi had jobs dedicated to the sorting of waste. The Timbavati PNR policy dictated that all solid waste should be removed from the reserve. However, the external recycling plant used by Ngala had ceased operating for commercial reasons, which meant that there was no further incentive for the enterprise to sort its waste. The remoteness of Ngala meant that the transport costs to remove waste from the reserve were not covered by revenue generated by the recyclables sold. Local farmers in Welverdiend and Huntingdon collected food waste from Ngala and Sabi Sabi respectively, for use as fodder for their pigs. Waste oil was stored and collected for recycling at Ngala, Pretoriuskop and Sabi Sabi.

Each of the enterprises had an incinerator to dispose of additional card and plastic waste, but none of these had air filters attached, nor was any air-quality monitoring implemented. Only the incinerator at Pretoriuskop was clay brick lined, which heated waste up to 800°C in order to completely combust waste. The other three enterprises either simply dried and burned non-recyclable waste in an open pit, or adapted old oil drums for use as incinerators, without insulation or temperature monitoring. In all four cases, ash leftover from incineration was landfilled. Landfill pits within the protected areas were covered over with topsoil and left to revegetate after use.

Only Sabi Sabi had worked with its suppliers in order to reduce the amount of packaging that came into the reserve with the materials it purchased – and in some cases they returned packaging to suppliers. The other enterprises tended to buy in bulk where possible and therefore reduce the packaging and transportation required to obtain goods. Purchasing concentrated detergents and using refillable containers were also strategies employed at Ngala and Sabi Sabi.

Only Pretoriuskop quantified the volumes of waste produced and recycled. Here it was estimated that ~120,450 kg (or ~1314 m^3) waste was collected annually and 24% of this was glass that could be recycled, and 14% was recyclable steel

or tin. This waste equated to just under 1 kg of waste per bed / night. However, no targets were set to reduce the volumes of waste created.

Wet waste

Ngala, Pretoriuskop and Sabi Sabi had constructed wetland wastewater purification systems in different designs in order to treat grey- and black-water waste. The reed beds at Pretoriuskop were the most heavily engineered, with a series of six evaporation ponds and two reed beds constructed. The septic tanks and wetlands at Sabi Sabi had been carefully designed to treat wastewater to such an extent that it could effectively be recycled back to the environment. Monthly water-quality testing at Pretoriuskop and Sabi Sabi permitted the release of treated water back into natural wetlands. The artificial wetland at Ngala was observed in a poor state of repair during the assessment, and electric fencing that had been used to keep game out had been damaged. Sabi Sabi purchased biodegradable detergents and soaps (including guest soaps and shampoos) in order that harsh chemicals would not adversely impact on the natural purification process. Artificial wetlands are preferable to chemical treatment plants because they require little maintenance, no chemical inputs and no electricity to operate. Jackalberry had the weakest sewage treatment system with a series of French drains (or soak-aways), which due to the geology of the area were not draining effectively.

Purchasing

The enterprises used their purchasing power to buy some local and environmentally friendly products. Biodegradable soaps and detergents were preferentially purchased at Ngala, Pretoriuskop and Sabi Sabi, while Pretoriuskop ensured that KNP's nature conservation department approved all chemical products. Enterprises preferentially purchased items from local suppliers (although the quality, consistency and availability was often problematic), and also from historically disadvantaged people in the case of Pretoriuskop. Ngala also purchased paper that had either been produced from sustainable forests or was recycled. This enterprise also used chemicals that did not bio-accumulate in its pest control programmes (e.g. for pest rodents and mosquitoes).

Discussion

The environmental results described for the four enterprises can be used to evaluate their environmental sustainability, and also to extrapolate lessons regarding best practice in nature-based tourism operations.

Environmental context

Comparisons made between the four enterprises made it clear that the existence and application of strategic environmental and development management plans promoted sustainable use. Overarching policies and plans reduced the fragmentation of approaches in relation to habitat management, while allowing coherent management of migratory wildlife to be applied. Cooperation on wildlife and habitat management between landowners promoted sustainable and strategic environmental management, while penalties applied by neighbours for infringements within a democratic process provided control and conflict resolu-

tion mechanisms. Cooperation was motivated by enlightened self-interest in the private-sector cases, where they could benefit from larger populations of wildlife ranging over larger geographical areas if they remained unfenced from their neighbours.

