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REPUBLIC OF SOUTH AFRICA



AN ASSESSMENT OF THE VALUE OF AFRICAN PENGUINS

September 2024



PREFACE & ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

Introduction

The African penguin *Spheniscus demersus* is the only penguin species that breeds on the African continent and is endemic to the southern African coast. The species has declined from an estimated 0.5-1 million breeding pairs in the early 1900s to the approximately 42 500 counted in 1991, and 8324 in 2023. The remaining birds are mostly found in just seven colonies in the Western and Eastern Cape provinces of South Africa.

Several factors have contributed to their population decline. Initially, a key reason was habitat destruction through guano harvesting as well as egg collection. However, over the last few decades, a shortage of small pelagic fish species, the penguins' main food source, seems to have been the main contributing factor. Increased vessel traffic and the resulting noise pollution has also contributed to the decline.

This study aimed to provide an assessment of the value of the African penguin in South Africa to inform decision-makers at all levels of government, conservation organisations and other stakeholders involved in decision making around African penguins. The study investigated the experiential benefits of the penguins as manifest in tourism, property, media and educational values, as well as the existence value of African penguins, as manifest in public willingness to pay. In particular, it focused on the quantification of tourism and existence value. The study also investigated the potential reputational risk of failing to adequately conserve African penguins. The study was based on information from existing published and unpublished sources, statistics provided by relevant conservation authorities, conversations with key informants, and surveys conducted among penguin visitors and among the general public in Cape Town.

While determining the economic value of penguin conservation is useful to inform policy decisions, it needs to be acknowledged that it represents one way to think about conservation. Besides economic arguments for threatened species conservation, arguments for species protection can also be made for moral reasons as well as due to South Africa's international commitments under the United Nations Convention on Biodiversity to halt all species extinctions.

Tourism value

Tourists visiting penguin colonies generate revenues for the park authorities and for a range of tourism-related business, all of which generates knock-on effects in the economy. In addition, the tourists themselves have a willingness to pay for seeing penguins that may exceed what they have to pay, the difference being their "consumer surplus" or "net benefit".

The willingness to pay and consumer surplus of tourists visiting the Boulders penguin colony was estimated based on a survey of visitors carried out during November 2023, using contingent valuation and, also in the case of Capetonian visitors, travel cost methods. Based on this study, for 2023:

- Revenues generated by SANParks through entrance fees were approximately R95 million;
- Consumer surplus of Cape Town residents was estimated to be around R3 million, both based on both the contingent valuation method and the travel cost method;

- Consumer surplus of domestic and international tourists was approximately R222 million, with R220 million of this attributed to international visitors, R0.6 million to SADC visitors and R1.7 million to domestic visitors from beyond Cape Town;

In addition, the penguin colonies have broader impacts on the South African economy. For the Boulders colony, this could be estimated as the proportion of tourism expenditure attributed to the penguin colony based on its contribution to attracting visitors to the Cape Town area. To extend this estimate, densities of geotagged photographs uploaded to the internet, which indicate the spatial pattern of tourism activity in South Africa, were used to estimate the total contribution of penguin colonies to the national tourism sector. To summarise:

- Based on visitor surveys, the total expenditure in South Africa related to the Boulders penguin colony, based on trip expenditure and the reported degree to which penguins played a role, was estimated to be in the range of R535.6 - 2273 million in 2023 based on median and average visitor expenditure, respectively.
- Based on spatial data, and fairly conservative assumptions, it was estimated that Boulders accounted for approximately R505 million of tourism expenditure, which was slightly lower than the above estimates, and that the remaining penguin colonies in South Africa generated some R108.3 million in tourism expenditure.

The total tourism value of all penguin colonies, including Boulders, Stony Point, Dassen Island, Bird Island, Robben Island, Dyer Island, and St Croix Island, was thus estimated to be in the range of R613 to 2702 million in 2023.

Existence value

People benefit from knowing that African penguins exist and are willing to pay for their conservation. As part of this study, surveys were conducted to estimate the non-use or existence value of African Penguins. The survey aimed to capture the value South Africans place on simply knowing that the penguins exist or are preserved for future generations.

A survey of approximately 400 Capetonians was conducted to understand the extent to which residents were aware of and cared about the future of penguins and the extent to which they had heard about or experienced them. The survey also elicited respondents' willingness to pay towards the conservation of the African penguin, from which a monetary estimate of existence value was derived.

The aggregate WTP for penguin conservation in Cape Town was in the order of R551 - 731 million per year. Even though WTP attenuates with distance, it is assumed that South African residents outside of Cape Town would also be willing to pay for penguin conservation. If the results from the Cape Town survey were extrapolated to the rest of the country, taking the relationship between WTP and income into account, the aggregate WTP would be an additional R771 - 1101 million. The main motivation for the respondents' WTP was that they liked knowing that penguins exist, having the option of visiting them in the future, and protecting them for future generations.

Other benefits – qualitative assessment

In both Simonstown and Betty's Bay, where colonies are in close proximity to built-up areas, the penguin colony has reportedly very little to no effect on the local property market. In Betty's Bay, proximity to the Stony Point colony reportedly has a negative effect on property prices. Property

prices in Simonstown are reportedly influenced very little by the penguin colony, except in as much as the protected area guarantees to the unobstructed views of the beach for some properties.

SANParks and CapeNature run several educational programmes to engage learners in conservation and to promote environmental stewardship. It is not possible to fully estimate the educational benefits of the African penguin in Rands. Environmental education and exposure to iconic species can change people's outlook and behaviour over the long term, and also raises both the use and non-value of nature. To some extent, the South African government recognises the value of research through the provision of publication subsidies. In this way, publications on penguins generated subsidies of at least R1.9 million in 2023.

Penguins also star in advertisements for Cape Town and films and documentaries such as Penguin Town and have not only entertained but also raised awareness about penguin conservation issues. The direct media related value of the penguin colonies was estimated to be almost R2.9 million per year.

Total value

Based on the estimation of tourism value, existence value, property benefits, educational and media-related benefits, the total value of the penguin colonies of South Africa was estimated to be between R1 946 million (lower bound) and R4545 million (upper bound) in 2023.

Reputational risks of failing at conservation

South Africa is legally considered as the owner of the African penguin and is morally its custodian. The loss of the African penguin would be a very large reputational risk to South Africa, especially because the African penguin only occurs in Namibia and South Africa. Just as South Africa's foreign policies and economic decisions contribute to its reputation, its position on environmental stewardship and the measures it implements to protect global assets, for which it is perceived as a guardian, will shape its international brand. If the African penguin population is lost completely, South Africa's brand reputation as a naturally rich and environmentally healthy destination, famed for its natural assets, will suffer.

Successfully conserving the African penguins is not a one agency issue but requires big systemic changes. Ultimately, improved management and policy is going to be the answer: an ecosystem approach to fisheries is needed and Ocean health needs to be better managed.

ABBREVIATIONS & ACRONYMS

ACSA	Airports Company South Africa
DFFE	Department of Forestry, Fisheries and the Environment
EAF	Ecosystem-based Approach to Fisheries Management
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIS	Geographic Information Systems
IUCN	International Union for Conservation of Nature
MPA	Marine Protected Area
NDP	National Development Plan
NGO	Non-Governmental Organisation
SAAMBR	South African Association for Marine Biological Research
SADC	Southern African Development Community
SANCCOB	Southern African Foundation for the Conservation of Coastal Birds
SANParks	South African National Parks
USD	United States Dollar
WEF	World Economic Forum
WTP	Willingness to Pay
WWF-SA	World Wildlife Fund

I. INTRODUCTION

BACKGROUND

The African penguin *Spheniscus demersus*, is the only penguin species that breeds on the African continent and is endemic to the southern African coast. Like many other species of penguins around the world, the African penguin is classified as “Endangered”, and is in serious decline (IUCN, 2019). Over the last hundred years, the number of breeding pairs have dropped from an estimated 0.5-1 million in the early 1900s to the approximately 42 500 counted in 1991, and 8324 in 2023 (Makoni, 2023; DFFE (unpublished), 2024). This represents a decline of over 95%. The African Penguin population is declining at less than 1.5% per year in the Western Cape, but the decline in the Eastern Cape has sharply worsened, reaching 13% annually over the past decade (Sherley *et al.*, 2024). Projections suggest that by 2028, the total population decline will likely exceed 80%, meeting the criteria for “Critically Endangered” status. Therefore, it has been recommended that the African Penguin be reclassified as Critically Endangered on the IUCN Red List (Sherley *et al.*, 2024). It is projected that the species could be functionally extinct by 2035, meaning that fewer than 50 breeding pairs are left (Sherley *et al.*, 2018, 2021). The remaining birds are mostly found in just seven colonies in the Western and Eastern Cape provinces of South Africa (DFFE, 2023a; Box 1).

Initially, a key reason for the strong decline in African penguin population was habitat destruction (Frost, Siegfried & Cooper, 1976; Pichegru, 2013; Simmons, Brown & Kemper, 2015; Espinaze & Waller, 2020). Guano, the excrement of sea birds, was harvested over multiple decades to be used as fertiliser but is used by penguins for building their nesting burrows. The continuous removal of guano meant that penguins had to build nests that were closer to the surface and more exposed to predators and extreme weather, reducing breeding success (Frost *et al.*, 1976; Shannon & Crawford, 1999; Pichegru, 2013; Simmons *et al.*, 2015; Espinaze & Waller, 2020). Additionally, exploitation of eggs had a significant impact on African penguin recruitment, particularly on Dassen Island (Shannon & Crawford, 1999). Egg harvesting has been identified as the most important factor of initial species decline (Shannon & Crawford, 1999).

However, in the last few decades, their accelerating decline has been mainly linked to increasing shortages of food (Roy *et al.*, 2007; Coetzee *et al.*, 2008; Crawford *et al.*, 2011). African penguins feed primarily on small pelagic fish species (sardines and anchovy) and to a lesser extent squid (Connan, Hofmeyr & Pistorius, 2016). While squid and anchovy were rated as being at optimal level in 2023, sardine’s stock status was “depleted” (DFFE, 2023b). Reportedly 2023 was the year with the lowest biomass recorded for sardines in South Africa (Human, 2024; Stander 2023, pers. comm., 30 November 2023). An indication of the fact that food has become a limiting factor for penguins is that forage fish abundance has a positive impact on breeding success (Crawford *et al.*, 2006; Sherley *et al.*, 2013) and penguin survival (Sherley *et al.*, 2013; Robinson, Butterworth & Plagányi, 2015; Weller *et al.*, 2016). In addition, when sardine and anchovy biomass fall below 25% of their maximum recorded biomass, penguin mortality increases (Robinson *et al.*, 2015).

Added to this is the impact of vessel traffic. Since 2014, the South African government has been driving Operation Phakisa to boost the country's blue economy. While this has included the expansion and improved management of marine protected areas (MPAs), it has primarily focused on industrial development in the oceans. In Algoa Bay, offshore ship-to-ship bunkering (the practice of supplying oil from one ship to another outside of harbours), outside the port of Coega from 2016 has increased vessel-driven noise pollution and led to several oil spills. Vessel traffic increased tenfold over the last 10-12 years (Stander, pers. comm., 30 Nov 2023) also leading to an increase in noise pollution. These

developments coincided with the loss of 85% of the penguins at St Croix Island from 2016 to 2022 (Pichegru *et al.*, 2022).

The rapid decline in penguin numbers is in itself of major concern from a moral and ethical standpoint. Apart from the potential extinction of a species, and the contribution of that to the potential extinction of penguins as a group, their loss could have economic ramifications for South Africa. If the moral argument is not enough to justify the channelling of sufficient resources to address the problem, then it might help to make an economic case for preventing further catastrophic losses of penguin numbers, and indeed for helping to recover their numbers to more viable levels.

Box 1. The seven largest colonies in South Africa which are home to more than 95% of the remaining global population of African penguins. These are listed from in order from the west to east, with the first five in the Western Cape, and the last two in the Eastern Cape. Populations are as at 2023 (DFFE (unpublished), 2024).

Dassen Island holds 2037 breeding pairs, which is about 25% of the African penguin population. Dassen Island is a Nature Reserve and not open to the public; visitors are only allowed on the island if they have a permit and are allowed to walk only on the road between the Dassen Island lighthouse and the buildings at Huisbaai conservation. Dassen Island is managed by CapeNature; however, the Lighthouse Services division of the National Ports Authority (Transnet) manages the lighthouse and associated buildings (CapeNature, 2019). Several private tour operators offer boat tours around Dassen Island which are mostly focused on fishing tourism.

Robben Island has 931 breeding pairs of African penguins according to the latest survey in 2023, which is equivalent to around 11% of the remaining population. Robben Island is a South African National Heritage Site and World Heritage Site, as it is the prison site where anti-apartheid activists, including Nelson Mandela, were jailed for decades (BirdLife SA, 2015). In 2019, SANParks declared 17 new national MPAs, including the Robben Island MPA. The conservation aspect of the island is managed by SANParks (BirdLife SA, 2015).

Boulders penguin colony has 845 breeding pairs, or about 10% of the remaining population. It has become world famous as a viewing site for one of the few remaining colonies of African penguins (SANParks, 2023a). Boulders falls under Table Mountain National Park and features three beaches, one penguin viewing area and three boardwalks (SANParks, 2023b). There are two entrances to Boulders: the southern entrance allows access to the beach where one can swim, and the northern entrance has a number of boardwalks leading to elevated penguin viewing platforms. Boulders is managed by SANParks, which together with the City of Cape Town have invested in the board walks, buildings for access control and administration, fencing and parking areas (van Zyl & Kinghorn, 2018).

Stony Point is home to approximately 1200 breeding pairs of African penguins, which is around 15% of the remaining population. The nature reserve is situated in the coastal town of Betty's Bay on an old whaling station site where visitors can view the penguins from a boardwalk that traverses the colony. The reserve is managed by CapeNature and falls within the Betty's Bay MPA (3 km long, extending 3.6 km out to sea) and is also part of the Kogelberg Biosphere Reserve.

Dyer Island is a 20-hectare nature reserve, situated 8.5 km from Gansbaai and is home to around 693 penguin breeding pairs, or 8% of the remaining population. It is the easternmost of the chain of seabird islands of the Western Cape (Birss *et al.*, 2012). Dyer Island is managed by CapeNature, primarily for seabirds and shore birds, such as the African penguins, Bank Cormorant and Roseate Tern (Birss *et al.*, 2012). The big tourism focus in Gansbaai is shark cage diving, however tour operators also offer boat-based trips to see the penguins and other marine life around the island. Given its sensitivity as a breeding

locality for numerous threatened seabird species Dyer Island is not open to the public (Birss *et al.*, 2012), hence, there is no tourism on the actual island.

St Croix Island is one of three rocky islands situated off the mouth of the Coega River in Algoa Bay and is home to 712 African penguin pairs (9% of the remaining population). The reserve is not open to the public and was established as a breeding ground for the African penguin (Nelson Mandela Bay Tourism, 2023). In 2005, it was proclaimed as part of Addo Elephant National Park and hence managed by SANParks. Private tour operators offer whale, dolphin and penguin watching around the island.

Bird Island is part of a group of four islands in Algoa Bay and is an important breeding place for marine bird species, including 1 722 African penguins (21% of the total population). Bird Island, like St. Croix Island, was proclaimed as part of Addo Elephant National Park in 2005 (SANParks, 2023c).

African penguins contribute to societal welfare both directly and indirectly. Their direct contributions are through the experiential use values, which manifest as international and domestic tourism value, recreational value (or enjoyment by nearby locals) and into property value (property price premiums that people pay to be close to or enjoy business opportunities relating to the presence penguins), as well as non-use values (otherwise known as “existence value”). In particular, the more accessible colonies such as at Boulders in Simonstown and at Stony Point in Betty’s Bay, are popular tourist destinations that generate revenues and employment and benefit neighbouring communities (Lewis, Turpie & Ryan, 2012). Their indirect values are through the roles that they play in maintaining ecological systems and in so doing supporting a range of other values that are generated from those systems. African penguins contribute to algae growth and bring nutrients to intertidal communities (Bosman & Hockey, 1988) and increase seabird’s prey capture efficiency (McInnes & Pistorius, 2019). Moreover, they give an indication about the health of the environment for breeding seabirds in the Benguela ecosystem (Underhill & Crawford, 2005).

Arresting or reversing the declines in African penguins would not be a trivial undertaking. It would require adopting an ecosystem-based approach to fisheries management (EAF) with better spatial management of marine resources for penguin foraging and fishing, and implementing measures such as creating additional MPAs, reducing fishing quotas and implementing fishery closures around the colonies during breeding and pre- and post-moult stages (Pichegru *et al.*, 2010, 2012; Sydeman *et al.*, 2021; Carpenter-Kling *et al.*, 2022).

However, the lack of clear evidence or agreement on the right approach is another factor that has retarded effective action. Between 2008 and 2021, scientists experimented with changing closing seasons for fishing near penguin colonies to test if limiting fishing activities could help penguin populations to recover. The Small Pelagic Working Group agreed that a 1% improvement in penguin population growth per annum would need to be achieved to deem closures beneficial for penguins. The international expert panel concluded that reducing fishing pressures could increase penguin population growth by 1% per annum but could be higher due to experimental design flaws. Scientists used different models for their analysis and consequently interpreted the results of the Island Closure Experiment differently (Evans, 2023). While Sherley *et al.* (2018, 2021) found that fisheries closures could improve penguin population trends, Butterworth & Ross-Gillespie (2022) refute this on the grounds that they found no significant impact of fishing in the neighbourhood of island colonies on penguin population growth rates. However, an expert panel subsequently concluded that a fishing ban was necessary to halt the decline of the African penguin population.

