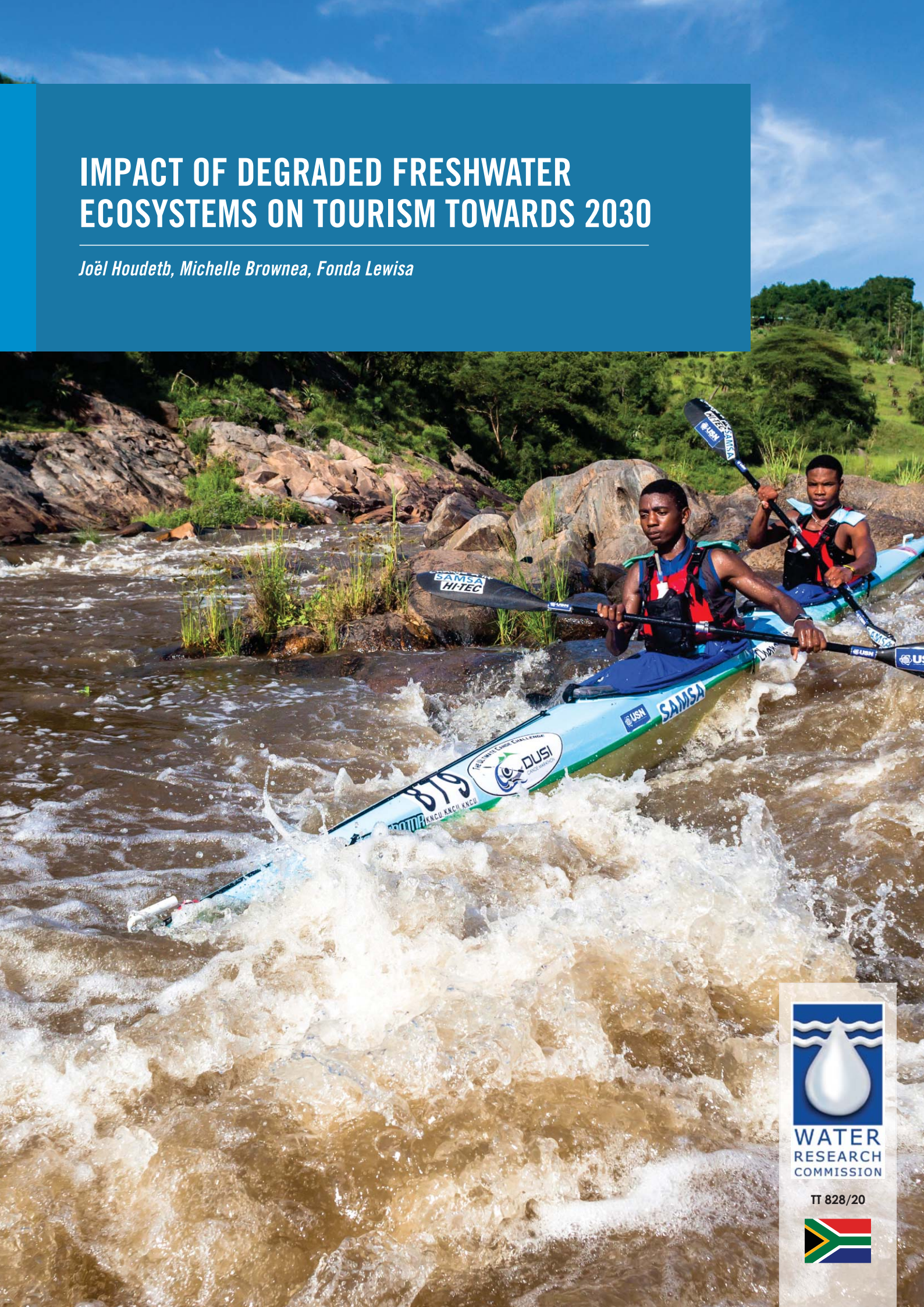
IMPACT OF DEGRADED FRESHWATER ECOSYSTEMS ON TOURISM TOWARDS 2030

Joël Houdetb, Michelle Brownea, Fonda Lewisa



WATER RESEARCH COMMISSION

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IMPACT OF DEGRADED FRESHWATER ECOSYSTEMS ON TOURISM TOWARDS 2030

FINAL TECHNICAL REPORT

Report to the

WATER RESEARCH COMMISSION

by

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EXECUTIVE SUMMARY

Rationale

One in every 22 working South Africans is employed in the tourism sector (StatsSA, 2019). The World Travel and Tourism Council estimated that travel and tourism directly employ more people than the mining, communication services, automotive manufacturing and chemicals manufacturing sectors in South Africa (SA). The 1996 White Paper on the Development and Promotion of Tourism in SA identifies tourism as having significant potential to serve as a vehicle for socio-economic upliftment and tourism is regarded as a key strategic sector for economic transformation, as emphasised in the 2019 State of the Nation Address (SONA).The combination of well-developed infrastructure, scenic beauty, rich biodiversity, sunny climate, cultural diversity and a reputation for value for money experiences, are believed to be what makes SA one of the world's fastest growing tourism destinations.

Tourism, like all economic sectors, is both directly and indirectly dependent on natural capital and the ecosystem services it provides. However, there is growing concern that ongoing degradation of natural capital, due to various global and local drivers of change, will compromise the delivery of these critical services. Biodiversity loss and ecosystem collapse, water crises and extreme weather events are primary global risks identified by the World Economic Forum. **Securing natural capital is critical to sustaining and growing SA's tourism sector, while degradation of natural capital undermines the sectors potential to support economic transformation**.