Limited natural resources were provided to local people from the enterprises, and therefore it was perhaps inevitable in the light of conflict with wildlife that subsistence poaching occurred, that the majority of community members did not think that the protected areas or tourism compensated them for their costs. Although environmental education programmes were beneficial to local people, it was clear that they required more economic benefits such as jobs, money and compensation, coupled with better communication between themselves and the protected area. Given the need for protected areas to engage with local communities, and to provide benefits that encourage conservation, it was clear that the well-motivated efforts of the four enterprises had not been sufficient to induce favourable perceptions of wildlife. Improving this perception and providing tangible benefits to the rural poor *must* be achieved if this form of land use is to be sustainable, and if levels of poaching are to be reduced.

Land management

The case studies highlighted that there was little formal planning of the environmental management. A key factor in the sustainable environmental management of habitats was the ability to control and finance activities. Habitat management practices, in relation to the use of fire, bush clearing, mowing or *laissez-faire* approach, were inconsistent between the enterprises. Since the private-sector enterprises did not monitor the ecological impacts of their activities in the long term it was not possible to say whether their activities promoted or detracted from environmental sustainability. The use of aerial photographs to guide management activities would only be 'best practice' if they were used in the context of the pressures that were prevalent at the time when they were taken, and in relation to changed circumstances. Extended research in KNP and the geographical extent of the park promoted a more hands-off management system. All of the enterprises provided artificial water for wildlife. According to research in KNP, this had been to the detriment of some herbivores and had benefited others, and so had skewed natural wildlife populations and species dynamics. Although KNP's policy towards artificial water had changed over time, all of the enterprises maintained too much water on their land – with no strategic or practical mechanisms to deal with the problem. The trade-off between conserving biodiversity and providing game-viewing opportunities for tourists was clear.

Consumptive utilisation of wildlife appeared to be sustainable at the four enterprises, with hunting quotas for meat and trophies set in relation to population counts from aerial censuses, and controlled through the use of penalties when infringements were identified. Political pressure, public perceptions and consumer demand influenced individual enterprise's hunting and culling activities. Although changes in wildlife behaviour were observed, it is difficult to say from the data collected whether this negatively impacted upon the survivorship of the species concerned, save in obvious cases where problem animals were euthanased.

Although the relative densities of roads were evaluated around the enterprises, there was no information available to determine at what level road coverage became unsustainable, given the absence of baseline information, or research addressing the impacts of roads and small-scale fragmentation on sensitive flora and fauna. Appropriate planning of the construction and placement of roads (in addition to their regular maintenance) was required to minimise erosion. Maintaining good quality roads improved the game drive experience for tourists, while the density of roads constituted a trade-off between accessing areas of the reserve while fragmenting habitats and removing vegetation to construct them.

In the cases where guides escorted tourists on photographic safari tours, it was clear that training coupled with rules, guidelines and monitoring promoted sensitive and sustainable tourism activities. However, the lack of systematic long-term ecological monitoring of the impacts of tourism activities (e.g. off-road driving) left the practice open to debate regarding its sustainability. Where self-drive tourists undertook their own tours, policing and control of adherence to rules was also necessary, although not infallible. In all cases, the key motivations behind training, rules and enforcement were improving the quality of experience for guests, minimising adverse impacts on the environment, and reducing risks of working in dangerous environments.

Environmental management within the enterprise

Little action was taken by any of the enterprises to reduce their energy expenditure or their water consumption, despite the financial and pollutant savings that would have been made. Energy was ultimately sourced from non-renewable fossil fuels, while use of renewable resources was not monitored (as in the case of wood) or limited (in the case of solar power). Active promotion of low-energy light bulbs; the use of natural lighting and cooling systems; and water-saving technology would have reduced the financial and environmental costs of energy and water use at the enterprises. The use of more appropriate and sensitive laundry programmes, and reducing the temperature on water geysers to between 46°C and 49°C, would have also saved energy. Programmes to evaluate and offset the production of carbon dioxide associated with guest flights and safari drives would also have promoted the sustainability of the activities on a global scale.

All enterprises operated recycling systems, within the constraints of local commercial capacity to deal with waste glass and steel. The donation of waste food to local pig farmers showed innovative reuse of waste, with knock-on socio-economic benefits for poor people. However, the incineration and landfill activities for other waste materials were inevitably polluting, and not implemented in line with best practice standards. Only one enterprise measured the volumes of waste produced, while only one other was working with suppliers to reduce the levels of packaging brought into the reserve.

However, efforts made to remediate grey- and black-waste water were more encouraging in cases where enterprises had established artificial wetlands and were monitoring the quality of remediated water. Effectively, these enterprises were sustainably recycling their waste water, with minimal energy inputs, to an extent that water could be reintegrated into local habitats.