At the same time several organisations launched campaigns to increase awareness about the plight of African penguins. For example, the Two Oceans Aquarium launched the “Not on our watch” campaign in March 2023, which has been supported by WWF-SA, the Endangered Wildlife Trust, the South African Association for Marine Biological Research (SAAMBR), the Southern African Foundation for the Conservation of Coastal Birds (SANCCOB), Birdlife South Africa, the African penguin and Seabird Sanctuary, the Dyer Island Conservation Trust, Animal Ocean, and Nelson Mandela University (Two Oceans Aquarium, 2023).

In August 2023, the South African Department of Forestry, Fisheries and the Environment (DFFE) announced their intention to ban commercial fishing in six areas around the penguin colonies from 2024 onwards for 10 years (Makoni, 2023). Fishing closures will be implemented around Dassen Island, Robben Island, Dyer Island, St. Croix, Bird Island and Stony Point. The fishing ban will be reviewed in January 2030 (after six years) to assess the impact on longer term adult and juvenile penguin survival.

Closing the areas for fishing activities has been controversial. It has raised concerns among fishers regarding its potential impacts on fish catches and jobs in the industry (Makoni, 2023). There are also concerns that these measures may not be enough to reverse the decline in penguin population which is estimated at around 8% a year, and they need to be supplemented with improved habitat conservation, reducing pollution, controlling diseases and controlling land predators (Keeton, 2023). A comparison of the benefits to penguin populations against the costs to the fishing industry for each colony and catch type presented by BirdLife South Africa indicates that the closures proposed by the DFFE would be inadequate (High Court of South Africa, 2024). Mcinnes *et al.* (2024) show that the current no-take zones have little benefit to the African penguin, except for Bird Island, and very little cost to the fisheries.

AIMS OF THE STUDY

The overall aim of this study was to provide an up-to-date assessment of the value of the African penguin in South Africa in order to inform decision-makers at all levels of government, conservation organisations and other stakeholders involved in decision making around African penguins.

More specifically, the terms of reference for the study were to provide estimates of the tourism, recreation and property value benefits and the existence value of African penguins, and to describe the media-related benefits and potential reputational risk of failing to adequately conserve African penguins.

STUDY APPROACH AND LIMITATIONS

The study was carried out based on a combination of information from existing published and unpublished sources, statistics provided by relevant conservation authorities, conversations with key informants, and surveys conducted among penguin visitors and among the general public. The methods, which are described in detail in the relevant sections, are outline below.

We collated available literature and data pertaining to tourism and recreation at the relevant colonies from the published and unpublished literature and by contacting relevant authorities and stakeholders. This was augmented with data collected in questionnaire surveys conducted at the Boulders colony, which were analysed using the Travel Cost Method. Note that surveys could not be conducted at the other main visitor colony at Stony Point due to the fact that there was already an ongoing university study at that site.

Properties sales premiums attributable to the presence of penguins were estimated using a rapid desktop approach using expert input, following published examples.

To estimate the existence value of penguins, we conducted a survey of around 400 respondents from a range of neighbourhoods in Cape Town which focused on understanding the extent to which citizens are aware of and care about the future of penguins, the extent to which they have heard about or experienced them and how, and to elicit their willingness to pay for penguin conservation. From this a high-level estimate of aggregate willingness to pay was derived, noting the limitations of the survey respondents being from the Western Cape only.

The contribution of penguin colonies to income generated from production of films and advertisements was estimated on the basis of information on permits issued from conservation authorities. Lastly, the potential reputational risk of allowing the African penguin population to decline is discussed based on conversations with appropriate conservation authorities and non-governmental organisations (NGOs).

IMPORTANT CAVEAT

Driving a species to extinction could have severe and potentially irreversible ecological and evolutionary consequences (Cooke *et al.*, 2023). The loss of a species would cause disruptions in the health and stability of ecosystems which are often difficult to predict to their full extent due to the interconnectedness of organisms. The loss of one species can trigger additional losses in the wider ecosystem.

Economic justification for conservation is a powerful incentive. Arguments advocating for conservation have shifted towards prioritising utilitarian values, emphasising tangible and measurable benefits for society. Valuing habitats and their species can be a helpful tool distilling information into numbers which can then be used in policy decision-making processes. Arguments have been made that the use of economic values make the importance of biodiversity conservation clearer to the public and policy makers (Salles, 2011).

However, some conservation biologists find it inappropriate to put a monetary value on species conservation (Redford & Adams, 2009). We also conserve species for their beauty and the wonder and inspiration they spark; and because they have a right to exist, regardless of their usefulness to us. “Many forms of value appreciation, understanding and experience of non-human worlds simply are incommensurable with economic pricing mechanisms” (Sullivan, 2009). Besides economic arguments for threatened species conservation, arguments for species protection can also be made for moral and spiritual reasons, because they foster our identity and connection to Nature. The intrinsic value of a species, i.e. the value of penguins regardless of whether they are useful as means to other ends, suggests that people have a moral duty to protect them and reduce damages and harm done to them (O’Neil, 1997). This stands in contrast to focusing on utilitarian values which would not generate an ethical obligation to protect species or a responsibility to be a good steward of the planet.

It is therefore important to keep in mind that while determining the economic value of penguin conservation is a useful tool to inform policy decisions, it needs to be acknowledged that it represents one way to think about conservation. Conservation policies need to encompass multifaceted considerations beyond mere economic assessments, underscoring the intrinsic value of biodiversity and ecological stability. Economic valuation provides insightful guidance, but it must be complemented by a holistic approach that embraces diverse perspectives and values.

2. TOURISM VALUE

REVIEW

The tourism industry is a key driver of South Africa's economy. Tourism is a significant source of income, foreign currency, and jobs according to the country's National Development Plan (NDP), and is also regarded as a key component of South Africa's programme for economic recovery (South African Tourism, 2020). The World Economic Forum has highlighted that South Africa's competitive advantage in tourism is its natural and cultural heritage (South African Tourism, 2020).

Tourism contributed 7.8% (R513.1 billion) to South Africa's gross domestic product (GDP) in 2019 and 6.3% (R421.7 billion) in 2022 (World Travel and Tourism Council, 2023). It provided a total of 1.51 million jobs in 2019 which reduced to 1.31 million jobs in 2022, which was 9.2% of total jobs in both years. Tourism's contribution is expected to grow to 8.6% (R688.5 billion) of South Africa's GDP by 2033 and to provide a total of 1.81 million jobs, which means that it is expected to create 400 000 new jobs between 2023 and 2033 (World Travel and Tourism Council, 2023).

In 2022, most of the tourism expenditure in South Africa came from domestic travellers (76.9%) while 23.1% came from international visitors. International visitor spending was R85 billion compared to domestic visitors who spent a total of R283 billion (World Travel and Tourism Council, 2023). In 2021, international tourism numbers increased from July onwards with numbers peaking in November and then dropping off again in December (StatsSA, 2023a). In 2022, international tourist numbers were substantially higher than in 2021 and numbers increased throughout the year (StatsSA (2023a); Figure 1). Some 1.4 million of international passengers arrived at O. R. Tambo and 634 000 arrived at Cape Town International Airport. Overseas tourists mainly came from the United Kingdom (19.5%), the USA (18.1%), Germany (11.9%), the Netherlands (6.2%) and France (5.2%).

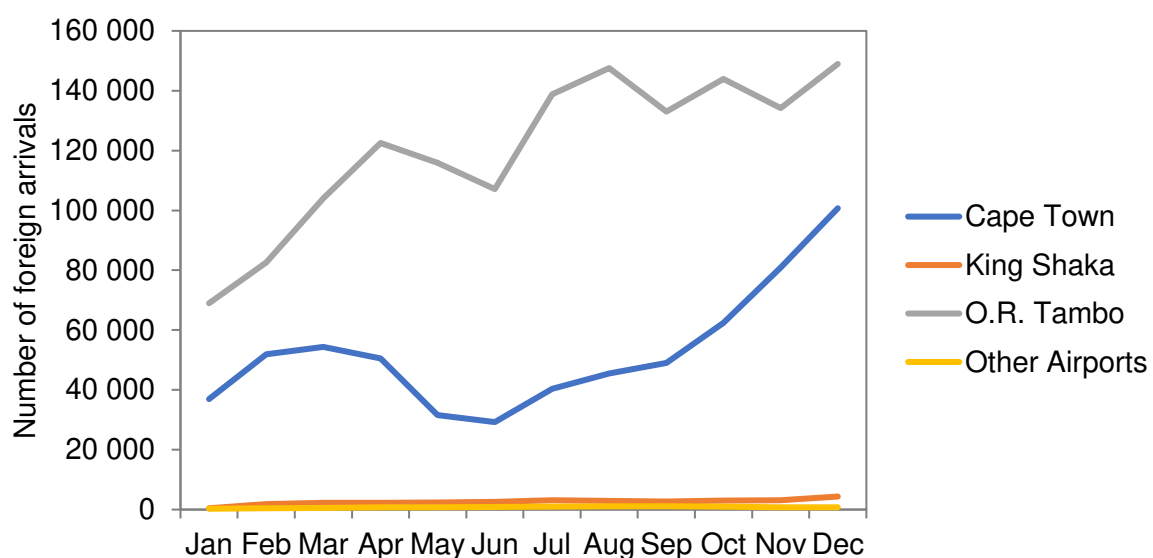


Figure 1. Number of foreign arrivals by air and month of arrival, 2022. Data source: StatsSA (2023a).

Some of South Africa's penguin colonies have become well known tourism attractions, that now make significant contributions to the sector, contributing to the generation of local, regional and national benefits. Penguin-related tourism is part of a larger phenomenon of avitourism, although it is broader than avitourism, because penguins appeal to the general public as well as to the more specialised avitourists. Penguin colonies are indeed popular tourism destinations not only in South Africa, but also in South America, the Galapagos Islands, Australia, and New Zealand, especially in areas where colonies are accessible and relatively close to major centres.

For example, a tourism industry has developed around the Australian little penguins *Eudyptula minor novaehollandiae* on Phillip Island in Australia (Dann & Chambers, 2013). Here it has been estimated that were this colony to be lost, it would lead to economic losses of around AUS\$30 million (Marsden Jacob Associates, 2008). In New Zealand, yellow-eyed penguins *Megadyptes antipodes*, blue penguins *Eudyptula minor* and Fiordland crested penguins *Eudyptes pachyrhynchus* were visited by an estimated half a million international tourists in 2019, some 1.2% of visitors to New Zealand (StatsNZ, 2024). The trend in total numbers of penguin visitors followed the general tourism trend for the country (StatsNZ, 2024). On the Otago Peninsula, it was estimated that the penguins generated direct tourism revenues of NZ\$6.5 million in 2006 / 2007 (Busch & Cullen, 2009). Tourists who visited the penguin colonies reported increased environmental awareness amongst other positive side effects (Schänzel & McIntosh, 2000). In southern Chile, ecotourism is an important source of income for communities close to the penguin colonies (Skewgar, Simeone & Dee Boersma, 2009). Magellanic penguins *Spheniscus magellanicus* and Humboldt penguins *Spheniscus humboldti* nest together in islands which are located 400 - 700 m offshore. It was projected that sustainable tourism could generate up to US\$190 000 per annum (Pérez-Muñoz, Lobos & Oetiker, 2007).

In South Africa, penguin tourism contributes to the growing avitourism industry. Being home to 8% of the world's bird species, South Africa is a popular destination for avitourism, which was estimated to be worth approximately R1.5 billion in 2010 and was estimated as likely to be over R2 billion in 2020 (BirdLife South Africa, 2020). Avitourism has been lauded as contributing to both economic development and conservation objectives, providing income and employment opportunities for local entrepreneurs and guides (Biggs *et al.*, 2011). The richness and abundance of birds are major factors determining the magnitude of benefits provided by birding (Cumming & Maciejewski, 2017). Nature-based tourism also helps to finance the operational and investment costs of conservation, such as the management of protected areas (Gössling, 1999; Buckley, 2009; Buckley, Morrison & Castley, 2016).

In South Africa, penguin-based tourism is mainly at the Boulders and Stony Point colonies, particularly the Boulders colony, which is both within the Greater Cape Town area and *en route* to Cape Point, another major tourism destination. Tourism in the other colonies is relatively limited due to them being located on offshore islands.

Penguins first settled at Boulders beach in 1985 (Crawford *et al.*, 2000), and this led to the establishment of the Boulders Coastal Park, managed by the then Simonstown Municipality. By 1995, at least 160 000 people were visiting the colony during the high season (September to February), generating revenues from entrance fees (Morgan, Turpie & Ryan, 1996). The colony was incorporated into the Table Mountain National Park in 1998, managed by SANParks, after which investments were made in visitor facilities to manage the growing numbers of tourists to the area. This colony now makes a major contribution to Cape Town's attractiveness for tourism: it has been ranked Number 5 of the Top Visitor Attractions in Cape Town after Table Mountain, the Table Mountain Aerial Cableway, the Victoria & Alfred Waterfront, and Kirstenbosch National Botanical Garden (Tripadvisor, 2023a). Similarly, but on a smaller scale, the Stony Point penguin colony has been ranked Number 1 of the Top Visitor Attractions in Betty's Bay (Tripadvisor, 2023b).

The Stony Point colony was established following the arrival of a breeding pair in 1982 (Whittington, Hofmeyr & Cooper, 1996). It is now protected within the Betty's Bay MPA which falls within the Kogelberg Reserve and is managed by CapeNature (Turpie *et al.*, 2009). CapeNature has invested in facilities such as boardwalk and fencing to manage the tourism site and has also been supporting the On the Edge community restaurant at Stony Point which provides benefits from ecotourism to local communities (Western Cape Government, 2022). The restaurant provides employment to members of the local community and some of the restaurant's profits are used to provide vouchers to the local community annually, and to support children's education (Western Cape Government, 2022). A survey undertaken in December 2008 showed that 10% and 13% of tourists visiting the Kogelberg coast, a valuable part of the False Bay coast (Pfaff *et al.*, 2019), indicated that the presence of the Stony Point penguin colony had strongly or somewhat, respectively, influenced their decision to visit the area (Turpie *et al.*, 2009). Some 6770 people visited the Stony Point colony in December 2008, and 1752 in January 2009 (Turpie *et al.*, 2009).

Several studies have estimated the economic value of the Boulders penguin colony and its impact on the local economy (Morgan *et al.*, 1996; Lewis *et al.*, 2012; van Zyl & Kinghorn, 2018). Morgan *et al.*, (1996) found that as a tourism attraction, the colony made a substantial contribution to the local economy. A follow-up study by Lewis *et al.* (2012) found that penguin-based tourism formed an integral part to Cape Town tourism and that on average Cape Town residents were getting more benefits from their visits to the colony than they paid for through the entrance fee and travel expenditures (Lewis *et al.*, 2012). Half of the interviewed businesses, such as restaurants, hotels, and curio shops, which operated within a 20 km radius reported a business advantage to being close to the penguin colony while 14% reported a disadvantage, including seasonality of visitors and the smell from the colony (Lewis *et al.*, 2012). A follow up review by Van Zyl and Kinghorn (2018) focused on attaching an economic value to the tourism and recreational activities associated with Boulders. Total expenditure associated with Boulders penguin colony was estimated to be R311 million per year, with 88% of the expenditure from international tourists, 8% from domestic tourists and 6% from Cape Town residents (van Zyl & Kinghorn, 2018). The authors estimated that the colony supported around 885 jobs across Cape Town, with about 180 - 327 of those being within Simonstown (van Zyl & Kinghorn, 2018).

In this chapter, we update earlier estimates of the value of the Boulders colony based on existing literature, data and statistics and a survey of visitors. We also triangulate our estimates using a novel approach to deriving the contribution of the site to tourism in the Greater Cape Town area. Finally, we provide an estimate of the overall tourism value of penguins across all the major colonies.

DATA AND METHODS

VISITOR STATISTICS

Visitor statistics for the Boulders colony were obtained from SANParks for 2004 to 2022. CapeNature was not able to share their visitor data for Stony Point for this study due to its being embargoed for use by a Masters student.

SURVEY-BASED ESTIMATES OF EXPENDITURE AND CONSUMER SURPLUS

The estimation of visitor expenditure and consumer surplus associated with the Boulders colony was based on a survey of visitors carried out during November 2023. Permission was obtained to survey visitors outside but not inside the Boulders tourism area as had been done in previous surveys. Surveys were therefore conducted along Kleintuin Road close to the visitor entrance and in the car

park at the beach. The surveys were carried out by a group of trained enumerators, all with tertiary-level qualifications. A total number of 1342 visitors were contacted over the course of five days, out of which 216 agreed to respond to the survey questions. Two interviews were rated as “poor” interview quality and were discarded from the analysis.

QUESTIONNAIRE DESIGN

The questionnaire aimed to collect data on visitor origins and expenditure so as to be able to estimate what they were spending to see the penguins, and their consumer surplus, which is the amount they would have been willing to pay over and above what they had to pay, which is a measure of their welfare gain.

Cape Town residents, domestic tourists from beyond Cape Town, and international tourists were asked slightly different questions as appropriate. Since the questionnaire was delivered using a programmed electronic device, the questions asked were determined by answers to the preceding questions. Questions were addressed to one representative in cases where two or more visitors had made their travel arrangements together.