A better understanding of the links between the condition of ecosystems and the sustainability and growth of the tourism sector creates the potential for tourism to unlock incentives for environmental management and restoration that will support tourism and thereby its capacity to drive economic transformation for South Africans.

Objectives

With a specific focus on freshwater ecosystems, the objectives were to:

- Demonstrate the links between natural capital, tourism and global change and the influence such links have on the development potential of the tourism sector and its contribution to generating economic benefits and supporting Small, Medium and Micro-enterprise (SMME) development;
- Generate recommendations regarding policy and further research needs to promote environmental management and ecological restoration through tourism.

The study also incorporated a capacity development component with youth in the case study areas. These activities sought to raise awareness about nature-tourism linkages as a building block towards empowering youth to recognize sustainable tourism opportunities.

Methodology

Building on the findings from an extensive literature review, a multi-pronged methodological approach was adopted to address these objectives. The approach involved undertaking research at both:

- The national level:
    - National level economic modelling of water-related global change scenarios for the tourism economy;
    - National level stakeholder engagement;
    - Policy review with respect to tourism, natural capital and SMME development.
- The level of two case study sites:
    - Characterising of the case study sites in the context of the Panarchy model;
    - Ecosystem service supply, demand and stress modelling according to different water-related change scenarios;
    - Economic impact modelling of the tourism system according to the different water-related change scenarios;
    - Assessment of opportunities and challenges for community-based tourism development through a soft-systems thinking approach incorporating community surveys, participatory action research and social learning techniques.

The two case study sites selected to investigate the research questions of this study were (a) the uMngeni River Catchment, specifically the Dusi Canoe Marathon event and tourism associated with Inanda Dam; and (b) the Olifants River Catchment, specifically recreational fishing events at, and tourism opportunities associated with, Loskop Dam. The case studies provided an opportunity to better understand the complex relationships (existing and potential) between drivers of change and tourism systems.

Results

The tourism sector in SA relies on both the domestic and international tourism markets and generates significant socio-economic benefits to the nation, with spatial differences / inequalities at the local level. The sector is based on a complex value chain with significant contributions by SMMEs, which explains why almost 10% of the SA workforce can be linked

to tourism. Its success and future are subject to numerous local and international factors and trends that influence how tourists make decisions.

Tourism systems are complex adaptive systems akin to socio-ecological systems. These systems are characterized by multiple, interacting components; cause and effect relationships that are often non-linear and unclear; system dynamism; 'butterfly effects' (being disproportionally affected by external events); and vulnerability to multiple shocks. The 'core' tourism system is not separable from the social, ecological and political systems. This model of tourism gives far greater significance to vital ecosystem goods and services, structures and functions, local society, its perceptions and aspirations, and a host of other components than the traditional model. The complex adaptive view of tourism thus focuses on adaptation rather than mitigation.

All tourism activity categories have impacts and dependencies on natural capital, not only tourism assets and destinations. While cultural ecosystem services are drivers of tourism activities, either directly or indirectly by attracting other activities, provisioning services provide inputs to many tourism businesses and are often imported from elsewhere. Regulation and maintenance ecosystem services are critical for site-specific activities and the associated tourism assets which rely on them.

Key policy gaps

The South African National Tourism Sector Strategy has limited focus on environmental issues, besides raising concerns over the impacts on inbound tourist numbers of carbon taxes on the aviation industry, and the need for SA to appear to be a responsible tourism destination to help mitigate this risk. In practice, this equates to funding support for environmental management activities for a selection of tourism businesses and assets (e.g. support to protected area management). There is no explicit and clear recognition of the importance of water source areas and ecological infrastructure linked to freshwater ecosystems (rivers, wetlands) as key enablers of tourism activities and the associated businesses and jobs. **While the Department of Water and Sanitation Master Plan focuses on "protecting and restoring ecological infrastructure" and has recognised key water source areas, the tourism sector has yet to formally take such an approach into account.** Greater cooperation between the tourism sector and government departments (DEFF, DWS, NDT, DMR) over the development and implementation of a freshwater ecosystem "source-to-sea" conservation and restoration strategy and action plan is warranted.

National scale modelling

At the national scale, the economic impact modelling results highlight the additional effects of the various climate change scenarios on tourism GDP and employment. While these results should be interpreted with caution, they emphasise that climate change, characterised by water-related extreme events, can negatively affect any growth pathway for the tourism and travel industries. Their effects would be particularly acute when the tourism spending / sector growth rate is low or negative (i.e. in times of global, regional or national economic crisis). This does not support the current National Tourism Sector Strategy which assumes continuous, steady growth of the tourism economy. **The degradation of freshwater ecosystems caused by many anthropogenic factors, including tourism, is threatening the future of the tourism economy in SA.** This is affecting all tourism stakeholders, including tourism businesses, local communities, employees and tourists. For example, what would happen to the iSimangaliso World Heritage Site tourism economy if freshwater ecosystems and the associated water quantity and quality were to further deteriorate due to land clearing and water pollution upstream of the estuary? Trends in degradation must be reversed if we are to reach SA's 2030 NDP and SDG goals.

Furthermore, nation-wide modelling masks spatial and temporal disparities and variabilities. For instance, under different climate change scenarios, some SA hydrological zones will suffer much more than others due to significant climate variability across the country, with direct consequences for the behaviour of tourists and hence tourism activity / businesses. In this context, it is critical to understand (a) which phase of the adaptive cycle various nested tourism systems may lie and / or transition towards and (b) what the potential traps for each nested system are (e.g. lack of water resources for tourism expansion). Accordingly, modelling water-related global change impacts on tourism at the local level (making use of more precise data sets) will likely better explain the relationships between changes in water-related ecosystem services and tourism in the context of climate change.