Conclusions

This paper has described a variety of different responsible strategies that have been used by four nature-based tourism enterprises in South Africa to promote long-term environmental sustainability. The paper has highlighted areas regarding the context, land and enterprise management that impact on the natural environment at local and global levels, and which have been addressed by enterprises with varying degrees of success.

The most important implication of this work for other researchers has been the production of the SUNTAT. The SUNTAT is unusual because it evolved in southern Africa, rather than in the academic environments of industrialised nations in Europe or North America, where the majority of sustainable tourism research takes place (Tosun, 2001). The toolkit's contents were based on the results of a regional consultation process to ensure that it would evaluate sustainable tourism within the context of value systems of those involved (Butler, 1998). Environmental assessment techniques within the toolkit appreciated the need for baseline information from which incremental change could be identified and measured (Butler, 1996). The SUNTAT integrated valuable concepts from process- and performance-based Environmental Management Systems, Strategic Environmental Assessment, Environmental Impact Assessment, and visitor management approaches (Spenceley, 2003a). Databases within the toolkit allow assessors to quantify and monitor the levels of water use, energy consumption, and waste production. Links between the environmental impacts of tourism and commercial characteristics of operational tourism enterprises were also forged, by providing tools that linked occupancy and consumption levels (Spenceley, 2003a).

Recognising the multitude of ways that nature-based tourism enterprises can impact on the environment highlights the need for detailed assessments that do not simply define the 'sustainability' or 'unsustainability' of the overall enterprise. Not only is this impossible, it is counterproductive with respect to encouraging responsible business practices. Therefore, the toolkit does not aim to pseudo-quantify environmental impacts to provide a relative 'score' of sustainability. Instead the toolkit appreciates the complexity of sustainable development as a goal which tourism should strive to achieve, rather than it being an inherent characteristic of its activity (Clarke, 1997). Therefore, the toolkit culminates in a summarised list of considerations that contribute to, or detract from, sustainable nature-based tourism. This is supplemented with an 'action summary' that is completed by the assessor and an enterprise representative to prioritise responses, organisational issues, cost implications, and set targets and progress review dates (Spenceley, 2003a).

Enterprises clearly require information and support in driving and maintaining environmental best practices – information that empowers them with sufficient information to make decisions, such as the range of technologies and techniques available, and also the relative financial and environmental costs and benefits of different options. Researchers should consider the application of locally appropriate grey literature such as the *Responsible Tourism Manual* in South Africa (Spenceley *et al.*, 2002), and international sources of information such as the Conservation International/Tour Operators Initiative *A Practical*

Guide to Good Practice (Sweeting & Sweeting, 2003) to promote best environmental practice in destinations.

With little comparable baseline data from other nature-based tourism enterprises with which to compare the relative environmental costs and benefits, it has not been possible to evaluate how the performance these establishments compares with other similar businesses. Potentially, the widespread uptake and implementation of the Responsible Tourism Guidelines for South Africa (DEAT, 2002) and the SUNTAT (Spenceley, 2003a) could address this shortfall, and begin to address the cumulative impact of environmentally sensitive best practices – rather than the currently observed isolated and fragmented efforts. This might also allow enterprises to exploit the increasing market demand for environmentally sustainable holidays by transparently reporting on their efforts to reduce their environmental impacts.

The toolkit provides a basis from which other researchers may quantify and measure the component factors of sustainable tourism. Application of the evolving toolkit during the case studies produced comparable baseline information from enterprises concerning the economic, environmental and social facets of sustainable tourism. Researchers may now go beyond simply defining sustainable tourism, and begin to tangibly and transparently measure its characteristics in a reliable and comparable way. By developing a database of economic, environmental, and social benchmarks relevant to sustainability, the SUNTAT may be used as a mechanism for the tourism industry to develop baseline standards and improve the level of performance.

Finally, it is critical to indicate the limitations of this study in light of the holistic nature of sustainable development. As mentioned earlier, sustainability is not only dependent upon the appropriate application of 'environmentally friendly' activities, but it must also address economic, social and cultural sustainability. In the case of the four enterprises documented, these aspects were assessed and are reported elsewhere (Spenceley, 2003a). The sustainability of nature-based tourism must also be aligned to the strategic political and planning frameworks of particular countries or localities to promote sustainable development. Application of the SUNTAT may assist governments and the private sector in achieving obligations made towards implementing international conventions, including the Convention on Biological Diversity and the Commission on Sustainable Development. The toolkit addresses major themes that were prioritised at the World Summit on Sustainable Development in 2002 with regard to forging linkages between poverty, the environment and use of natural resources (UN/DESA, 2002). The SUNTAT is therefore highly relevant to the current international agenda on sustainable development.

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