The first part of the questionnaire enquired about the respondent’s place of origin and their travel method. Respondents were also asked why they chose to come to Boulders today (for the penguins, the beach, or both) and if they still would have come if there were no penguins at Boulders (if they indicated that they were at Boulders to visit the beach or both).

The second part of the questionnaire collected the data required to estimate visitors’ expenditure and to estimate their consumer surplus using the travel cost method. This focused on expenditure and covered questions relating to the size of their companion group, the length of their trip, the expenditure they incurred to get to South Africa and their in-country expenditure (if respondents were international visitors). They were also asked what the percentage of the reason for their whole trip was to visit Cape Town and to see the penguins, if they had been aware of the penguin colony before their trip.

The third part of the questionnaire collected the data required to estimate visitors’ consumer surplus using the contingent valuation method, as a means of triangulating the results of the travel cost method. These comprised questions to elicit their maximum willingness to pay to visit the penguins. The travel cost and contingent valuation methods are described in more detail below.

VISITOR EXPENDITURE

Respondents were asked about their local expenditure, so how much they spent on entry fees, food and beverages, souvenirs, guided tours, local transport as well as any other kind of entertainment and accommodation during their trip. They were also asked for their travel expenditure to get to Cape Town (domestic visitors) or South Africa (international visitors).

Expenditure for international visitors on travelling to Cape Town is mostly made up of the cost of airfare; however, only the portion of the tickets which goes towards the Airports Company South Africa (ACSA) and local ground staff could be counted towards local spending (following Van Zyl and Kinghorn (2018)). The ACSA passenger service charges for international passengers was R238 (ACSA, 2023) and was used to account for each international traveller’s contribution to the South African economy in terms of travel expenditure. Domestic travellers were asked how much they roughly spent on travelling to Cape Town and the reported amount was counted towards their visitor expenditure.

To get to the value of visitor expenditure that can be ascribed to the Boulders penguin colony, international and domestic visitors were asked how much the presence of the penguin colony affected their decision to come to Cape Town (“What percentage of the reason for visiting Cape Town was to see the penguins?”).

Local Cape Town visitors were asked how much their group will be spending on their outing to the Simonstown area (such as on shopping and restaurants), apart from petrol and entrance fees. Local visitors were also asked what percentage of the reason for their outing was to see the penguins to attribute the relevant amount of their expenditure to the Boulders penguin colony.

ESTIMATION OF CAPETONIAN CONSUMER SURPLUS USING TRAVEL COST METHOD

The travel cost method is commonly used to estimate economic use values in the form of consumer surplus associated with recreation sites, especially where the entry is free or potentially underpriced. Consumer surplus is the willingness to pay (WTP) over and above what was actually paid for a visit to a recreational site. In aggregate, it is the area under a demand curve that lies above the price paid. The demand curve is derived from a travel cost model which describes the relationship between the number of trips that people make and the travel costs.

A zonal travel cost method was used to estimate the consumer surplus of Capetonian visitors. The method involves estimating the proportion of visitors that come from different zones of increasing distance away, and the average costs of travelling from those zones. It also requires information on total visitor numbers (obtained from entry statistics), and of the populations of the zones (obtained from census data). In general, the method is more easily applied for local tourism than for domestic or international tourism which usually involves multiple destination trips.

Following Lewis *et al.* (2012), zones were created using travel distances from Boulders and travel costs were calculated for each zone averaging the distance from the three most common suburbs of origin for each zone and multiplying this by the cost of road travel for a standard vehicle. The zones are varying in shape and size due to geographical features and roads which impact travel distances (Zone 1 < 15 km, 2 = 15–30 km, 3 = 30–45 km, 4 = 45–60 km, 5 > 60 km). The population size of each zone was calculated using the Census 2011 data, inflated to 2023 values¹. Total travel costs per travel group were converted to costs per adult based on the number of adults in the group. The relationship between visitation rate per zone and travel cost per zone (the travel cost model) was used to derive a demand curve by imputing hypothetical increases in entry fees to predict changes in visitor numbers. The demand curve was then used to estimate consumer surplus through integration.

¹ NB this analysis can be updated when 2022 Census data becomes available. At the time of writing, the Census 2022 was not available yet.

ESTIMATION OF TOURIST CONSUMER SURPLUS USING CONTINGENT VALUATION METHOD

The contingent valuation method (CVM) is another method that can be used to estimate willingness to pay for something, and that can be used to estimate consumer surplus. CVM involves asking respondents directly how much they would be willing to pay for a particular product, service, or resource (Carson, 2000). It represents the monetary value that consumers attach to the perceived benefits or utility they expect to receive from the product, service, or resource (Hanemann, 1991).

WTP can be elicited using open-ended questions, dichotomous choice (yes/no) questions, or payment cards where respondents choose from a range of options (Donaldson, Thomas & Torgerson, 1997). The most widely used approach is to ask respondents whether they are willing to pay x for a specific type of service and varying the value of x across respondents. Varying the value of x allows the researcher to map the demand curve. Having respondents answering yes or no has been argued to be aligned with the real world where decision-makers either decide to purchase a product or service or to not make the purchase (Donaldson *et al.*, 1997).

All survey respondents were asked if they would have been willing to visit Boulders if the entrance fee had been higher. Values were increased by 20%, 50%, 100%, 150%, 200%, and 300% and randomly allocated to visitors. Values were given in Rand for South African residents and SADC residents but in US\$ for international visitors. Respondents were addressed as follows: “The current entrance fee for (South African residents/SADC residents/international visitors) is RXX per adult (RXX per child). If the entrance fee had been RXX per adult (*note the value is randomly increase by either 20% / 50% / 100% / 150% / 200% / 300%*) would you have visited Boulders today?” If the respondent was a Wild Card user, the following explanation was added: “Imagine that Wild Cards don’t exist, and you had to pay an entrance fee at the gate.” This was followed by asking survey respondents about the highest amount that they would be willing to pay as an adult daily entrance fee for Boulders using a payment card.

To analyse the payment card responses, firstly, a non-parametric Turnbull lower bound approach was used as it allows to calculate lower bounds of WTP without assuming a distribution for the unobserved parts of preferences (Haab & McConnell, 2002). The method has been widely used in the literature to estimate average WTP values analysis (see for example Haefele *et al.*, 2019 and Ren *et al.*, 2022). This approach assumes that when a survey respondent selects a certain value on the payment card, his or her WTP is not less than the stated cost. We then also computed WTP estimates using both the Weibull and mixed Weibull distribution families (following Turnbull, 1976). Additionally, nonparametric WTP estimates were derived by leveraging the empirical survival function. Nonparametric estimates offer a more straightforward approach compared to parametric estimates since they do not rely on any distributional assumptions for unobserved preferences. In our approach, we assume that respondents' WTP falls between the chosen value and the subsequent highest value. All models were fitted using R software.

ESTIMATES OF TOURISM CONTRIBUTION BASED ON REGIONAL DATA

An alternative technique for estimating the contribution of natural attractions to tourism income is to disaggregate regional data, since statistics are often collated at this level. Following Turpie *et al.*, (2021), we use spatial data on the density of geotagged photographs uploaded to internet sites to map relative levels of interest in various attractions, and to isolate the value of the penguin colonies.

First, we isolated the expenditure on visiting attractions as opposed to business travel, based on tourism data for South Africa from the World Travel & Tourism Council’s (WTTC) which splits tourism numbers by purpose of visit. The WTTC data also gives information on the share of tourism expenditure allocated to leisure, recreation, and holiday (70%) compared to business travel (30%).

Tourist who are in South Africa on holiday account for most of the expenditure on visiting tourism attractions. Tourists whose main purpose is business travel tend to spend much less of their money on visiting attractions. It was assumed that the expenditure of tourists who travel for holiday purposes only is 100% related to attractions, such as nature and culture related tourism, while only 10% of business travel expenditure is related to attraction-based tourism (Table I).

Using the percentage spend for each group of tourists and the percentage spent on attractions (Table I), we estimated that approximately R170.1 billion and R7.3 billion of total domestic and foreign tourism spend was spent on what were primarily leisure and business trips, respectively, on visiting attractions.

We used spatial variation in the density of geo-tagged photographs uploaded to Flickr to estimate the spatial spread of tourism value generated by tourism attractions. The data was collected through the InVEST Recreation Model which provides data as Photo User Day (PUD), which means that one user has taken at least one photo on a specific day. The average PUD count per year was calculated from data between 2005 and 2017. The annual average PUD count in South Africa was 12719 in urban areas and 7601 in non-urban areas. Based on previous studies (UBOS, 2023; World Bank, 2023), it was assumed that 69% of pictures in non-urban areas and 43% of pictures in urban areas were attraction based. Based on this, we could calculate the average value per PUD for urban and non-urban areas.

The tourism spend on attractions was spatially allocated in proportion to photo density. We first calculated the attraction-based tourism level on a district level by multiplying the value of one PUD by the number of PUDs per district. We also estimated the proportion of district attraction-based tourism value coming from the various penguin colonies by dividing the number of PUDs in the colonies by the number of PUDs per district. From this we were then able to estimate the total value of each penguin colony.

Adjustments were made to the InVEST-generated PUD densities by the percentage of photos that were penguin-based at Robben Island and Dyer Island, where attractions other than penguins are dominant. This was assessed by determining the proportion of photos having penguin-related content in a sample of 300 photos at each locality.

Table I. Typology of tourists, and the % of each type of foreign tourist undertaking nature-based activities. % engaged in nature-based tourism was taken as the maximum of the three subcategories.

Type of tourist	Purpose of visit	Spend R million	Spend % of total	% spend attractions	Attraction-based value-added R million
Holiday	95%	106 598	70%	100%	170 099
Business	5%	45 903	30%	10%	7 325

RESULTS

TRENDS IN VISITOR NUMBERS AT BOULDERS

Visitor statistics for Boulders were obtained from SANParks for 2004 to 2022. These show that visitor numbers at the colony increased from around 578 000 in 2004 to a peak of 924 000 in 2017 (Figure 2). Exposure to international events is very evident in the long-term trends, with visitor numbers having declined during the aftermath of the global financial crisis in 2008, and the Covid-19 pandemic in 2020-2022 (Figure 2). Based on the past trend, once global tourism has fully recovered from the pandemic, one could expect tourism demand to exceed a million visitors per year in the near future.

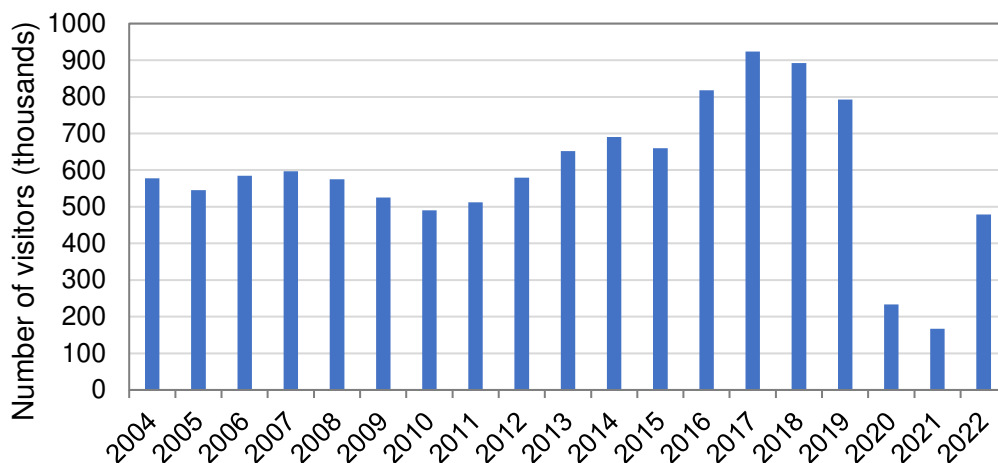


Figure 2. Visitor numbers for Boulders penguin colony 2006 to 2023; Data source: SANParks (2023d).

Although the peak of the breeding season when penguins are more visible at the colony is February to August (peaking in March to May), and penguin numbers on the beach are lowest in September-October, seasonal variation in visitor numbers is largely driven by general tourism trends. The Boulders penguin colony is mostly visited in the South African summer months (Figure 3). The busiest months are November to January, when about 2000-5000 people visit the colony per day. Relatively fewer people visit the colony in the winter months of May to July (Figure 3).

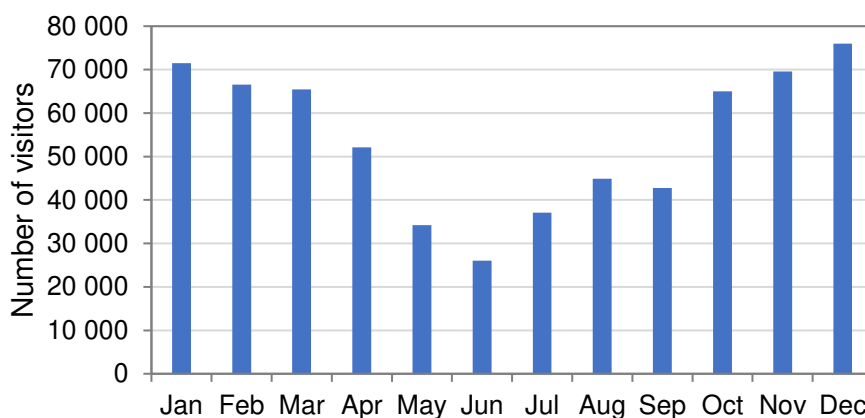


Figure 3. Average monthly visitor numbers for Boulders penguin colony (2005 to 2019); Data source: SANParks (2023d).

Until 2019, all visitors paid the same entry fee to visit the Boulders colony. Then, SANParks introduced variable pricing based on origin. International visitors pay the highest fee, a slightly lower fee is charged for SADC residents, and South African citizens and residents pay the lowest fee. The price structure was introduced to capture some of the higher willingness to pay of overseas visitors without reducing accessibility to South African citizens and residents. The new pricing structure may explain the slight reduction in visitor numbers in 2019. In 2010, all visitors paid R35 (Lewis *et al.*, 2012), which is equivalent to about R70 in today's terms. Visitor prices in 2024 are R190, R95 and R45 for international, SADC and domestic visitors, respectively. This means that in real terms, entry fees have effectively doubled for international visitors and almost halved for South Africans relative to 2010.

Most of the growth in visitor numbers is due to growth in numbers of international visitors. The proportion of international visitors grew from 44% in 1995 to 88% in 2019 (Table 2). Unfortunately, the effects of the pandemic mask any trends in the data beyond 2019. Previous studies which broke down visitor numbers according to user groups before the differential tariff structure was introduced showed that while in 1995/1996 the majority of Boulders visitors were South Africans (Cape Town residents made up 34.7% of visitors and domestic tourists made up 21.3%; Morgan, 1996), the proportion of international tourists increased by the year 1999/2000 (based on SANParks unpublished data; Lewis, Turpie & Ryan, 2012). Lewis *et al.* (2012) collected survey data at Boulders and found that most visitors at the penguin-viewing site were international (89%), while most beach visitors were Cape Town residents (50%) followed by international visitors (38%) and domestic visitors (12%). Most international tourists came from Europe (52%, mostly France, Germany, Netherlands, and the United Kingdom) and Asia (32%, mostly China, India and Japan). Less than 1% of visitors came from other African countries. In 2009/2010, 78.8% of visitors were international (Lewis *et al.*, 2012) which increased further as in 2019, 88% of visitors were international (including both SADC and international visitors; SANParks, 2023d).

Table 2. Proportion and numbers of visitors to Boulders penguin colony; Date sources: Morgan, (1996); Lewis *et al.*, (2012); SANParks, (2023d).

User group	1995/1996		1999/2000		2009/2010		2019	
	Proportion (%)	n	Proportion (%)	n	Proportion (%)	n	Proportion (%)	n
Cape resident	34.7	92 300	25.0	85 750	15.9	90 182	12.0	94 879
Domestic tourist	21.3	56 700	18.0	61 750	5.3	30 104		
International	44.0	117 000	57.0	195 500	78.8	446 550	88.0	698 045
		266 000				566 836		792 924

This trend in increasing international visitors to Boulders penguin colony is in line with the international visitor trends in the Western Cape over the same time period (Figure 4; Wesgro, 2016, 2018). International visitor numbers to the Western Cape increased by around 44% between 2014 and 2019. Boulders penguin colony visitor numbers increased by 33% between 2014 and 2017. After 2017, visitor numbers decreased at Boulders, whereas they continued to increase in the Western Cape (Figure 2; Figure 4). Although numbers were slightly down in 2018, this does support the fact that the bigger drop in 2019 could have been at least partly due to the increased prices, as economic theory would predict.

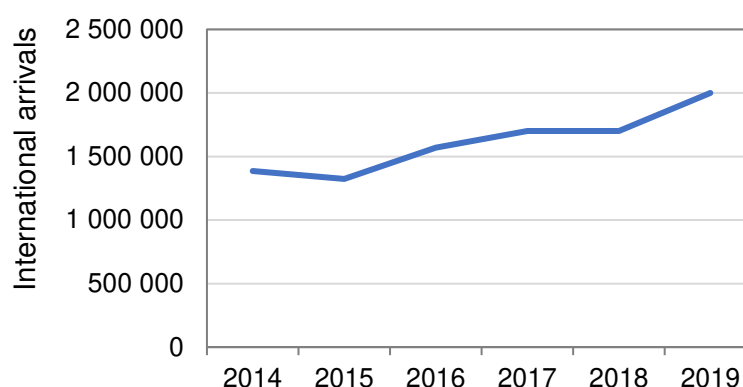


Figure 4. International tourist arrivals in the Western Cape 2014 – 2019; Data source: Wesgro (2016, 2018).