Case study analysis – water-related scenarios and the associated economic impacts on local tourism

Through the review of case study evidence (e.g. drought impact on tourism in Cape Town), and the modelling of different climate change scenarios on the local tourism systems of two case studies (Dusi Canoe Marathon and Loskop Dam tourism), this research underlines the fact that **freshwater-related extreme events can have significant impacts on the tourism industry, especially in rural areas** with weak institutional support and limited community skills / know-how and / or where tourism systems are small or weak due to a combination of factors (e.g. a single event or attraction).

Dusi Canoe Marathon

Two natural capital dependency pathways relevant to participants in the Dusi Canoe Marathon were identified as material:

- River water levels (risk of decrease) → affect the quality of experience to the participant, influencing future participation → participant numbers impact the product (organizer financial impact, jobs, etc.) and have a regional economic impact (e.g. accommodation, other spending categories); with three key change drivers / factors of water levels – rainfall, dam releases, exotic vegetation density (e.g. alien plants).
- River water quality (risk of decline) → affects the quality of experience to the participant (health, satisfaction), influencing future participation → participant numbers impact on the product (organizer financial impact, jobs, etc.) and have a regional economic impact (e.g. accommodation, other spending categories); with two key change drivers / factors of water quality – point and non-point source pollution, water quantity (dilution).

Building on the ample evidence of water-related impacts on the canoeing experience (i.e. importance of river levels and water quality), the economic impacts of several water-related change scenarios were modelled. Results show that collapse scenarios may be supported by a combination of key factors, such as an aging client base (the Dusi Canoe Marathon is dominated by return or repeat participation) and few new participants (younger audiences prefer alternatives with no water-related problems). While no staff member is dedicated full time only to the Dusi Canoe Marathon and the event represents a small, but predictable, proportion of the turnover of interviewed businesses, the results of such collapse scenarios would have significant implications for water-related tourism businesses and jobs throughout the uMngeni-Msunduzi River. **Unless water quantity and quality trends improve and new entrants are attracted, there are serious concerns about the resilience and sustainability of the regional tourism economy**. Though beyond the scope of this study, one could raise further concerns about the impact of degraded freshwater ecosystems on tourism activities further downstream (e.g. the Blue Flag status of Durban beaches).

Loskop Dam Tourism

One natural capital dependency pathway relevant to participants of the Loskop Dam fishing competitions was identified as material:

- River water quality (risk of decline) → quality of experience to the fishing competition participants (recreational fishing as final ecosystem service, with fish mortalities and declining fish health as the key risks) → impact to the products and services (financial

impacts, jobs, etc.) and regional economic impacts (e.g. accommodation, other spending categories); with three key change drivers / factors affecting water quality: water quantity (dilution), point and non-point source pollution.

The evidence collected and the modelling of the impacts of water-related scenarios on competition participation and estimated total spending at the Loskop Dam fishing competitions up to 2030 suggest the likelihood of collapse scenarios may not be as high as for the Dusi Canoe Marathon. While declining water quality has been confirmed in the catchment due to several factors (e.g. mining) and efforts have been made to prevent and minimise extreme water pollution events, the tourism system appears to be more robust and resilient to change in the area of the Loskop Dam (e.g. greater diversity of activities and products available which don't require direct contact with water). Yet, it is critical to emphasise that, **would efforts to manage water quality in the catchment not be sustained and further extreme pollution events take place, there could be significant negative impacts** on (a) fishing competitions (e.g. due to higher fish mortalities, unpleasant odours) and (b) the development potential of new tourism products for local communities within the scope of the successful land claim of the Loskop Dam Nature Reserve (i.e. algae bloom constantly visible in the vicinity of the main inflow to the Dam).

Case study analysis – opportunities and challenges for community-based tourism development

The case studies clearly highlighted that the need for development and economic transformation in these communities is significant. The widely held view among the surveyed communities is that formal employment in one of the mainstream economic sectors (e.g. mining, retail, and manufacturing) is the best way to achieve financial security and prosperity. Self-employment and entrepreneurship in alternative sectors such as tourism are seen as less desirable and inferior in terms of securing prosperity (in its currently held definition). **There is little understanding or motivation in these communities, particularly among the youth, to explore alternative development pathways and opportunities such as those in tourism and the blue-green economy. Readily available opportunities in the tourism sector are, therefore, not recognised** nor their potential to contribute to alternative development concepts and issues, such as empowerment, self-reliance, and sustainable livelihoods.

The level of awareness and information on the tourism sector among the surveyed communities was extremely limited, including among the youth. Even those employed in the tourism sector had very little understanding of the sector and the types of development

opportunities it can stimulate. Without this awareness and understanding, it is almost impossible for people to harness enterprise opportunities that may be readily available in the tourism sector. In general, environmental awareness and / or ecological- and tourism-literacy was limited, notably in terms of the **lack of understanding of the links between environmental condition and the delivery of critical ecosystem services that are crucial for tourism businesses and the associated supporting socio-economic activities** (e.g. food production for tourists).

Access to finance and start-up capital was widely highlighted by survey respondents as a constraint to the start-up of SMMEs in any sector. The study also highlights that, even where start-up capital was secured, **the sustainability and growth of the enterprises were severely constrained by lack of capacity or resources for adequate business support such as marketing, advertising and business development**. As a result, the enterprises were floundering and their sustainability compromised, or they were just able to survive, but were nowhere near fulfilling their potential in terms of growth and capacity to employ more people to support the start-up of complementary enterprises along the tourism value chain.