REVENUES GENERATED FROM BOULDERS

Assuming an entrance fee of R75 for adults and R40 for children before the differential tariff structure was implemented and a tariff of R40 for domestic visitors (R20 for children), R80 for SADC visitors (R40 for children) and R160 for international visitors (R80 for children) from April 2019 onwards, it is estimated that Boulders generated a revenue of R94.7 million through entrance fees in 2019.²

CONSUMER SURPLUS OF BOULDERS VISITORS

CHARACTERISTICS AND BEHAVIOUR OF SAMPLED VISITORS

Some 31% of the respondents were South African, 1% from SADC countries, and 68% were international visitors. In terms of domestic visitors, 64% were from Cape Town, 6% from the Western Cape and 30% from elsewhere in South Africa. The SADC visitors were from Namibia, Zimbabwe, and Botswana. International visitors mostly came from the UK, the USA, Germany, Canada, and France (Figure 5).

Domestic visitor groups were 93% adults and 7% children, while Cape Town visitor groups on average consisted of more kids (83.5% adults; 16.5% children). International visitor groups were 93.5% adults and 6.5% children.

² Note that we did not have an official breakdown of adult / children visitors from SANParks, so we applied the rate of adult / children visitors from the tourism survey conducted for this study.

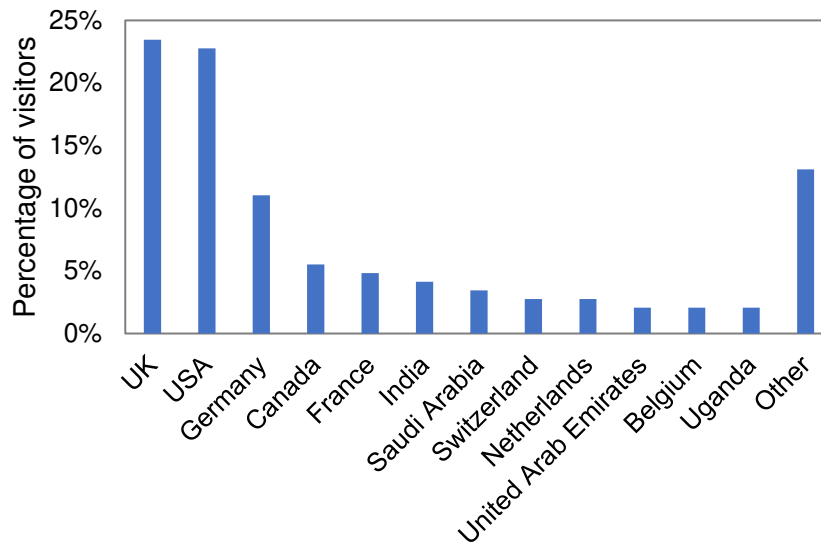


Figure 5. Percentage composition of international visitors by origin.

Capetonians mostly drive to Boulders (86%); only 12% of Capetonians were part of a tour bus and 2% walked to the penguin colony. Most visitors who do not reside in Cape Town but came from elsewhere in South Africa, Africa or overseas were self-drive visitors (60%) and 36% were part of an organised tour.

The majority of visitors who were not part of an organised tour (70%) came to Boulders to see the penguins (Figure 6). Around 20% of visitors indicated that they came for the penguins as well as for the beach (Figure 6). Around 7% of visitors said that they came to the colony to show their guests the penguins (Figure 6). For the visitors who were part of an organised tour, 52% indicated that seeing the penguins was the main reason for them to select the tour; 39% of tour participants indicated that it was a combination of factors, including penguins; 10% indicated that they were mostly interested in visiting Cape Point. Out of the visitors who came to Boulders to go to the beach or to go to both the beach and to see the penguins, 61% would still have come if there were no penguins and 39% would not have come.

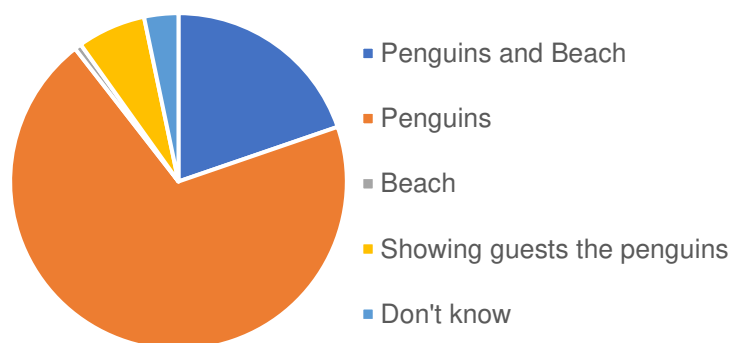


Figure 6. Main reason for visiting Boulders for visitors who were not part of an organised tour.

Awareness of the penguin colony before visiting Boulders was 83% amongst visitors from elsewhere in South Africa or abroad; only 17% of visitors did not know about the penguins before visiting the colony (this being possible for guests on a private or organised tour, e.g. of the peninsula).

Out of those who were aware of the penguin colony before coming to Boulders, on average, international visitors and visitors from elsewhere in South Africa indicated that 19% (median 10%) of the reason for their trip to Cape Town was to visit the penguins while Cape Town residents on average indicated that 62% (median 73%) of their reason for their outing to Simonstown was to see the penguins.

Around 88% of respondents indicated that their expectations were either exceeded or matched while only 12% of respondents indicated that they were unhappy with their experience; 10% of visitors indicated that their experience provided them with less than expected and 2% of visitors responded that they received much less than expected (Figure 7).

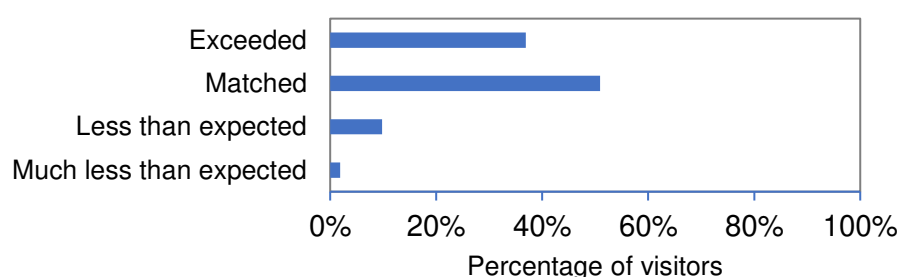


Figure 7. Level of satisfaction of all visitors (domestic, SADC, international) with their experience at Boulders penguin colony.

Most visitors paid the gate entry fee, and the second largest group were those whose fee had included in their tours (Figure 8). Around 17% of respondents did not enter the SANParks viewing facility but chose to go for a walk on the boardwalk and see the penguins from there. Very few visitors accessed the facility using a SANParks Wild Card (Figure 8).

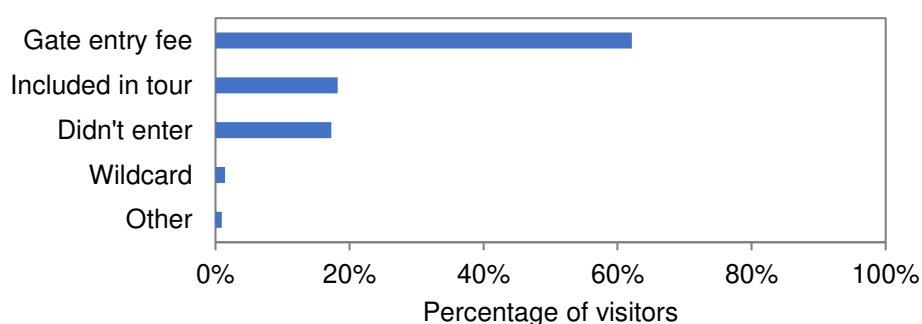


Figure 8. Payment method to get into Boulders used by all visitors (domestic, SADC, and international).

Out of the people who did not enter the SANParks viewing facility, 73% were South African residents, either from Cape Town or elsewhere in South Africa. The main reason for not entering this area was to avoid the entrance fee, followed by avoiding the crowds. Other reasons for not entering included

just wanting to go for a walk, having been to the colony before, not wanting to disturb the penguins, and not having enough time to go in.

CAPETONIANS' CONSUMER SURPLUS BASED ON TRAVEL COSTS

In addition to the visitors which travel from further away, such as from elsewhere in South Africa or from overseas, Boulders also provides benefits to local residents. Lewis *et al.* (2012) used the travel cost method to show that visitation rates to Boulders decreased with increasing travel costs for Cape Town residents. Using this relationship to construct a demand curve, the overall consumer surplus of Cape Town visitors was estimated to be R4.5 million per year, or around R20 per visit (in 2010 Rands). For comparison, a study in 1995 showed similar travel costs (R32, in 2010 Rands) and consumer surplus was estimated to be R28 per visit (in 2010 Rands; Morgan, 1996). Cape Town residents attributed 64% of the reason for their trip to Boulders to the penguins. Total WTP for access to Boulders was estimated at R45.60 per person, which was 78% more than what Cape Town residents paid at the time.

As with the previous studies, this study found that visitation rates to Boulders decreased with increasing travel costs (Figure 9). Total consumer surplus for Cape Town residents was R2.9 million, which is around R51 per visitor. These findings are closer to Morgan (1996)'s consumer surplus of R54 per visitor in 2023 Rands than Lewis *et al.* (2012)'s R37 per visitor in 2023 Rands. Lewis *et al.* (2012) estimated an aggregate consumer surplus of R4.5 million which was much larger than Morgan (1996)'s 1995/1996 estimate of R208 000 in 2010 Rands.

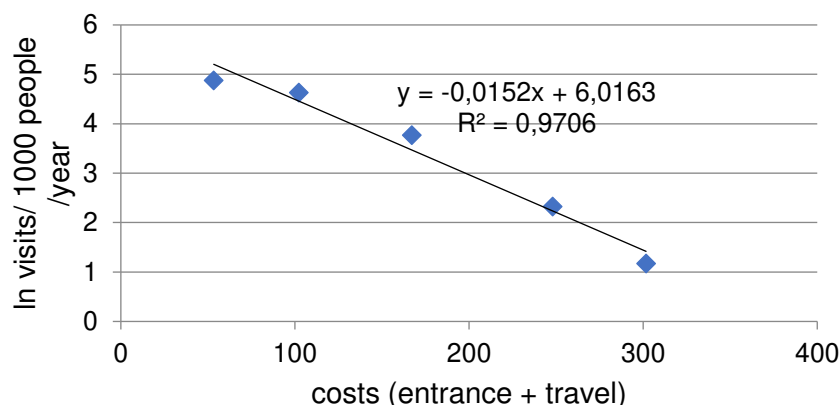


Figure 9. Relationship between visitation rate of Cape Town residents to Boulders and the travel cost of visiting Boulders, including entrance fee (R45)

VISITORS' CONSUMER SURPLUS BASED ON CONTINGENT VALUATION

A payment card was used to elicit people's WTP. This approach assumes that when someone selects a value on the payment card, their WTP is at least that amount. Consumer surplus was estimated using different statistical methods to compare results. The first and second columns in Table 3 use the actual values chosen on the card, calculating the mean and median (following Haefele *et al.* 2019). The other two columns show the results of fitting a Weibull distribution to the data to consider the shape and spread of the data (following Turnbull 1976). The nonparametric estimate indicates that the CS was R341 for international, R75 for SADC and R55 for domestic visitors (shown in column 3; Table 3). We further estimated the mean CS based on the parametric Weibull model which takes the self-selected intervals as Turnbull intervals and shows that the mean CS for international visitors was R297, R61 for SADC and R44 for South Africans (shown in column 4; Table 3).

Table 3. Consumer surplus (CS) estimates for access to Boulders for international, SADC, domestic visitors, and Cape Town residents.

	(1)	(2)	(3)	(4)
User group	Mean CS	Median CS	Mean CS (based on the nonparametric estimator)	Mean CS (parametric Weibull model)
International visitor	US\$13.15 (R250)	US\$10 (R190)	US\$17.97 (R341)	US\$15.65 (R297)
SADC visitor	R55	R50	R75	R61
Domestic visitor	R39	R25	R55	R44
CT residents	R42	R30	R60	R46

Using the annual visitation rates and the nonparametric WTP estimates, the estimated total consumer surplus of the Boulders penguin colony is R222 million³. Most of the consumer surplus comes from international visitors as their consumer surplus is R220 million, SADC contributes R0.6 million to the total WTP, domestic visitors R1.7 million, and Cape Town residents R3.0 million. International visitors are the largest visitor group and have the highest WTP to see the penguin colony.

Through the travel cost method, it was estimated that consumer surplus for Cape Town residents was around R51 per visitor. This is very close to the consumer surplus of R60 which is based on the mean nonparametric WTP estimate, calculated using the Weibull model (Table 3).

TOURIST EXPENDITURE ATTRIBUTABLE TO BOULDERS

ESTIMATES BASED ON REPORTED EXPENDITURES AND INTERESTS

The average per person spending of international visitors, including overseas visitors as well as visitors from other African countries, was US\$1894 (median US\$1266) over the duration of their trip. On average, international visitors spent US\$1942 (median US\$1000) per person on travelling to South Africa. However, most of this expenditure would have accrued to airline companies outside of South Africa. We included the ACSA passenger service charges for international passengers which would go towards local ground staff and could therefore be counted as local spending. According to the ACSA website, the most recent ACSA charge was R238 (US\$12.53; ACSA, 2023). All international expenditure reported in by respondents in the survey was converted from the respondent's chosen currency into USD. The mean total trip duration was 27 days; median total trip duration was 14 days. On average, visitors spent eight days in Cape Town with the median being five days. The average percentage contribution of the penguin colony to the reason for international visitors visiting Cape Town was 18% (median 10%). Using this, it could be estimated that spending attributed to the Boulders penguin colony was US\$41-182 per person.

SADC visitors on average spent US\$888 per person during their trip (median US\$1053) and spent an average of US\$339 per person (median US\$351) on their travel to South Africa. All SADC visitors in our sample came to South Africa with the sole purpose of visiting Cape Town. Based on the average

³ Please note that we used the number of visitors for 2019 as this was a pre-pandemic year for which total annual statistics were available. Domestic visitors refer to South African residents who do not live in Cape Town and percentage allocation was based on results from the survey conducted for this study (36%). Similarly, we used the results from the survey to exclude children from the estimation.

and median percentage reason for coming to Cape Town being ascribed to their interest in seeing the penguins at Boulders (both 5%), their expenditure that could be ascribed to the Boulders penguin colony was estimated as US\$39 per person.

Domestic visitors on average spent R6718 per person (median R5000) on their trip and spent 95% of their trip time in Cape Town. The average trip duration was six days, and the median trip time was four days. On average, the percentage of reason for visiting Cape Town due to the penguins was 28% (17.5% median). Therefore, the value that can be attributed to the Boulders penguin colony from South African visitors (excluding Cape Town residents) could be estimated as R804 - R1050 per person.

Cape Town residents on average spent R132 per person (median R75). On average, the percentage of reason for visiting Simonstown due to the penguins was 62% (73% median). Based on the survey done for this study, 64% of domestic visitors were from Cape Town. The value that can be attributed to the Boulders penguin colony from Cape Town residents could be estimated as R43 – R87 per person.

Table 4. Local expenditure for international, SADC and domestic visitors (Boulders penguin colony).

User group	Per visitor expenditure ascribed to Boulders		Estimated number of adult visitors ¹	Total expenditure	
	Average	Median		Average	Median
International visitor	US\$182	US\$41	644 949	R2 230 233 381	R502 415 212
SADC visitor	US\$39	US\$39	7 496	R5 554 596	R5 554 596
Domestic visitor (non-CT)	R1050	R804	31 717	R33 302 529	R25 500 222
CT residents	R87	R43	50 678	R4 409 006	R2 179 164
Total				R2 273 499 512	R535 649 194

¹ Please note that we used the number of visitors for 2019 as this was a pre-pandemic year for which total annual statistics were available and applied the percentage of adult visitors from the visitor survey conducted for this study.

Using this method, the estimated total tourism expenditure attributed to the Boulders penguin colony is estimated at R535.6 million (based on median; Table 4) to R2273 million per annum (based on average; Table 4). This is comparable to the high-level estimate of Van Zyl & Kinghorn (2018) of R311 million per year in 2018, which is equivalent to around R415 million in 2023 terms.

ESTIMATES BASED ON SPATIAL DATA

Another method to estimate the economic impact of the penguin colonies on tourism revenue involves leveraging spatial data reflecting the frequency of geotagged photographs shared on the online platform Flickr (Figure 10). This data serves as a proxy for the level of tourism expenditure which can be attributed to the various colonies.

The photo data analysis suggested that the tourism expenditure which can be attributed to the Boulders penguin colony in 2022 was R505 million. This is in line with the value of R311 million per year in 2018 (or R391 million in 2022 terms) estimated by Van Zyl & Kinghorn (2018) as well as the value estimated from the visitor survey in this study of R535.6 -2273 million per annum (based on the median and average estimates, respectively).

Note that the expenditure attributed to visiting the penguin colonies are taken from country-wide data and that the expenditure attributed to the penguin colonies is orders of magnitude greater than

the revenues from entrance fees (where applicable, such as at Boulders penguin colony). As for all national accounting, this does not include the positive economic effects it has on other sectors.

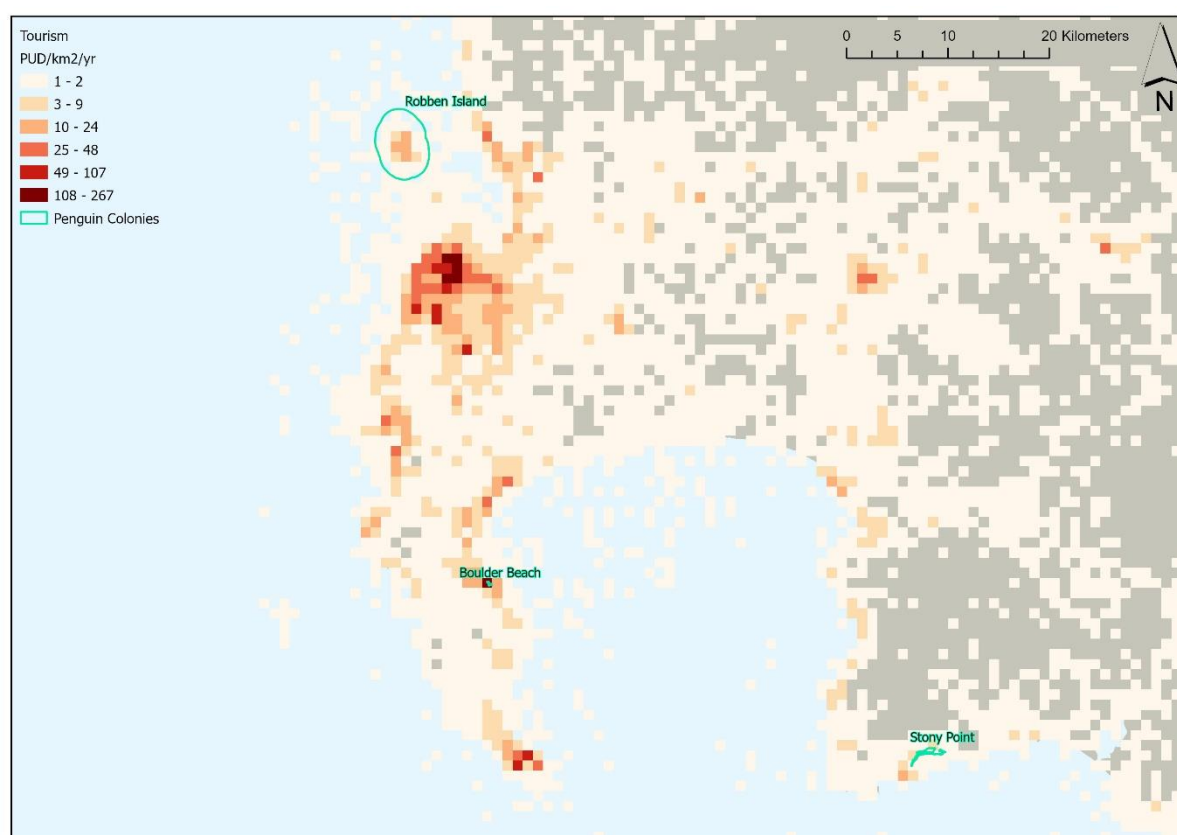


Figure 10. Spatial distribution of tourism expenditure value across the wider Cape Town region

SUMMARY OF VALUES ASSOCIATED WITH BOULDERS COLONY

The direct value of the colony is the **total willingness to pay** for entry to see the Boulders colony of the existing visitors. This comprises the amount actually paid at the gate (revenues to SANParks) plus their consumer's surplus (the difference between their willingness to pay and the amount actually paid). These were estimated as follows, generating a total value of R94.7 million + R3 million + R222 million.

- *Revenue generated by SANParks through entrance fees to Boulders:* Assuming an entrance fee of R75 for adults and R40 for children before the differential tariff structure was implemented and a tariff of R40 for domestic visitors (R20 for children), R80 for SADC visitors (R40 for children) and R160 for international visitors (R80 for children) from April 2019 onwards, it is estimated that Boulders generated a revenue of R94.7 million through entrance fees in 2019.
- *Consumer surplus of Cape Town residents* was estimated to be around R3 million, both based on the Contingent Valuation Method as well as the Travel Cost Method.
- *Consumer surplus of domestic and international tourists:* Using the annual visitation rates and the nonparametric WTP estimates, the estimated total consumer surplus of the Boulders penguin colony is R222 million. Most of the consumer surplus comes from international visitors as

their consumer surplus is R220 million, SADC contributes R0.6 million to the total WTP, domestic visitors R1.7 million.

In addition, we have estimated the **economic impact** of the colony through its contribution to tourism expenditure in the country in general. This is the proportion of tourism expenditure attributed to the penguin colony based on its contribution to attracting visitors to the Cape Town area. This was estimated to be between R505 million and R2273 million, as follows:

- *Based on visitor surveys:* Total expenditure in South Africa related to the Boulders penguin colony, based on trip expenditure and the reported degree to which penguins played a role, was estimated as R535.6 million to R2273 million in 2023 based on median and average visitor expenditure, respectively.
- *Based on spatial data on tourism attraction:* Using the photographic analysis, and using fairly conservative assumptions, it was estimated that the penguin colony accounted for approximately R505 million of tourism expenditure.

The total value of Boulders penguin colony is hence estimated at R505 - 2593 million, including entrance fees, tourism expenditure attributable to the penguin colony and consumer surplus of all visitors.

ESTIMATED VALUE OF ALL SOUTH AFRICAN COLONIES

Based on the photo data analysis, the areas around the penguin-colonies contributed a total of R613.3 million to tourism expenditure in 2022 (Table 5). The value for Robben Island and Dyer Island was adjusted as the islands are mostly visited for other reasons than seeing penguins. However, Dyer Island does not have visitors on the island itself, but boat-based tourism. We analysed the first 300 pictures uploaded to Flickr for penguin content and adjusted the tourism expenditure value accordingly. Boulders contributes the largest amount of expenditure, followed by Stony Point (Table 5). As Boulders tourism value was calculated separately in the previous sections, the tourism value attributed to Boulders needs to be deducted from the total tourism expenditure value attributed to Penguin colonies across South Africa. This gives us an estimated total value of R108.3 million for all other South African colonies. The total value of Boulders penguin colony and all other penguin colonies was hence estimated as R613 million to R2702 million.

Table 5. Total tourism expenditure attributed to the Penguin colonies for 2022 based on the photo data analysis.

Penguin colony	Tourism expenditure in R million
Boulders	505.0
Stony Point	55.6
Dassen Island	20.6
Bird Island	11.3
Robben Island	10.9
Dyer Island	5.7
St Croix Island	4.1
Total	613.3
Total (excluding Boulders)	108.3

To estimate the number of jobs associated with visitor spending, an employment multiplier was estimated based on the Tourism Satellite Account for South Africa for 2019 (StatsSA, 2023b). A multiplier of 1.7 direct jobs per R1 million spent by tourists was applied in order to obtain the direct jobs associated with visitor expenditures. Since the total value of all South African penguin colonies was estimated as R613 million to R2702 million, this indicated that a total of 1046 to 4611 jobs are linked to the penguin colonies.

3. EXISTENCE VALUE

OVERVIEW

Existence values in environmental economics reflect the benefits that people receive from knowing that for example a particular species, such as African penguins, exists. South Africans attribute value to the existence of penguins even if they never aim to visit them; they are still interested in them and benefit from their existence. People are willing to pay for the existence of biodiversity without the intention of ever utilising or experiencing it. Their WTP could be motivated by environmental ethics, altruism or because they want future generations to benefit from the penguins too.

However, such value of biodiversity and species is rarely measured (Turpie, 2003). In light of competing national budgets, it is imperative to understand such value to highlight the importance of biodiversity conservation (Turpie, 2003). South African penguins are an integral part of South Africa's natural heritage. As there is no market for the existence value of penguins, economic value can be estimated through surveys which asks survey respondents about their WTP.

A survey of approximately 400 Capetonians was conducted using convenience sampling methods that result in a representative sample across different socio-economic strata. The survey focused on understanding the extent to which residents are aware of and care about the future of penguins, the extent to which they have heard about or experienced them, and how. The survey also elicits respondents' willingness to pay towards the conservation of the African penguin, from which a monetary estimate of existence value is derived.

DATA AND METHODS

DATA COLLECTION

A survey-based method, the contingent valuation method, was used to estimate the existence value of African penguins to South Africans. This was based on a survey carried out in Cape Town. The survey was designed in two stages: the initial design was tested on 20 individuals; several small changes were made to the survey design after the initial testing stage. The survey was carried out by a group of enumerators who were trained on the questionnaire and how to administer it. Face-to-face interviews were conducted with randomly selected people from the queues outside of the Department of Home Affairs (DHA) in Cape Town (Barrack Street) and Wynberg in December 2023. Participants were only interviewed if they gave their consent and were a South African citizen or resident. The DHA queues were chosen because they comprise a broad cross-section of South African society, as citizens and residents need to apply for official documents in person. Furthermore, the participants are generally available and willing to be interviewed, given the long waiting times. This provided a convenient and relatively stress-free means of obtaining a representative sample.

QUESTIONNAIRE DESIGN

The first section covered the respondents' interest in nature and their knowledge of penguins. This included questions on their interest in wild nature, whether governments should be setting aside funds to protect species conservation, and whether they donated to organisations that work to protect wildlife or the environment in the last year. They were asked whether they knew that it is possible to see penguins in the wild in South Africa, whether they were aware of the African penguin being an

endangered species, if they had ever seen a penguin. If they had, they were asked where they had seen them (wild, aquarium or both), and how they got to see them, for example through an educational trip, and organised tour, independently, or by chance.

The second section covered the questions regarding respondents' willingness to pay into a conservation fund specifically focusing on penguin conservation. Depending on whether respondents said yes or no to these questions, they were asked to choose one statement on the most important reason why they would or would not pay for penguin conservation. Participants were also asked if they would have gone ahead with setting up the payment. The WTP elicitation process is explained in more detail in the following section.

The final section of the questionnaire asked respondents about their socio-economic background, including the suburb in which they live, their highest level of education, and their household's gross monthly income before tax. Enumerators also filled in the respondent's gender, age group, and racial background, and noted the quality of the interview.

ELICITATION OF WILLINGNESS TO PAY

When eliciting WTP, some limitations and biases need to be considered and controlled to ensure the results' validity and reliability. Hypothetical bias refers to respondents giving a socially desirable answer rather than a true one because their choices are not required to be supported with any real monetary commitments. Strategic bias refers to respondents misrepresenting their preferences to influence the decision-making process (Bennett & Blamey, 2001). Respondents may believe that if enough positive responses are given, conservation levels will increase; however, the respondents themselves would only be able to pay less than their stated amount. Such biases can be controlled through careful survey design as well as developing realistic WTP questions and payment vehicles. Strategic bias was reduced through ensuring participants prior to the survey that their responses are confidential and their identity would remain anonymous (Meginnis *et al.*, 2021; Thapa *et al.*, 2022).

WTP can be elicited through several techniques, including a payment card, open-ended questions, iterative bidding, and dichotomous choice (Covey, Loomes & Bateman, 2007). The open-ended approach commonly results in many non-responses. In the single bounded dichotomous choice survey respondents are randomly shown an amount and asked whether they would pay a certain amount ("yes/no"). While this type of question is the easiest one to answer for survey respondents, they only elicit whether the respondents' WTP is greater or smaller than the bid amount they were offered. This means that little valuation information is gathered from each respondent, requiring large sample sizes (Hanemann, Loomis & Kanninen, 1991).

In this study, WTP was elicited using a payment card approach. The payment card gives a relatively precise lower bound at small sample sizes and is easy to use with low experimental complexity (Covey *et al.*, 2007; Haefele *et al.*, 2019; Thapa *et al.*, 2022). Studies using payment cards include the option to give a zero WTP response and a value that is higher than the amounts displayed on the card (Haefele *et al.*, 2019). Increments between each bid increase at an increasing rate (Haefele *et al.*, 2019). This method has also been used in estimating the value of endangered species in other localities, for example in the investigation of WTP for Crested Ibis conservation in China (Ren *et al.*, 2022), for the protection of Elliot's pheasant (*Symaticus ellioti*) in Qianjiangyuan National Park in Zhejiang, China (Sun *et al.*, 2023), as well as for conservation in general, such as a study to assess tourists' WTP for upstream restoration and conservation measures in the Masai Mara National Reserve in Kenya (Pedroso & Biu Kung'u, 2019).

The payment card was also selected as the appropriate payment vehicle for this study since household income in South Africa is extremely unequal. Randomly assigning a value to ask for households' WTP, such as in the dichotomous choice method, might create situations where lower income households are asked about relatively high, unrealistic WTP values, which could create negative sentiments towards the survey or lead respondents to overstate their WTP because the question makes them uncomfortable. Using a payment card method helps to avoid this situation. According to best practices, while answering the questionnaire, respondents were reminded that they need to consider their budgetary constraints and not only the issue in question (Fankhauser, Tol & Pearce, 1998; Turpie, 2003).

WTP estimates were calculated based on the Weibull and mixed Weibull families of distribution and nonparametric WTP estimates were based on the empirical survival function. Nonparametric estimates are more simplistic than parametric estimates as they do not make any distributional assumptions for the unobserved component of preferences. Respondent's WTP was assumed to be located above the chosen value and below the next highest value. Models were fitted using the R software.

RESULTS

SAMPLE CHARACTERISTICS

A total of 735 people were approached, out of whom 420 were eligible and agreed to answer the survey. Twenty-eight observations were dropped due to poor interview quality or being incomplete, resulting in a final sample of 392 interviews. 53% of these were collected at Cape Town and 47% at Wynberg.

Around 55% of the survey respondents were female and the respondents came from 89 different Cape Town suburbs. Race composition of the sample was closely in line with the distribution in the City of Cape Town (Table 6; City of Cape Town, 2023). A Chi-square test did not show a significant difference between the population group composition of the sample from that of the City of Cape Town. However, the sample was more educated. Very few respondents had no education or only primary school education; 36% of respondents indicated that they had completed matric (Table 6). Around 35% of respondents had completed a diploma or a higher education degree, which was significantly higher than the 20% of population reported in the latest Census 2022 (City of Cape Town, 2023; $p < 0.01$).

Households came from a wide range of income groups (Table 6). Households for which no income data was available because they preferred to not state their monthly household income, income was imputed based on the average income for their suburb, taken from Stats SA's Census 2011 and inflated to 2023 values. Income between the Census 2011 (adjusted for 2023 prices) and this sample was significantly different ($p < 0.01$). There was an oversampling of households earning in the higher categories of R25 601 or more per month and an undersampling of households earning less than R6401 per month.

Table 6. Demographic characteristics of sample (N=392)

Income category (ZAR per hh per month)	%	Education level	%
R1- R400	4%	None	1%
R401 – R800	5%	Primary	2%
R801 – R1600	4%	Secondary	24%
R1601 – R3200	7%	Matric	36%
R3201 – R6400	9%	Diploma	17%
R6401 – R12 800	12%	Degree	18%
R12 801 – R25 600	9%		
R25 601 – R51 200	9%		
R51 201 – R102 400	3%		
R102 401 – R204 800	2%		
R204 801 or more	2%		
Prefer not to say	21%		
No income	13%		
Age group	%	Race	%
18-30	38%	Black African	38%
31-45	35%	Coloured	45%
45-60	20%	Asian	1%
> 60	6%	White	16%

INTEREST IN NATURE AND PENGUIN AWARENESS

Most respondents rated their interest in wild nature as either high (appreciate nature a lot), or moderate (enjoy nature sometimes) (Figure 11). Around 24% of survey respondents indicated that their level of interest in nature was “very high” (Figure 11).

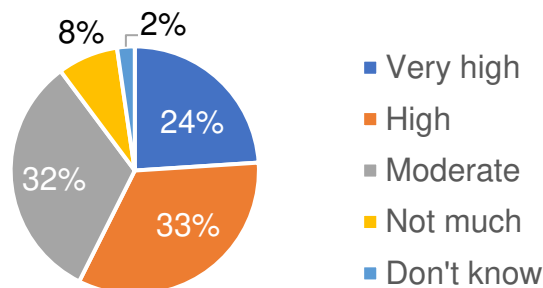


Figure 11. Survey respondent's level of interest in wild nature.

Three quarters of respondents indicated that they thought that it was important that governments set aside funds to protect species from going extinct (Figure 12). 19% of respondents felt that government should set aside funds to protect species to an extent but that we might have to let some species go in the process (Figure 12). Only 4% of respondents felt that there were other more important things to budget for.

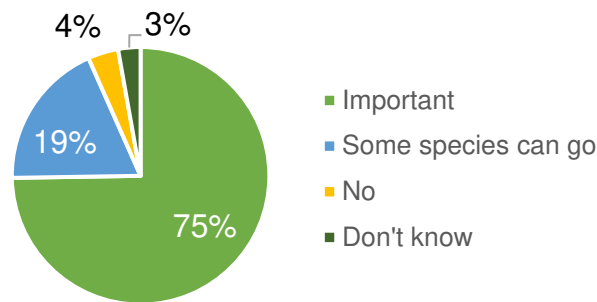


Figure 12. Level of importance survey respondents attribute to government investments in conservation.