Conclusion and recommendations

The evidence gathered through this research project led to the following key findings:

- The tourism sector in SA relies on both the domestic and international tourism markets and generates significant socio-economic benefits to the nation, with spatial differences / inequalities at the local level. The sector is based on a complex value chain with significant contributions of SMMEs, which explains why almost 10% of the SA workforce can be linked to tourism. Its success and future are subject to numerous local and international factors and trends that influence how tourists make decisions.
- All tourism activity categories have impacts and dependencies on natural capital, not only tourism assets and destinations. While cultural ecosystem services are drivers of tourism activities, either directly or indirectly by attracting other activities, provisioning services provide inputs to many tourism businesses and are often imported from elsewhere. Regulation and maintenance ecosystem services are critical for site-specific activities and the associated tourism assets which rely on them.
- While the SA government has recognised the importance of the tourism sector for the economy, especially for transformation and pro-poor growth, notably through the support and development of SMMEs throughout urban and rural areas, this study has highlighted a number of policy gaps and shortcomings. First and foremost, there is a lack of clear recognition of the importance of freshwater source areas (for both surface

and groundwater) and the ecological infrastructure linked to freshwater ecosystems (rivers, wetlands) as key enablers of tourism activities and the associated businesses and jobs. Currently, environmental activities in the tourism sector focus on improving environmental management of selected tourism sites (e.g. national parks) and businesses (e.g. hotels), which is not sufficient to sustain the freshwater ecosystems and associated ecological infrastructure on which tourism relies.

- A pathways approach to sustainability acknowledges that there are alternative, competing pathways towards multiple sustainable tourism futures, which emphasises the role of power relationships between stakeholders in the framing of sustainability discourses / policies and the adoption / implementation of the associated strategies and activities. There is an urgent need for various government departments (NDT, DWS, DEFF, DMR, relevant local municipalities) to work together, with the tourism sector, towards the development and implementation of a freshwater ecosystem "source-to-sea" conservation and restoration strategy and action plan.
- As is well known by tourism stakeholders, growth trajectories of the sector can vary considerably over time, depending on a number of socio-economic and political drivers of change. The impacts of tourism on the national economy and job creation will vary accordingly. Through the review of case study evidence (e.g. drought impact on tourism in Cape Town), the modelling of different climate change scenarios on the national tourism industry and the local tourism systems of two case studies (Dusi Canoe Marathon and Loskop Dam tourism), our research underlines the fact that freshwater-related extreme events can have significant impacts on the tourism industry and stakeholders, especially in rural areas with weak institutional support and limited community skills / know-how, and / or where tourism systems are small or weak due to a combination of factors (e.g. a single event or attraction).
- Water-related drivers of change and variables hold non-linear relationships with the various components / structures and processes of tourism systems. The adaptive capacity of tourism systems will vary significantly across SA. For instance, under different climate change scenarios, some SA hydrological zones will suffer much more than others due to significant climate variability across the country, with direct consequences for the behaviour of tourists and hence tourism activity / businesses. In this context, it is critical to understand (a) which phase of the adaptive cycle various nested tourism systems may lie and / or transition towards and (b) what the potential traps for each nested system are (e.g. lack of water resources for tourism expansion).
- Finally, the need for economic and environmental transformation in the case study communities needs to be emphasised. While aquatic ecosystems may hold significant

potential to support increased tourism SMME development, particularly pro-poor tourism, several constraints currently hinder the harnessing of this potential, notably the lack of: (a) awareness of alternative development pathways, (b) knowledge and capacity to harness potential for tourism enterprises and (c) access to finance and business support. Without adequate support, such rural areas will neither positively benefit nor contribute to SA's 2030 NDP and SDG targets.

The continued degradation of freshwater-related ecosystems (ecological infrastructure) caused by many anthropogenic factors threatens the future of the tourism economy in SA and its potential as a key strategic sector for economic transformation and the transition to a Green Economy. Trends must be reversed if NDT, and other government departments influencing freshwater ecosystems (e.g. DEFF, DWS, DMR), are to meet their respective NDP and SDG 2030 targets. Investing in conservation and restoration of the freshwater ecosystems (ecological infrastructure) to enable tourism growth, SMME development and pro-poor opportunities should drive the agenda of all tourism actors in SA.

Working towards 2030 to mainstream natural capital, notably freshwater ecosystems, in the tourism economy may involve identifying, designing and implementing various mainstreaming interventions at one or more pilot sites, including potential natural capital impact avoidance (e.g. through strategic planning) and minimisation (e.g. infrastructure design based on green infrastructure principles), natural capital restoration / rehabilitation (e.g. as part of tourism product development) and / or offset measures (e.g. through stewardship site declaration).

Yet, despite such measures, the absence of education and capacity to harness these opportunities is a current reality that profoundly limits the tourism sector's ability to deliver on its promise as "a modern-day engine of growth potential". This is particularly the reality among disadvantaged communities who potentially stand the most to gain from pro-poor tourism. Communities are currently not empowered to harness tourism opportunities, including those related to freshwater ecosystems.

Accordingly, a comprehensive, integrated tourism socio-economic and ecological strategy and action plan is warranted:

- From an ecological perspective, this calls for strategically investing in freshwater ecosystems following a "source-to-sea" approach: that is, strategic water source area stewardship, sustainable water infrastructure design and management, sustainable water use / management practices in various tourism businesses (accommodation,

catering, recreation, etc.) and ecological infrastructure stewardship at tourism asset / destinations.

- From a socio-economic perspective, an extensive programme of capacity building is required to empower rural and marginalised communities, and particularly the youth, to recognize and harness tourism opportunities and to embed an understanding of the linkages and interdependencies between tourism and natural capital. Such a programme needs to focus not only on aspects directly regarding tourism and its value chains, but also on the issues needed to provide an enabling environment for tourism such as water and waste management, pollution reduction and crime control.