Donating money to conservation or related work is often seen as an indicator of environmental awareness because it signifies a proactive commitment to protecting ecosystems and wildlife and promoting sustainability. The majority (75%) of respondents had not donated money to an organisation that works to protect wildlife or the environment in the past year.

Most respondents knew that it was possible to see penguins in the wild in South Africa (Figure 13). However, they were unaware that the African penguin is an endangered species (Figure 14).

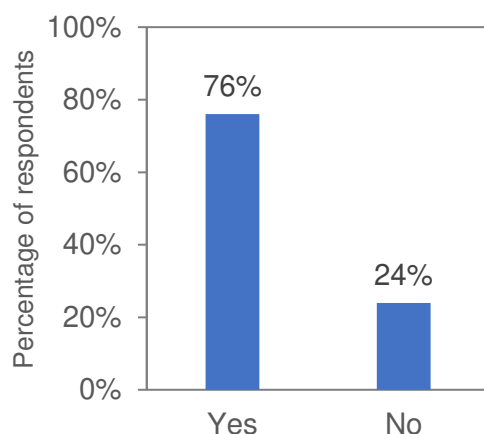


Figure 13. Percentage of respondents being aware that penguins are living in South Africa (yes, indicating awareness)

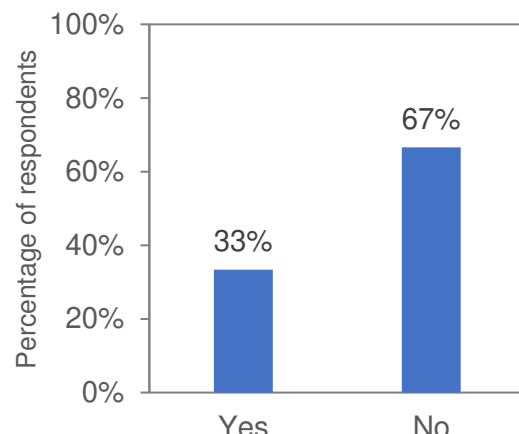


Figure 14. Percentage of respondents indicating that they know that Penguins are an endangered species (yes, indicating awareness)

Most respondents (56%) had seen penguins in the wild (Figure 15). Some 22% of respondents had only seen penguins in an aquarium, and 22% had never seen a penguin.

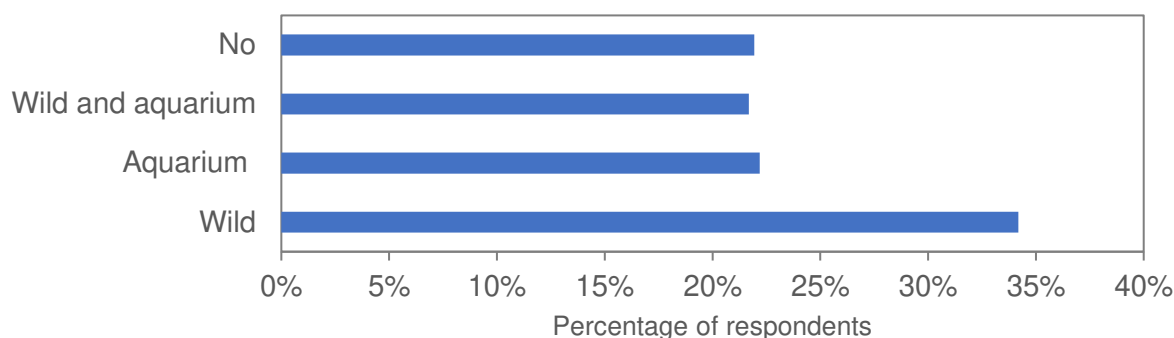


Figure 15. Have you ever seen a penguin?

For respondents who indicated that they had seen penguins before, the most common way of seeing them was independently, such as on a trip with family and friends, followed by educational trips, for example with their school, college, or university. Some 16% of respondents indicated that they had seen them by chance.

WILLINGNESS TO PAY FOR CONSERVATION

After being informed that South Africa has quite a few endangered species, and that African penguins are just one of them, respondents were told that government conservation agencies are lacking funding. Respondents were told that there are several international funds which collect donations to support conservation and are managed by reputable organisations. Around 61% of respondents indicated that they would be willing to contribute to such a conservation fund.

Bearing in mind their household's monthly income and expenses, households indicated that they would be willing to contribute an average of R364 per month to conservation in general (median R100), including amounts that they may already be donating to conservation organisations.

Around 26% of the respondents indicated that they would not be willing to donate to the conservation fund. The most common reason for this was that the respondent could not afford to donate (Figure 16). This was followed by "All costs should be funded by the government" and "It's not important to me / I have other priorities". Few people indicated that they did not trust that the funds would really be used for conservation.

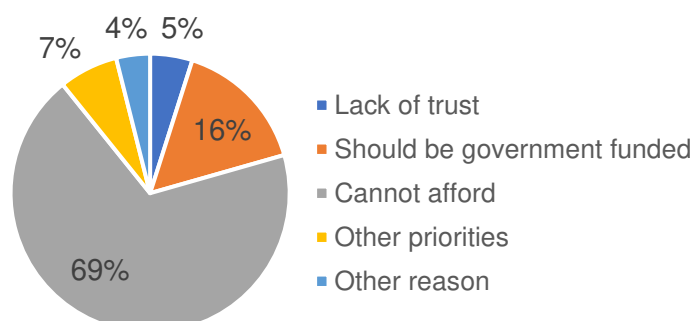


Figure 16. Respondents' reasons for not being willing to donate to a conservation fund.

Respondents who were willing to donate to a conservation fund were then informed about the opportunity to also donate to a Penguin Conservation Fund which could significantly improve the outlook for African penguins. Around 53% indicated that they would willing to donate money to such a fund.

The 34% of people who indicated that they would not be willing to donate to the penguin specific conservation fund indicated that the main reason for them not donating is that they could not afford to do so (Figure 17). Respondents further indicated that penguin conservation should be government funded (Figure 17). Other reasons given for not being willing to donate included respondents not wanting to make a monthly payment (56%), already or rather contributing to general conservation projects (17%), having privacy concerns disclosing banking details (17%), and not having a bank account (11%).

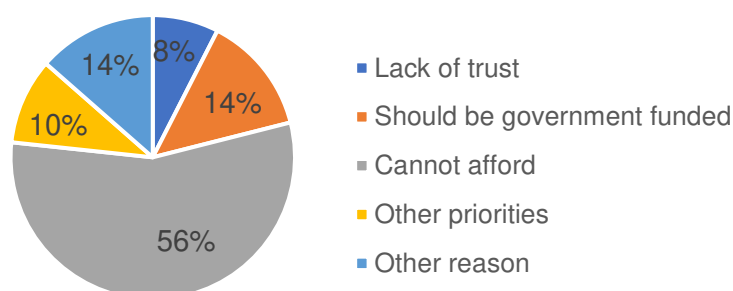


Figure 17. Reasons for not being willing to donate to the Penguin Conservation Fund

Most respondents chose to contribute R50 or R100 (Figure 18). Respondents had an average WTP of R86.46 and a median WTP of R50 per month. The nonparametric estimation of the mean value of the empirical survival function showed that survey respondents were willing to contribute R112.3 per month to the Penguin Conservation Fund. Estimated Mean WTP based on the parametric Weibull model was R98.6 (Table 7).

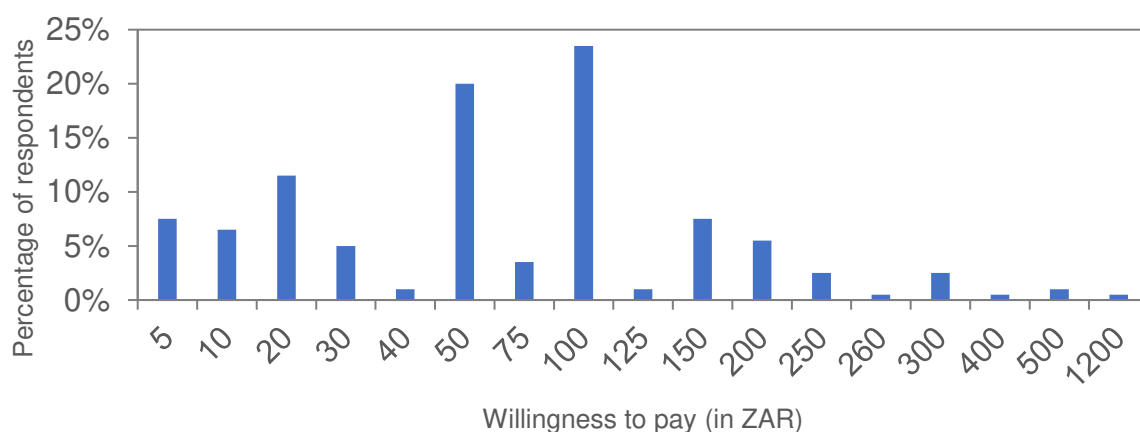


Figure 18. Frequency distribution of the WTP for the Penguin Conservation Fund.

Table 7. WTP estimates for the Penguin Conservation Fund, for entire sample and for the sample excluding households earning less than R6401.

	(1)	(2)	(3)	(4)
	Mean WTP	Median WTP	Mean WTP (nonparametric estimator)	Mean WTP (parametric Weibull model)
All respondents	R86.46	R50	R112.3	R98.6
Excluding low-income households	R82.55	R50	R125.7	R102.8

Income categories below the category of "R6401 to R12 800" were dropped from the analysis because these households would be classified as indigent by the City of Cape Town. Indigent households qualify for a discount on water, sewerage, electricity, and waste removal to improve their access to basic municipal services. Given these households' difficult financial situations, it was assumed that they could not be burdened with a monthly payment to a conservation fund. The average WTP estimate for the sample excluding low-income households is shown in the second row of Table 7. The lower mean WTP when excluding low-income households suggests that these households may view the issue as important and want to show their support, but they could be overstating their WTP relative to their actual financial capacity. This overstatement likely reflects a desire to contribute despite limited resources.

Using the Weibull model, mean WTP was estimated for four income categories corresponding to groupings in the 2022 Census. The highest income categories were aggregated as only few respondents indicated a monthly income above R51 200. Household WTP for the penguin conservation fund increased logarithmically with income, as expected, and ranged from R65 to R131 per month (Figure 19).

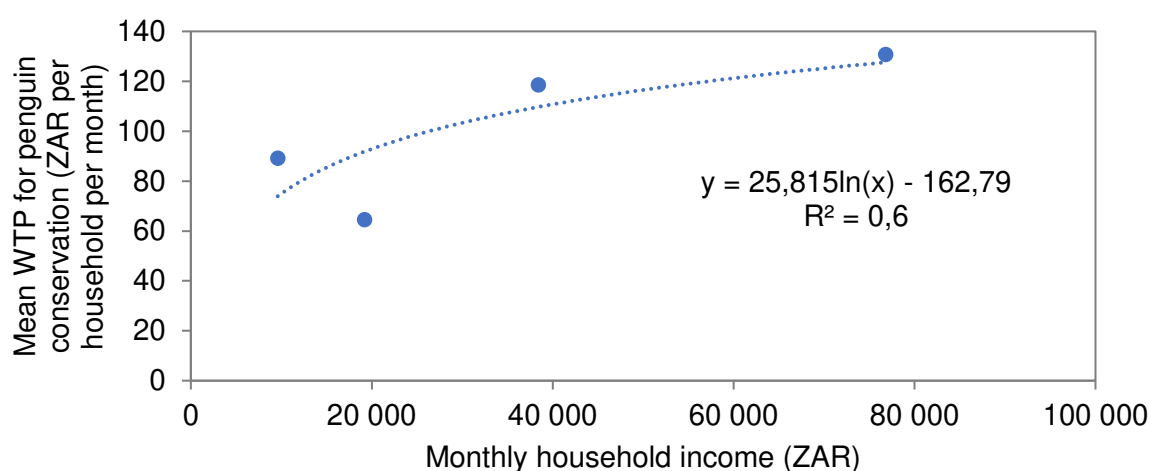


Figure 19. Mean WTP towards penguin conservation per income category.

The Weibull model estimation results, with the dependent variable being WTP for penguin conservation, showed that among the respondents who were willing to pay for penguin conservation, household income explained a significant amount of variation in WTP (Table 8).

Exploring the association between WTP and knowledge of the African penguin's current situation showed that people who were aware of penguins being endangered were not significantly more likely

to contribute to the penguin conservation fund (Table 9). Whether respondents had seen a penguin or not did not influence their WTP, neither did their level of interest in nature (Table 9). Presence of multicollinearity was tested using the variance inflation factor (VIF) and none of the variables had a VIF above 2.

Table 8. Weibull model 1 estimation results, only using income as independent variable.

	(1)	(2)	(3)	(4)
Variable	Co-efficient	Standard error	z-value	$p(> z)$
(Intercept)	2.6170	0.9451	2.77	0.0056
Ln Household Income	0.1902	0.0923	2.06	0.0393
Log(scale)	-0.1590	0.0725	-2.19	0.0283
Scale	0.853			
Loglik(model)	-558.3			

Table 9. Weibull model 2 estimation results, including income and other predictor variables.

	(1)	(2)	(3)	(4)
Variable	Co-efficient	Standard error	z-value	$p(> z)$
(Intercept)	2.9780	0.9530	3.12	0.0018
Ln Household Income	0.1396	0.0957	1.46	0.1447
High interest in Nature	0.1017	0.1867	0.54	0.5861
Has seen penguin	-0.0192	0.2764	-0.07	0.9447
Penguins endangered	0.2337	0.1825	1.28	0.2005
Log (scale)	-0.1812	0.0744	-2.44	0.0149
Scale	0.834			
Loglik (model)	-557.2			

Among the respondents who were willing to contribute to the Penguin Conservation Fund, their main reasons for doing so were that they liked knowing that penguins exist, having the option of visiting them in the future, and protecting them for future generations (Figure 20). Respondents also enjoyed contributing to a good cause. Benefiting from penguin related activities, such as going to see the penguin colonies, was given as the primary reason for their WTP by 12% of the respondents.

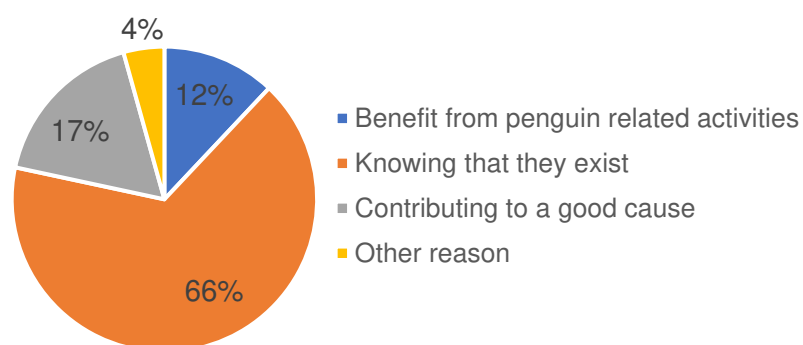


Figure 20. Reasons for a positive willingness to pay for penguin conservation

AGGREGATE WILLINGNESS TO PAY

Aggregate WTP was determined by multiplying the mean WTP per income category by the estimated number of households in Cape Town within each of the Census income groups. The estimation was based on the Census 2011 categories and extrapolated to 2022 values based on the recent Census 2022 population growth estimates. At the time of writing, the Census 2022 income data was not yet available. The aggregate WTP for penguin conservation in Cape Town was in the order of R551 million to R731 million per year (Table 10). Even though WTP attenuates with distance, it is assumed that South African residents outside of Cape Town would also be willing to pay for penguin conservation. If we were to extrapolate the results from the Cape Town survey to the rest of the country, the aggregate WTP would be an additional R771 to R1101 million. However, it needs to be acknowledged that estimating such value without additional surveys in other areas likely results in an overestimation of South African's total WTP for penguin conservation.

Table 10. Aggregate WTP per income group.

Income category (in Rand)	Mean WTP (lower bound estimate) R/month	Mean WTP (nonparametric Weibull model) R/month	Aggregate WTP (lower bound and nonparametric Weibull model) R millions per year
6401 – 12 800	73	112	155 – 239
12 801 – 25 600	81	85	157 – 164
25 601 – 51 200	99	142	140 – 202
51 201 or more	122	155	99 – 126
Total			551 – 731

4. OTHER BENEFITS

PROPERTY VALUE BENEFITS

Cape Town has some of the most sought-after properties and high aesthetic and recreational amenities due to the city's natural beauty and assets. Indeed residential housing prices in the Western Cape have shown the largest increases in South Africa, with an average annual increase close to 10% (Meelun, 2020). The housing market contributes to the economy in multiple ways: through the construction of new properties, reselling of existing properties, and the rental market (Centre for Affordable Housing Finance in Africa, 2018). The housing market contributes towards economic growth, creates jobs, and a local government's rates base.

Cape Town's residential property market was valued at R1.23 trillion in June 2021, with 43% of these residential properties being valued over R1.2 million, which is classified as luxury properties by the Centre for Affordable Housing Finance in Africa (2022). Natural features are commonly highlighted in the local property market to attract potential real estate buyers or renters. Common natural features in Cape Town include proximity to beaches, proximity to or view of Table Mountain National Park (TMNP).

The TMNP has previously been shown to have positive effects on property prices as the park offers a number of recreational activities in close proximity to urban areas (Standish *et al.*, 2004). Real estate agents interviewed as part of the study by Standish *et al.* (2004) suggested that a view of the TMNP was an "undoubted value creator". Houses in areas without a sea view, such as the Southern Suburbs, that do not have a mountain view reportedly sold at a discount of around 20%. Properties bordering TMNP have the benefits of close access to nature but at the same time could face increased security and fire risk. Properties not bordering the park but in walking distance to TMNP were estimated to sell at a premium of two to three percent (Standish *et al.*, 2004). Security concerns seemed to be the largest factor to potentially reduce TMNP's positive influence on property prices.

Hedonic valuation is the statistical method used to assess the property premium associated with being close to a particular environmental good, such as a mountain or natural park (Jim & Chen, 2009). Based on this approach, Pfaff *et al.* (2019) estimated that the property premiums paid for being close to the coast or having a sea view amounted to R37 million in Rooiels and R248 million in Pringle Bay, which was 14% and 17% of property value, respectively. The Boulders penguin colony has had mixed effects on property values in Simonstown. When the colony first became established, local residents complained about being exposed to noise and smell from the penguins as well as noise and traffic congestion due to tourists (Morgan *et al.*, 1996). The management of Boulders has made efforts to reduce these negative impacts. However, when part of the beaches were fenced off for penguin use, local residents also lost access to some of the beaches (Lewis *et al.*, 2012). However, on balance, the penguins have had a positive impact on property values, and this will have increased as properties have changed hands over time. Based on interviews with Simonstown property estate agents, Van Zyl & Kinghorn (2018) concluded that Boulders enhances property values throughout Simonstown. The property premium is driven by the amenity values provided by Boulders and the surrounding beaches and the economic opportunities that the tourists provide. Rental prices close to the colony are high because tourists who are interested in the penguins are willing to pay a premium to stay close to the colony.

Generating an accurate estimate of the property premium associated with proximity to the penguin colony would ideally require an analysis of house sales across the whole city over a number of years,

using a dataset that would allow the analysis to control for a range of factors that influence value. Nevertheless, the role of the penguin colony was discussed in interviews with estate agents who operated in Simonstown and Betty's Bay.

The number of residential properties sold within Simonstown was already on a slight downward trend before the Covid-19 pandemic year of 2020. The total number of properties sold within the Simonstown area increased from 2021 onwards and was highest in 2022 – more than double the number of houses were sold in 2022 compared to 2020 (Figure 21). The average sales price increased steadily from around R1.65 million in 2015 to R2.7 million in 2023 (Figure 21). On average, sales price was always below asking price over the last decade.

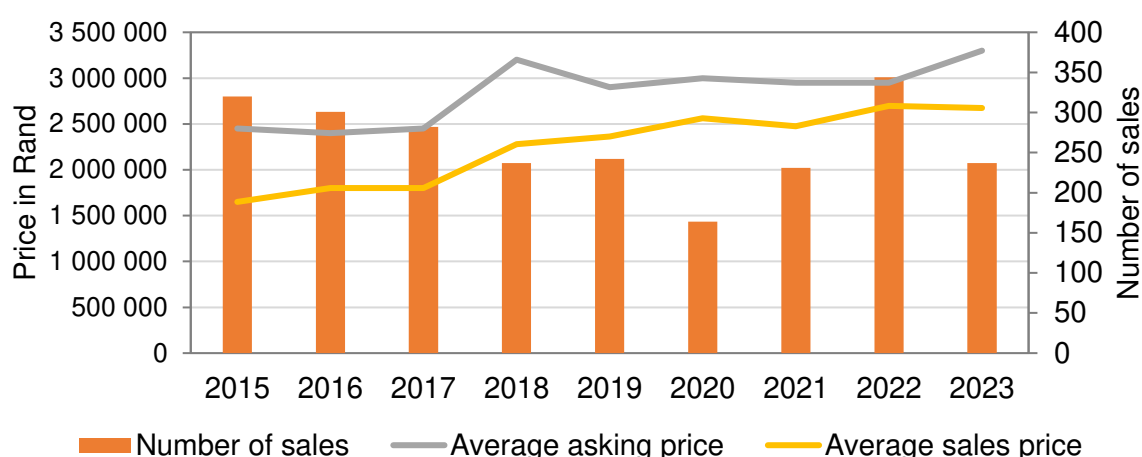


Figure 21. Average asking price and sales price and number of properties sold in the Simonstown area from 2015 to 2023. Data source: Property24 (2024).

Simonstown property agents interviewed in this study did not think that the penguin colony influenced people's purchase decision but at the same time advised that the colony also does not put them off. Property buyers are generally aware of Boulders penguin colony when they inquire about available properties, but they are not too concerned about the colony, neither are they particularly interested. The colony is seen as being valuable for tourists but offering very little recreational value to local residents.

Properties that are close to Boulders are some of the highest valued properties in Simonstown but not because of their proximity to the penguin colony but due to their proximity to beautiful, pristine beaches. According to local agents, houses near Boulders are typically valued at around R15 million, compared to other houses of similar size in the area that would be selling for R6 million to R10 million. While properties which are close to Boulders do not have direct access to the entire beach coastline outside of their house because part of the beach is blocked off for the penguin colony, they do benefit from the fact that the protected area prevents any further property development which could obstruct their view. According to local property agents, the view influences purchase decisions the most. Regarding rental properties, property agents suggested that the penguin colony would not have a big influence on their value. Seeing the penguins at Boulders is only a short activity out of many others and tourists would not stay overnight in Simonstown just to see the penguins. There are plenty of activities in Simonstown which contribute to the value of the village, including various water sport activities, such as diving, boat trips and people would come to Simonstown irrespective of the

penguins. Simonstown also benefits from its proximity to Cape Point. A large-scale statistical analysis would be required to determine whether penguins and the associated tourism business might contribute to the value of property in Simonstown more generally.

In Betty's Bay, the average house prices have fluctuated over the last decade with the lowest average value in 2019 (R580 000), and the highest price in 2016 (R1.3 million; Figure 22). While asking price exceeded sales price until 2020, since then the sales price has been slightly higher than the asking price (Figure 22).

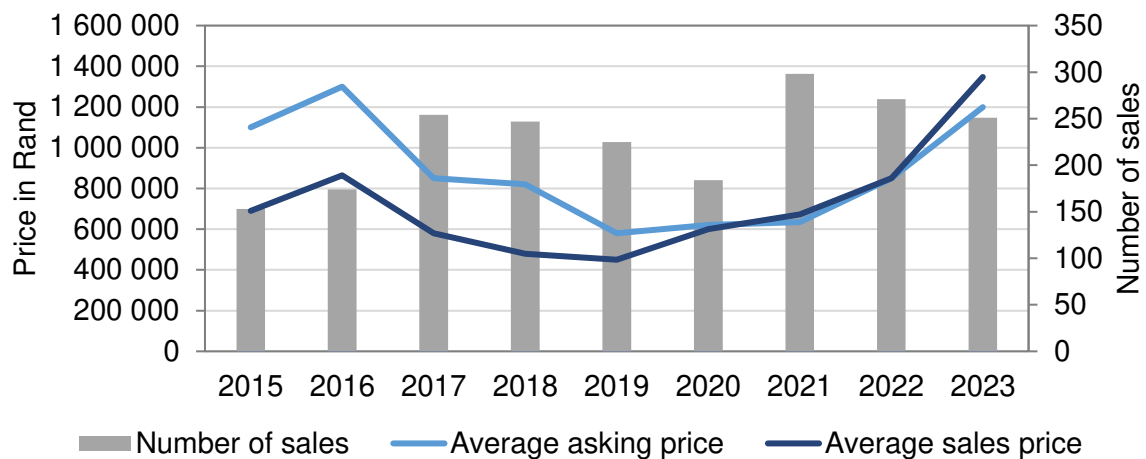


Figure 22. Number of sales, average asking price and sales price and number of properties sold in the Betty's Bay area from 2015 to 2023. Data source: Property24 (2024)

When asked to put a percentage to how much the Stony Point penguin colony contributes to the property sales price, property agents in Betty's Bay suggested that they would attribute zero value or a negative value to the Stony Point penguin colony, discounting property values by up to 15%. Buyers are commonly aware of the colony and do not want to be close to it. They are mostly concerned about the smell of the colony, particularly exacerbated by the strong South Easter wind over the summer months, followed by destruction of gardens and vegetation which requires fencing to keep penguins out. According to the property agents, the colony is mostly used by tourists and is not perceived as an attraction for local residents. Regarding the rental market, interviewed agents found it unlikely that an Airbnb closer to the penguin colony would generate a higher price. It was concluded that the penguin colony does not draw people to buying property in the area.

EDUCATIONAL BENEFITS

People's concern for the environment is positively correlated with their WTP for species conservation (Kotchen & Reiling, 2000; Gong, Bi & Wu, 2020). Thereby, WTP is driven by two factors: (1) the level of familiarity with a particular species, and (2) the level of understanding of the species' importance in an ecosystem (Martín-López, Montes & Benayas, 2007). The level of familiarity plays a larger role for people with low levels of knowledge, while people with higher levels of environmental knowledge display larger WTP for non-charismatic species. Higher levels of environmental knowledge increase people's concern and appreciation for endemic species and threatened species and their willingness to donate to the conservation of these. Therefore, educational programmes should highlight the importance of certain species for ecosystem functioning.

Similarly, in South Africa, interest in biodiversity has been shown to be positively correlated with knowledge of biodiversity and both are positively correlated with WTP for conservation (Turpie, 2003). Environmental education hence plays a significant role not only in improving environmental knowledge and shaping environmentally friendly behaviours of younger generations but also to increase future generations' concern for endangered species and their WTP for their protection.

Both SANParks and CapeNature run several environmental education programmes to increase future generation's environmental awareness of environmental issues, such as biodiversity loss, climate change, and pollution (CapeNature, 2021; SANParks, 2024). The programmes provide information about ecological processes and the interconnectedness of humans and nature. Further, they aim to empower pupils to learn about environmentally responsible behaviours and lifestyles. Ultimately, environmental education programmes can foster a deeper connection between pupils and Nature. Experiencing Nature through outdoor activities and hands-on learning experiences can help pupils develop a sense of responsibility towards Nature and a desire to preserve biodiversity.

On average 300 000 pupils per year benefit from SANParks Environmental Awareness programme (SANParks, 2024). Organised groups with pre-booked educational excursions are waived the park entrance fees. CapeNature runs both in school and out of school programmes which can be aligned with the relevant class curriculum (CapeNature, 2021). General awareness programmes and environmental calendar days, such as National Marine Week in October or Coastal Clean Up Day in September, are also celebrated throughout the year. CapeNature does not record the number of pupils per colony per annum but only the name of school and grade. In the financial year 2021/22, a total of 373 environmental awareness activities were conducted (CapeNature, 2022).

Besides supporting environmental education, which is primarily aimed at pupils, both SANParks and CapeNature support several research projects which are often conducted in collaboration with universities or other research institutions to improve our understanding of penguins. Information regarding SANParks and CapeNature's expenditure on penguin research and monitoring activities (annual, past 10 years, per colony) were requested but not obtained. Similarly, no information was provided regarding the amount of external funding used for penguin-related research (annual, past 10 years, per colony). In absence of data from the respective organisations, a brief assessment of the penguin-related literature was undertaken.

The number of publications with *Spheniscus demersus* in the title of the publication fluctuated over the past ten years and was highest in 2014 (Figure 23). Results are similar when searching for the number of publications with "African Penguin" in the title. However, total number of publications referring to "*Spheniscus demersus*" anywhere in the body of text has increased steadily over the last ten years from a total of 191 in 2013 to 307 in 2023 (Figure 23). While total publications with "African Penguin" in the text were lower overall compared to the number of publications referring to "*Spheniscus demersus*" (101 publications in 2013 and 226 publications in 2023), the upward trend was similar.

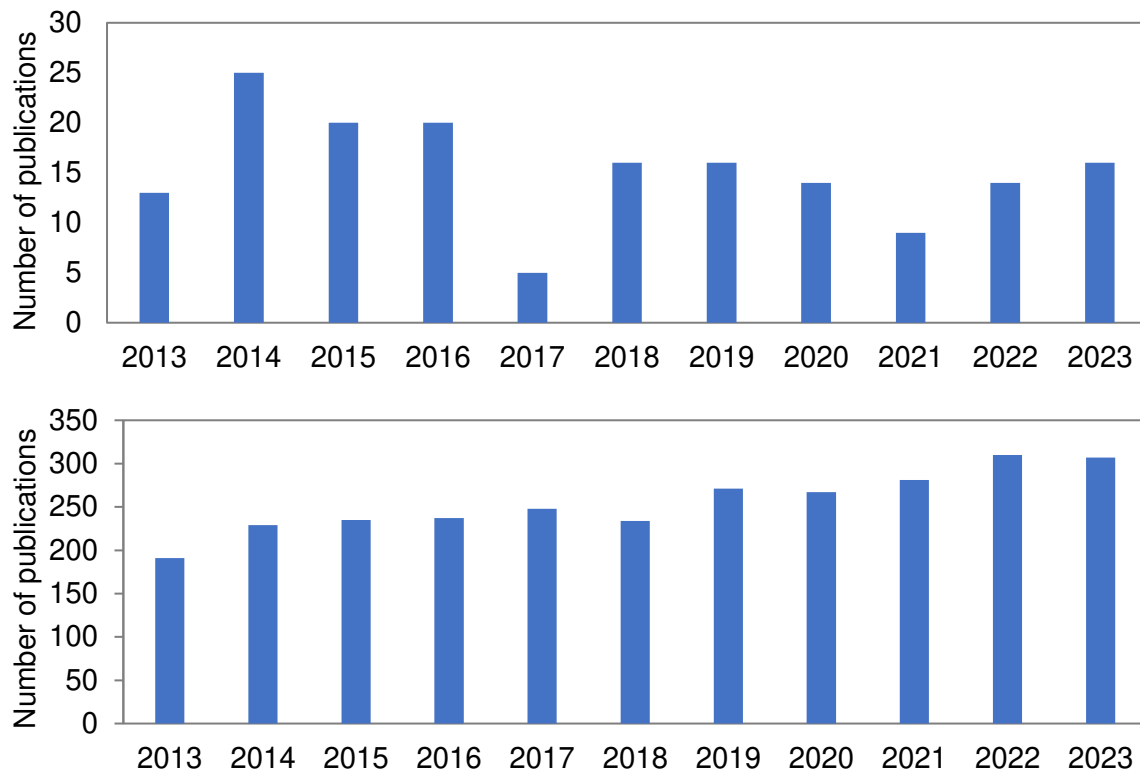


Figure 23. Number of publications with "*Spheniscus demersus*" in the title (top figure) and text (bottom figure) over the last 10 years.

The Department of Higher Education and Training (DHET) rewards research productivity through the allocation of government subsidies. A research article published in an approved journal is subsidised as a single unit (Research Support Hub UCT, 2024). Subsidy figures fluctuate across years but reportedly are around R120,000 per full publication unit (Stellenbosch University Library, 2024). Given that 16 papers with "*Spheniscus demersus*" in the title were published in 2023, it is estimated that penguin research contributes at least R1.9 million per annum in research value.

Penguins can provide an effective tool to learn more about conservation. Allowing pupils to observe penguins up close and explore their habitats, can promote environmental awareness, make future generations be more engaged in science and cultivate a love for Nature and learning. To enhance educational engagement with penguins, pupils should be encouraged to research penguins before a visit to a colony and create posters based on their findings. Schools should organise more guided tours to penguin colonies or aquariums, focusing on penguin conservation. These tours can include lessons on geography, environmental science, and biology relating to penguins. Additionally, pupils could be involved in real-world research projects or participate in penguin adoption programs, providing them with hands-on experience in conservation efforts.

MEDIA RELATED BENEFITS

Iconic species, such as elephants, rhinoceroses, bears or big cats, are often used by environmental NGOs to communicate development and species management policies (Horsley *et al.*, 2020). Birds and mammals are frequently the predominant taxonomic groups on the covers of wildlife and nature conservation magazines, such as Defenders of Wildlife and the National Wildlife Federation (Clucas, McHugh & Caro, 2008). The African penguin is an iconic and charismatic species which makes it a

compelling animal to be used for commercial products, images, and logos. African penguins are featured in South African tourism adverts as they are a key attraction, especially in Cape Town. The wide use of the penguin image in popular culture has also led to more penguin conservation focused media outputs.

Media can be a powerful tool for raising awareness and can support educational outreach programmes, increase community involvement and policy advocacy and public support for conservation. For example, rhinos received increasing media attention between 2012 and 2013 and voluntary contributions to antipoaching efforts increased from R110 million during the financial year 2010/2011 to R1 billion during 2013 (Saayman & Saayman, 2017). Storytelling can play an important role in getting people to care about conservation (Evans, 2021).

Penguins have been popularised by movies such as *Happy Feet* (2006), *Surf's Up* (2007), and *Madagascar* (2005). In 2021, Netflix released a documentary series titled “Penguin Town” which follows the life of a group of penguins in Simonstown over six months and tells the viewers about their mating efforts, raising their penguin chicks and their interactions with other penguins in the colony. The documentary series trended in the top 10 of popular shows on Netflix South Africa. Penguin Town has raised public awareness of the importance of marine conservation and started a conversation about environmental issues. Field producer of Penguin Town, Cayley Christos, said that in a response to the documentary, many people pledged on Twitter to make a donation to SANCCOB or try support the species in other ways (Evans, 2021). In the tourism surveys conducted as part of this research study, several people who were interviewed commented that they had been to see the Boulders penguin colony because they had seen the Penguin Town Netflix documentary.