To that end, a multi-stakeholder private-public sector forum or working group (involving at least DSBD, DEFF, DHET, DMR, DWS, NDT) is needed to drive this integrated socio-economic and ecological tourism / freshwater ecosystem "source-to-sea" agenda on three main fronts:

- Lobbying for policy change, notably in the education, tourism, mining, water management and local government space, with an emphasis on policy integration / alignment across both the public and private sectors;
- Through the support of relevant tertiary education institutions and research organisations (e.g. SANBI, Tourism SA), funding for continuous research / evidence gathering to make / support the business case with respect to freshwater ecosystems conservation / restoration planning and prioritisation for pro-poor tourism growth (e.g. freshwater ecosystem trends; tourism value chain statistics, especially in rural areas);
- Unlocking financial and institutional support to harness tourism potential in critical "source-to-sea" pilot areas (e.g. for the iSimangaliso WHS); ideally through establishing financially independent (e.g. non-sinking, endowment / trust fund), multi-stakeholder, accountable / transparent Water Funds with broad mandates to ensure alignment in public-private sector policy-making and implementation throughout the pilot sites.

KEY TERMS

- **Ecological infrastructure**: According to the South African National Biodiversity Institute, ecological infrastructure refers to naturally functioning ecosystems that deliver valuable services to people, such as fresh water, climate regulation, soil formation and disaster risk reduction. It is the nature-based equivalent of built or hard infrastructure, and is just as important for providing services and underpinning socio-economic development. The term should also be distinguished from 'green infrastructure', which is broadly seen as any infrastructure that is good for the environment and promotes sustainable development.
- **Ecosystem services**: The term 'ecosystem services' relates to the *flow of benefits derived by humans from nature;* the concept was popularised by the 2005 Millennium Ecosystem Assessment (MA).
- **Freshwater ecosystems: A subset of Earth's aquatic ecosystems, freshwater ecosystems include lakes, ponds, rivers, streams, springs, bogs and wetlands. They can be contrasted with marine ecosystems, which have a larger salt content. Freshwater ecosystems can be divided into lentic ecosystems (still water) and lotic ecosystems (flowing water).**
- **Natural capital**: According to the Natural Capital Protocol (Natural Capital Coalition, 2016: 2), "*natural capital can be defined as the stock of renewable and non-renewable natural resources (e.g. plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people*".
- **Natural ecosystems**: The complex of living organisms, their physical environment, and all their interrelationships in a particular unit of space[1]. An ecosystem can be categorized into its abiotic constituents, including minerals, climate, soil, water, sunlight, and all other non-living elements, and its biotic constituents, consisting of all its living members. Linking these constituents together are two major forces: the flow of energy through the ecosystem, and the cycling of nutrients within the ecosystem.

[1] https://www.britannica.com/science/ecosystem

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LIST OF ABBREVIATIONS

Bn	Billion
CPA	Communal Property Association
DCM	Dusi Canoe Marathon
DEA	Department of Environmental Affairs (now DEFF)
DEFF	Department of Environment, Forestry and Fisheries (formerly DEA)
DGC	Durban Green Corridors
DHET	Department of Higher Education and Training
DMR	Department of Mineral Resources
DSBD	Department of Small Business Development
DTI	Department of Trade and Industry
DUCT	Duzi-uMngeni Conservation Trust
DWS	Department of Water and Sanitation
EI	Ecological Infrastructure
EPI	Economic Policy Instruments
ES	Ecosystem Services
GDP	Goss Domestic Product
HAI	Health Assessment Index
HAND	Height Above the Nearest Drainage
INR	Institute of Natural Resources
IPI	Inverted Parasite Index
KNCU	KwaZulu-Natal Canoe Union
KZN	KwaZulu-Natal
MA	Millennium (ecosystem) Assessment
NDP	National Development Plant
NDT	National Department of Tourism
NDVI	Normalised Differential Vegetation Index
NTSS	National Tourism Sector Strategy
PES	Payment for Ecosystem Services
R	Rand
SA	South Africa
SAM	Social Accounting Matrix
SDG	Sustainable Development Goals
SMME	Small, Medium and Micro-enterprises
SONA	State of the Nation Address of the President of South Africa
UNWTO	United Nations World Tourism Organization
WMA	Water Management Area
WRC	Water Research Commission
WTTC	World Travel and Tourism Council

1 INTRODUCTION

1.1 Rationale

One in every 22 working South Africans is employed in the tourism sector (Statistics South Africa, 2019). The 1996 White Paper on the Development and Promotion of Tourism in South Africa identifies tourism as having significant potential to serve as a vehicle for socio-economic upliftment. Tourism development is identified in South Africa's National Development Plan 2030[2] as a strategy for an inclusive and integrated rural economy. Globally, tourism is increasingly recognized as a key sector to support a transition to a Green Economy, towards increasing human well-being and social equity, as well as reducing environmental risks and ecological scarcities (UNEP, 2011).

All businesses both depend on and impact, directly and indirectly, natural capital stocks and the associated ecosystem services (Hanson *et al*., 2012; Houdet *et al*., 2012; Natural Capital Coalition 2016; TEEB 2012). Natural capital is critically important to the tourism economy. As stated in the National Tourism Sector Strategy "South Africa's natural environment is one of its greatest tourism resources". There is growing concern that ongoing degradation of natural capital, due to various global and local drivers of change, will compromise the delivery of the ecosystem services (ES) on which the Tourism Sector in South Africa relies. Biodiversity loss and ecosystem collapse, water crises, failure of climate-change mitigation and adaptation and extreme weather events are some of the primary global risks identified in the 'Global Risks Report 2019' (WEF, 2019).