Data on income directly generated through media productions, such as films, advertisements and documentaries, were not available for all penguin colonies. Where data were available, revenue streams from such productions fluctuated strongly over time. According to the SANParks Hospitality Services Manager and Film and Events Manager regarding film and media permits, SANParks only has overall park-wide global annual figures for permits issued. Boulders figures are not kept as a separate line item. Revenue for feature films and advertisements in Table Mountain National Park ranged from approximately R2.6 million in the financial year 2018/2019 to R2.8 million in the financial year 2022/2023. However, as permits cannot be directly linked to specific areas of Table Mountain National Park, it is difficult to allocate the appropriate amount of revenue generated through Boulders penguin colony. Considering that Table Mountain National Park generated a total revenue of R298.8 million in the financial year 2022/2023, the media related income of R2.8 million makes up less than 1%.

While no penguin-colony specific data were available for Boulders, SANParks’ Regional Communications Manager provided data for Addo Elephant Park. In the financial year 2022/23, total revenue from media related permits was around R184 000 of which around half of the revenue came from drone and documentary filming in the Bird Island section of Addo Elephant National Park.

Regarding Dyer and Dassen Island, between the financial year 2017/18 and 2022/23, CapeNature did not make any positive revenue through location fees. Very few media shootings happened at either site, and no media shootings occurred in the financial year 2020/21 as well as 2021/22.

It is therefore estimated that media-related benefits are still fairly small compared to the other benefits that penguin colonies generate. While the direct media-related benefits through the payment of permits might be low, indirect media benefits have been observed. Popularity of the Penguin Town Netflix documentary likely has encouraged people to go visit the penguins in Simonstown and to donate money for their conservation.

5. REPUTATIONAL RISKS OF FAILING AT CONSERVATION

OVERVIEW

In South Africa, the South African government is legally considered as the owner of the African penguin and is morally its custodian. The loss of the African penguin would be a very large reputational risk to South Africa, especially because the African penguin is a restricted-range species that only occurs in Namibia and South Africa (Freitag-Ronaldson, pers. comm., 27 November 2023). The country's response to the well-being of the penguin population is likely impacting its global image. Just as South Africa's foreign policies and economic decisions contribute to its reputation, its position on environmental stewardship and the measures it implements to protect global assets, for which it is perceived as a guardian, will shape its international brand. If the African penguin population is lost completely, South Africa's brand reputation as a naturally rich and environmentally healthy destination, famed for its natural assets, will suffer.

No country or conservation agency would want to incur a loss of a species as, besides reputational damages, this would also have negative impacts on ecosystem functions and structures and cause other secondary issues (Makoala, pers. comm., 5 December 2023). DFFE provides regulatory policy and advises management authorities but does not manage penguin colonies (Makoala, pers. comm., 5 December 2023). SANParks assumes that DFFE would be very conscious of a potential species loss and how this would reflect on their ability to make trade-offs for conservation and longer-term sustainability (Freitag-Ronaldson, pers. comm.). Given SANParks's mandate of managing South Africa's national parks, natural and cultural assets, there is an expectation that SANParks can stop the ongoing decline of the penguin population (Freitag-Ronaldson, pers. comm.). However, successfully conserving the African penguins is not a single agency issue but requires big systemic changes (Freitag-Ronaldson, pers. comm.).

Each year, the World Economic Forum (WEF) publishes a Global Risk Report which highlights the key risks that global economies face according to the WEF's Global Agenda Councils. In 2010, for the first time, biodiversity loss was highlighted as one of the risks that can affect economies' bottom lines (WEF, 2010; Dempsey, 2013). Biodiversity risk, according to the WEF, does not only comprise the dependence of economies on biodiversity but also the reputational risks that arise due to economies' relationships with biodiversity and ecosystems (WEF, 2010). According to the WEF's typology of biodiversity risks, being associated with negative effects on biodiversity and ecosystems can cause significant harm to a brand and limit its "social license to operate" (WEF, 2010). Reputational risks could also negatively affect a country's funding opportunities and credit worthiness and subsequently raise the expenses associated with obtaining new financing.

While the following section is not intended to serve as a comprehensive list of key actions, it aims to capture and highlight the significant actions identified through the expert interviews conducted during this study. These interviews provided valuable insights and perspectives, which have been synthesised to present a coherent overview of the key actions that emerged. It is important to note that this summary is not exhaustive, and there may be additional actions that were not captured during the interviews. Initially, a comprehensive list of experts, including NGOs, government institutions and the private sector, was compiled. From this list, the most suitable candidates were shortlisted and contacted via email. The meeting invitation explained the purpose of the interview and how their expertise would be valuable to the study.

POTENTIAL IMPACTS ON TOURISM

The public, both locally in South Africa and internationally, increasingly expects proactive and effective measures to conserve and protect iconic species and ecosystems, and shortcomings in such efforts can lead to reputational damage. Nation branding refers to the international reputation and image of a country (Fan, 2010). This image is defined by people outside of the country and their perceptions are influenced by media coverage and personal experiences (Fan, 2010). A nation's image can be proactively managed to enhance the country's reputation among a target international audience (Fan, 2010).

Tragic biodiversity loss events are reported on in the traditional news outlets and widely discussed on social media. For example, the death of the last male northern white rhinoceros in Sudan triggered strong reactions in social media and online news in western countries, outside rhinoceros range states (Fink, Hausmann & Di Minin, 2020). Tragic events showed a strong temporal cross-correlation between social media data volume and online news volume (Fink *et al.*, 2020). Failing to stop the decline of biodiversity loss could have negative media effects and boycotts from tourists.

In Australia, regarding natural assets, the Great Barrier Reef is the biggest contributor in terms of brand and icon value to international perceptions of the Australian brand (Deloitte Access Economics, 2017). However, the reef has been experiencing significant damage over the years. During 2016 to 2017, international news extensively covered the mass coral bleaching event at the Great Barrier Reef, with a lot of the media stories taking on a sensationalised tone (Curnock *et al.*, 2019). There were concerns that this negative portrayal might result in a decrease in tourist visits to the region and contribute to the perception that effective action to save the reef is no longer possible. However, visitor records for the Great Barrier reef showed an increase in 'last chance tourism,' referring to people being motivated to experience an iconic place or species before it disappears or undergoes irreversible changes (Curnock *et al.*, 2019).

Cape Town Tourism has been using African penguins as mascots for Cape Town and Boulders has been shown on the cover of the Cape Town visitor's guide (including a penguin) (Lombard, pers. comm., 24 November 2023). Just like Table Mountain, the image of the penguin and visiting penguins is one of the major attractions of coming to Cape Town. In fact, an international focus group study which tested various campaign materials showed that the best performing image was the penguins (Lombard, pers. comm.). Tourists' perception and association with Cape Town is to visit Table Mountain and to see the penguins at Boulders (Lombard, pers. comm.). It is a unique opportunity to see penguins in their natural habitat, as in most parts of the world they can only be encountered in zoos.

Despite the penguin being so vitally important for Cape Town Tourism, the probability of the African penguin extinction is currently not on their radar or something that they are concerned about (Lombard, pers. comm.). There are other more pressing issues that Cape Town Tourism is dealing with for the high season 2023/24, including safety and security on the mountain. Considering limited funding availability, safety and security currently takes priority. Further, Cape Town Tourism is still at the beginning stages of considering sustainability in their marketing strategies, for example communicating the environmental impact of traveling to Cape Town from overseas and how visitors could offset this. Once the situation becomes even more critical, marketing materials might communicate the urgency. However, in line with the response to the Cape Town drought and the Covid-19 pandemic, this would most likely be a very reactive response, with the situation only being communicated once it is very dire (Lombard, pers. comm.).

POTENTIAL IMPACTS ON CONSERVATION FUNDING

Funding for biodiversity conservation in South Africa relies on global funds to existing public and private sector commitments (DEA, 2017). NGOs from the Global North can leverage substantial amounts of funding for monitoring and evaluation as well as the design of conservation interventions. One of the main funding mechanisms for biodiversity conservation is the Global Environment Facility (GEF) which has been a strong funder of South Africa's conservation efforts. Organisations such as GEF may be hesitant to provide additional funds for new conservation projects if previous investments did not yield the expected results. Failure to improve the status of the African penguin could lead them to question the likely success of future conservation projects. On the other hand, it could be argued that the threat of losing a species would encourage them to increase their funding to prevent extinction.

According to SANCCOB, the Southern African Foundation for the Conservation of Coastal Birds, whose main objective is to conserve seabirds with a focus on African penguins, South Africa is already experiencing reputational damage. International donors have been questioning national government's plans to halt the decline of the penguin population (Stander, pers. comm., 30 November 2023). Government support is essential to signal to investors that their financial support is expected to yield positive impacts (Stander, pers. comm.). Funders want to focus on impactful work; a measure of penguin conservation impact would be the change in penguin population. International funders have been aiming to keep the penguin population stable with little success. Consequently, they have been asking the NGOs on the ground, such as SANCCOB, to increase their focus on advocacy and policy work (Stander, pers. comm.).

SANParks expects that international conservation funders would be willing to provide more financing the closer South Africa edges towards penguin extinction due to the threat of species loss and the charisma of the species (Freitag-Ronaldson, pers. comm., 27 November 2023). However, it is questionable whether this would make a significant difference (Freitag-Ronaldson, pers. comm.). Additionally, international NGOs might have their own research agenda and it could be difficult for them to address national drivers. While an increase in funding might allow more ex-situ approaches to sustain the penguin population in the short term, this could result in the development of a system which becomes increasingly dependent on funding and is unsustainable in the longer term (Freitag-Ronaldson, pers. comm.).

Species survival depends on long-term commitment from national government, in the same way that South Africa has achieved for other species such as rhino (Freitag-Ronaldson, pers. comm.). Failing at conserving the African penguin, would mean that national government does not fulfil their mandate and that they did not do everything in their power to prevent species extinction (Stander, pers. comm.). National government needs to fully understand what a species loss means and what measures need to be implemented to stop this from happening. According to Stander (op cit) it is not enough to declare new MPAs, e.g. through Operation Phakisa, such actions also need to be supported through the provision of additional funding for the newly established protected areas. Increasing funding could work as a short-term solution, but we need to change how we structurally think about the importance of a species.

According to the DFFE, funders have recognised the issues around African penguins and that it is a very complex issue which cannot be solved by one government entity alone but requires joint efforts amongst multiple stakeholders (Makoala, pers. comm., 5 December 2023). The DFFE has been reaching out to the international community of practice on penguin conservation, for example to create the international review panel for fisheries and penguins, and has also been getting feedback from the IUCN penguin specialist group, which provides lessons learned from penguin conservation

efforts elsewhere in the world (Makoala, pers. comm.). According to the DFFE, the conservation of the African penguin is seen as a collective responsibility and a species extinction would be everyone's loss, not just South Africa's (Makoala, pers. comm.).

GOING FORWARD: INCREASING AWARENESS AND IDENTIFYING KEY ACTIONS

Over the last few years, it has increasingly been recognised that penguins are in dire need (Freitag-Ronaldson, pers. comm., 27 November 2023). Ultimately, a better understanding and awareness of what a functional extinction of the African penguin population really means is needed (Freitag-Ronaldson, pers. comm.). People commonly struggle to understand marine systems compared to terrestrial systems; at the same time penguins are not perceived as being as charismatic as some of the endangered terrestrial species, such as the rhino (Freitag-Ronaldson, pers. comm.). Ultimately, it comes down to messaging and communications and it needs to be clearly communicated what needs to be done to save the penguins. Penguins are very "PR-able" which can be used to their advantage (Lombard, pers. comm.).

Penguins are part of a very complex socio-ecological system, which includes the utilisation of marine resources through fishing and other activities, is impacted by changing climate and changing prey bases, and which has been experiencing degradation and decline of penguin nesting sites. Policymakers have to make trade-offs between fisheries, industry interests (including ports and bunkering), and penguin habitats with industry needs usually trumping the needs of the species (Freitag-Ronaldson, pers. comm.). This is a challenging situation for SANParks because they are often seen as parastatal and therefore are not overly critical about the decisions that the Ministry makes (Freitag-Ronaldson, pers. comm.). NGOs on the other hand can be more critical and outspoken about the DFFE's decisions and policies (Freitag-Ronaldson, pers. comm.). Solutions to these issues are not straight-forward and require a holistic approach.

Ultimately, improved management and policy is going to be the answer: an ecosystem approach to fisheries is needed and ocean health needs to be managed much better, not just focusing on one particular species but taking a whole system perspective. It needs to be ensured that rehabilitated penguins are released into an ecosystem that can support them. Island closures for fishing around penguin breeding colonies are currently not adequate, but as a concept, they do give penguins a chance to find more food, feed their young and have a more successful breeding season. A longer-term solution could be a moratorium on sardine fishing to attempt a revival of the sardine population (Stander, pers. comm.).

From a tourism perspective, it was suggested that the facilities at Boulders should more strongly communicate the extinction probability of African penguins to visitors (Lombard, pers. comm.). Boulders could provide visitors the opportunity to donate money to penguin conservation, especially considering that international visitors have higher spending power compared to the average South African. Additionally, the Boulders penguin colony retail range could include additional markup which could be used for penguin conservation. (Lombard, pers. comm.).

6. CONCLUSION

At the current rate of population decline, the African penguin could be extinct in the wild by 2035. Driving the African penguin population to extinction could have severe and potentially irreversible ecological consequences. The decline and loss of penguins could cause disruptions in the health of ecosystems and could trigger additional losses in the wider ecosystem. Beyond environmental reasons, species conservation is also justified by moral and spiritual values, as species contribute to our identity and connection to Nature. The intrinsic value of a species, its inherent worth beyond utility, imposes a moral duty to protect it and prevent harm (O'Neil, 1997). Focusing solely on practical benefits may not acknowledge our ethical responsibility to preserve species and care for the planet. If the ethical imperative alone does not justify the allocation of necessary resources, a compelling economic argument could further underscore the urgency of preventing further catastrophic losses and restoring penguin populations to sustainable levels.

The aim of this study was to provide an up-to-date assessment of the value of the African penguin in South Africa to inform decision-makers at all levels of government, conservation organisations and other stakeholders involved in decision making around African penguins. We provided estimates of the tourism, recreation, and the existence value of African penguins, and described the property-related, media-related, and educational benefits and potential reputational risk of failing to adequately conserve African penguins.

The South African penguin colonies attract several hundred thousands of local and international tourists annually, which contributes significantly to economic activities in the surrounding areas. Tourists generate revenue for local businesses, tour operators, and conservation authorities through ticket sales, accommodations, and related services. The total tourism value of Boulders was estimated to be in the range of R505 - 2273 million per year. The tourism value of the other colonies, excluding Boulders, was estimated to be worth an additional R108.3 million. The total value of Boulders penguin colony and all other penguin colonies was hence estimated to be in the range of R613 - 2702 million per year.

Tourism contributed 7.8% (R513.1 billion) to South Africa's gross domestic product (GDP) in 2019 and 6.3% (R421.7 billion) in 2022 (World Travel and Tourism Council, 2023).

People also receive benefits from knowing of the continued existence of wild African penguin colonies, irrespective of whether they aim to ever visit them. This benefit is expressed through their stated willingness to pay to ensure their conservation. Based on a contingent valuation study involving interviews with people from all parts of Cape Town, the aggregate WTP for penguin conservation of Capetonians is estimated to be in the range of R551 - 731 million per year. Taking the relationship between WTP and income levels into account, this suggests that the national existence value of African penguins could be in the order of R1.3 – 1.8 billion per year.

Regarding property value benefits, in both Simonstown and Betty's Bay, the penguin colony has reportedly very little to no effect on the property market. While estate agents reported that Stony Point would have a negative effect on property prices, in Simonstown the colony at least helps to ensure that houses have unobstructed views of the beach. A large scale statistical analysis would be required to determine whether penguins and the associated tourism business might contribute to the value of property in Simonstown more generally.

It is not possible to fully estimate the educational benefits of the African penguin in Rands. Environmental education and exposure to iconic species can change people's outlook and behaviour

over the long term, and also raises both the use and non-value of nature. To some extent, the South African government recognises the value of research through the provision of publication subsidies. In this way, publications on penguins generated subsidies of at least R1.9 million in 2023.

Penguins have also been used as mascot for Cape Town and several films and documentaries have raised awareness about the species' decline. The direct media related value of the penguin colonies was estimated to be almost R2.9 million in 2023.

Table 11. Total value of African penguins to South Africa (in 2023).

Type of tourist	Lower bound (in R million)	Upper bound (in R million)
Tourism value	613.3	2701.6
Existence value (CT)	551	731
Existence value (Rest of SA)	771	1101
Property value	6.3	6.3
Educational benefits	1.9	1.9
Media benefits	2.9	2.9
	1946.4	4544.7

The African penguin creates value for South Africa in many ways as demonstrated in this study and the total value was estimated to be between R1.9 billion (lower bound) and R4.5 billion (upper bound) in 2023 (Table 11). Most of this value comes from the tourism value of the colonies as they attract visitors from overseas and within South Africa who spend money in the local economy. South Africans also put a large value on knowing that the African penguin exists, that they have the option of visiting them in the future and that their children will be able to enjoy them too.

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Stakeholders consulted to assess the reputational risk of failing at conservation:

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