A better understanding of the links between the condition of ecosystems and the sustainability and growth of the tourism sector creates the potential for tourism to unlock incentives for environmental management and restoration that will support tourism and thereby its capacity to drive economic transformation for South Africans.

1.2 Study aims and scope

This technical report covers the findings and recommendations emanating from a research study entitled "The inland water related tourism in South Africa by 2030 in the light of global change" (WRC Project No. K5/2620, Annexure 7.1). The technical report is accompanied by two synthesis products.

[2] The National Development Plan aims to eliminate poverty and reduce inequality by 2030, providing a broad strategic framework to guide key choices and actions.

The study aimed to investigate:

- The links between natural capital, tourism and global change, with a focus on freshwater aquatic ecosystems, and
- The influence such links have on the development potential of the tourism sector and its contribution to generating economic benefits and supporting Small, Medium and Micro-enterprise (SMME) development.

To address these aims, the following tasks were undertaken:

- The national level (section 4.1):
    - National level stakeholder engagement;
    - Policy review and analysis with respect to tourism, natural capital and SMME
    - National level economic modelling of water-related global change scenarios for the tourism economy.
- The level of two case study sites (sections 4.2 and 4.3):
    - Characterising of the case study sites in the context of the Panarchy model;
    - Ecosystem service supply, demand and stress modelling according to different water-related glocal[3] change scenarios;
    - Economic impact modelling of the tourism system according to the different water-related glocal change scenarios;
    - Assessment of opportunities and challenges for community-based tourism development.

The report is structured as follows. Chapter 2 provides an overview of the literature review. Chapter 3 describes the multipronged study approach involving research at both the national and case study levels. Chapter 4 reports the results of the research at the national level and for the two case-study sites, the uMngeni River Catchment and Olifants River Catchment tourism systems. The study conclusions and recommendations are presented in Chapters 5 and 6.

[3] Glocal reflects or characterizes both local and global considerations.

2 LITERATURE REVIEW & EVIDENCE BASE

Chapter 2 of the report provides an overview of the key findings from the literature review undertaken, notably:

- A brief presentation of the tourism economy in South Africa (economic contribution, growth prospects, tourism value chain, SMME and transformation) (section 2.1);
- A review of the conceptual foundations linking business to natural capital, notably the inter-dependencies between business and natural capital (section 2.2);
- The subsequent application of the adaptive theory of change to tourism systems (section 2.3);
- A policy review with respect to tourism, natural capital and SMME development (section 2.4).

2.1 A short introduction to the tourism economy in South Africa

This section presents a brief introduction to the tourism economy in South Africa, including:

- Its economic contributions and the associated tourists' spending statistics (section 2.1.1);
- Growth prospects and challenges (section 2.1.2);
- The key actors of the industry (section 2.1.3);
- The rise of sustainability in tourism (section 2.1.4);
- The opportunities for pro-poor growth, SMMEs and transformation (section 2.1.5).

2.1.1 Economic contribution and SA and visitor spending statistics

The tourism industry in South Africa has grown considerably since the country's first democratic elections in 1994 (National Department of Tourism, 2011). The latest Tourism Satellite Account for South Africa report (Statistics SA, 2018) provides an overview of tourism's contribution in terms of spending, employment and its impact on the gross domestic product (GDP) (Table 2-1).

Table 2-1: Key findings of the Tourism Satellite Account for South Africa for 2012 to 2016 (Statistics SA, 2018)

	2012 (f)	2013 (f)	2014 (f)	2015 (p)	2016(p)
Inbound tourism expenditure (R million)	85 423	94 183	106 728	108 760	121 400
Annual growth in inbound tourism expenditure (%)	19.1	10.3	13.3	1.9	11.6
Outbound tourism expenditure (R million)	58 588	62 596	68 417	72 712	78 493
Annual growth in outbound tourism expenditure (%)	-3.2	6.8	9.3	6.3	8.0
Tourism trade balance with the rest of the world (R million)	26 835	31 587	38 311	36 048	42 907
Annual growth in the tourism trade balance with the rest of the world (%)	139.5	17.7	21.3	-5.9	19.0
Domestic tourism expenditure (R million)	114 511	124 137	133 990	122 744	144 358
Annual growth in domestic tourism expenditure (%)	11.4	8.4	7.9	-8.4	17.6
Internal tourism expenditure (R million)	199 934	218 320	240 718	231 504	265 758
Annual growth in internal tourism expenditure (%)	14.5	9.2	10.3	-3.8	14.8
Tourism direct gross value added (TDGVA) (R million)	86 646	95 469	104 000	99 348	114 850
Tourism direct gross value added (TDGVA) (%)	2.9	3.0	3.0	2.7	3.0
Tourism direct gross domestic product (TDGDP) (R million)	93 750	103 349	112 571	108 683	125 136
Tourism direct gross domestic product (TDGDP) (% of GDP)	2.9	2.9	3.0	2.7	2.9
Persons directly engaged with producing goods and services purchased by visitors (number)	646 390	657 766	681 915	668 651	686 596
Persons directly engaged with producing goods and services purchased by visitors (% of total)	4.5	4.4	4.5	4.2	4.4

Note: (f) final; (p) preliminary.

Tourism direct gross domestic product was R85 423 million (or 2,9% of total gross domestic product) in 2012, and R121 400 million (still 2,9% of total gross domestic product) in 2016, with a significantly positive trade balance with the rest of the world (Table 2-2). The year 2016 saw 15 121 328 non-resident visitors to South Africa compared with 12 097 490 non-resident

visitors for 2011 (Statistics SA 2015; 2018). Of the 15 121 328 non-resident visitors in 2016, 5 077 165 (or 33,6%) were same-day visitors and 10 044 163 (or 66,4%) were tourists (Statistics SA 2018). Furthermore, there were 681 915 persons (or 4,5% of total employment) directly engaged in producing goods and services purchased by visitors in 2014 and 686 596 (or 4,4% of total employment) in 2016. However, when indirect and induced jobs are considered, as many as over 1.5 million jobs could be linked to the tourism industry, representing 9.9 percent of all employment in South Africa in 2015 (NDT, 2017).

Table 2-2: The Tourism Balance of Payments for South Africa, 2005 to 2016 (Statistics SA, 2018:16)

Year	Inbound tourism expenditure	Outbound tourism expenditure	Trade balance with the rest of the world
		R million	
2005	51 090	30 631	20 459
2006	57 983	35 413	22 570
2007	66 653	42 875	23 778
2008	69 963	56 317	13 646
2009	67 141	53 553	13 588
2010	69 422	59 452	9 970
2011	71 747	60 545	11 202
2012	85 423	58 588	26 835
2013	94 183	62 596	31 587
2014	106 728	68 417	38 311
2015	108 760	72 712	36 048
2016	121 400	78 493	42 907

The Tourism Satellite Accounts makes a distinction between three categories of industries, namely (Statistics SA, 2018):

- A **tourism-characteristic industry** is one where either:
  - At least 25 percent of the industry's output is purchased by visitors; or
  - The industry's characteristic output includes a tourism-characteristic product.
- A **tourism-connected (or related) industry** is one where:
  - The industry is not a tourism-characteristic industry;
  - Between 5 percent and 25 percent of the industry's output is purchased by visitors; and
  - A direct physical contact occurs between the industry and the visitor buying its product. In practice, the retail trade industry is the only tourism-connected industry.

- A **non-tourism-connected industry** is any industry that is not a tourism-characteristic or tourism connected industry. A non-tourism industry may still sell some of its products to visitors.

Inbound tourism expenditure amounted to (Table 2-3):

- R85 423 million in 2012, with the main expenditure items recorded as follows: 'non-specific products' (26.2%), 'tourism-connected products' (15.1%), 'accommodation for visitors' (14.5%) and 'road passenger transport services' (12.5%).
- R121 400 million in 2016, with the main expenditure items recorded as follows: 'non-specific products' (28.1%) 'accommodation for visitors' (15.0%), 'connected products' (13.4%) and 'road passenger transport services' (11.9%).

Based on data from Table 2-3, one can estimate that for every R100 spent by an international visitor in 2016, R28.10 was spent on non-specific products, R15 on accommodation, R13.40 on tourism-connected products, R11.90 on road transport and R11.80 on air passenger transport services. Analysis of the annual growth of inbound tourism expenditure by type of product (Statistics SA, 2018:19) highlights decreasing rates of growth for 'sports and recreational services' over time and the emerging 'water passenger transport services' (e.g. cruises) market (i.e. highest growth rates recorded over the years, though from a low base).

Table 2-3: Inbound tourism expenditure by type of product, 2012 to 2016 (%) (Statistics SA, 2018:18)

Tourism product	**Inbound tourism expenditure (%)**				
	2012	2013	2014	2015	2016
Accommodation for visitors	14.5	14.3	13.8	15.1	15.0
Restaurants and similar services	9.7	9.6	9.0	9.2	8.8
Railway passenger transport services	0.1	0.1	0.2	0.2	0.2
Road passenger transport services	12.5	12.1	12.3	13.0	11.9
Water passenger transport services	0.0	0.0	0.0	0.0	0.0
Air passenger transport services	11.5	11.7	11.2	12.2	11.8
Transport equipment rental	1.4	1.5	1.4	1.5	1.5
Travel agencies and other reservation services	2.7	2.7	2.7	3.0	2.9
Cultural services	0.2	0.2	0.2	0.2	0.2
Sports and recreational services	6.1	6.6	6.4	6.7	6.3
Tourism-connected products	15.1	14.6	14.3	15.1	13.4
Non-specific products	26.2	26.5	28.5	23.8	28.1
Total	100.0	100.0	100.0	100.0	100.0

Note: individual figures may not add up to stated totals due to rounding.

With respect to domestic tourism expenditure, the following trends were recorded from 2012 to 2016 (Table 2-4):

- R114 511 million of expenditures in 2012, with the main expenditure items recorded as follows: 'road passenger transport services' (29.3%), 'non-specific products' (19.9%), 'accommodation for visitors' (14.1%) and 'air passenger transport services' (13.8%).
- R144 358 million of expenditures in 2016, with the main expenditure items recorded as follows: 'road passenger transport services' (27.8%), 'non-specific products' (17.3%), 'accommodation for visitors' (14.8%) and 'air passenger transport services' (14.3%).

Based on data from Table 2-4, one can estimate that for every R100 spent by a domestic visitor in 2016, R27.80 was spent on road transport services, R17.30 on non-specific products, R14.80 on accommodation, R14.30 on air passenger transport services and R10.00 on tourism-connected products.

The total internal tourism consumption in cash for South Africa (Table 2-5) (Statistics SA, 2018):

- Stood at R199 934 million in 2012, with inbound tourism consumption recorded at R85 423 million (42.7%) and domestic tourism consumption at R114 511 million (57.3%).
- Was R265 758 million in 2016, with inbound tourism consumption recorded at R121 400 million (45.7%) and domestic tourism consumption at R144 358 million (54.3%).

In 2012, the main expenditure items for internal tourism were 'non-specific products' (22.6%), 'road passenger transport services' (22.1%), 'accommodation for visitors' (14.3%) and 'air passenger transport services' (12.8%). In 2016, the main expenditure items for internal tourism were 'non-specific products' (22.2%), 'road passenger transport services' (20.5%), 'accommodation for visitors' (14.9%) and 'air passenger transport services' (13.2%).

Table 2-4: Domestic tourism expenditure by type of product, 2012 to 2016 (%) (Statistics SA, 2018:20)

Tourism product	Domestic tourism expenditure (%)				
	2012	2013	2014	2015	2016
Accommodation for visitors	14.1	14.7	14.6	16.4	14.8
Restaurants and similar services	4.1	4.3	4.2	5.1	4.8
Railway passenger transport services	0.3	0.3	0.3	0.3	0.3
Road passenger transport services	29.3	29.3	29.3	27.6	27.8
Water passenger transport services	0.0	0.0	0.0	0.0	0.0
Air passenger transport services	13.8	13.8	13.8	16.3	14.3
Transport equipment rental	2.2	2.2	2.2	2.7	2.4
Travel agencies and other reservation services	4.7	4.9	5.1	6.4	5.7
Cultural services	0.1	0.1	0.1	0.1	0.1
Sports and recreational services	1.6	2.2	2.6	2.4	2.5
Tourism-connected products	9.8	9.9	9.9	8.2	10.0
Non-specific products	19.9	18.4	17.9	14.4	17.3
Total	100.0	100.0	100.0	100.0	100.0

Note: individual figures may not add up to stated totals due to rounding.

Table 2-5: Internal tourism expenditure by type of product, 2011 to 2013 (%) (Statistics SA, 2017:22)

Tourism product	Internal tourism expenditure (%)				
	2012	2013	2014	2015	2016
Accommodation for visitors	14.3	14.5	14.2	15.8	14.9
Restaurants and similar services	6.5	6.6	6.3	7.0	6.6
Railway passenger transport services	0.2	0.2	0.2	0.2	0.2
Road passenger transport services	22.1	21.9	21.8	20.8	20.5
Water passenger transport services	0.0	0.0	0.0	0.0	0.0
Air passenger transport services	12.8	12.9	12.6	14.4	13.2
Transport equipment rental	1.9	1.9	1.8	2.1	2.0
Travel agencies and other reservation services	3.9	4.0	4.0	4.8	4.4
Cultural services	0.1	0.2	0.2	0.1	0.2
Sports and recreational services	3.5	4.1	4.3	4.4	4.2
Tourism-connected products	12.1	11.9	11.6	11.5	11.6
Non-specific products	22.6	21.9	22.6	18.8	22.2
Total	100,0	100,0	100,0	100,0	100,0

Note: individual figures may not add up to stated totals due to rounding.

2.1.2 Tourism sector growth prospects and challenges

From a competitiveness perspective, South Africa is ranked 48th out of 141 countries on the United Nations World Economic Forum International Tourism Competitive Index (NDT, 2017). South Africa is ranked the top tourism destination in sub-Saharan Africa, and the second most popular destination in Africa, after Morocco, based on international tourist numbers. Notably, South Africa ranks in 20th place for its cultural resources, 22nd for its natural resources, 15th for its positive business environment, 25th for wildlife and 15th for its World Heritage Sites. South Africa also ranks 24th overall in online searches for nature-related activities.

The 2017 National Tourism Sector Strategy (NTSS; NDT, 2017) identifies several major trends impacting on world tourism economy which are relevant to SA:

- Consistent and increasing growth globally in international tourist numbers (1.184 billion international visits in 2015);
- Shift in tourism demographics: China and some other emerging source markets growing at double digit levels, an increase in the numbers of both older tourists travelling and under 35s travelling;
- Ubiquitous mobile digital technology resulting in an expectation of permanent quality connectivity availability, changed patterns in information seeking, buying behaviour and hence advertising and information provision;
- Disruptive technologies, with platforms such as Uber, Airbnb and Lyft, which have consequences for conventional operators of tourism transport and accommodation services;
- The reputation of destinations for violent crime, terrorism and exposure to disease has significant influences on tourist decisions: e.g. South Africa experienced a decline in international tourists in 2015 of 6.8 percent, which was mainly attributable to the effects of the Ebola epidemic in West Africa and perceptions linked to this in certain source markets;
- Increased accessibility and increased ease of access: e.g. bilateral, regional and international “Open Skies” agreements and easier visa requirements[4];
- Increasing interest in “green” “sustainable”, “responsible” and “ethical” tourism as tourists are increasingly choosing to reduce negative environmental, economic and social impacts on the host country. As a result, the United Nations declared 2017 as the International Year of Sustainable Tourism for Development.

[4] However, the implementation of new visa regulations in 2015 created greater obstacles to travel to South Africa and may have contributed to lower numbers of non-resident visitors in 2015 compared to 2014.

The NTSS (NDT, 2017) identified several key challenges or limiting factors for inbound tourism in South Africa, including security and health, labour market and ease of visa access, which have all contributed to low international tourist numbers in 2014. Yet, according to NDT (2017), more than 10 million international tourists arrived in South Africa in 2016, representing a 13% growth compared to 2015 (8.9 million international tourist arrivals). All regions recorded positive growth: Asia (30.3%), North America (14.9%), Europe (15.8%), Australasia (10.9%), Africa land markets (11.4%) and Africa air markets (5.3%). Furthermore, the average length of stay for international leisure tourists increased from 8.6 nights in 2014, to 9.5 in 2015 while international tourist spending increased from R68.1 billion in 2015 to R75.5 billion in 2016. This is why NDT (2017) has argued that this major rebound has put tourism firmly back on track for a strong recovery.

In terms of domestic tourism however, SA Tourism data derived from its annual domestic tourism survey indicates a decline in the number of domestic tourism trips from 29,7 million in 2010 to 28 million in 2014. This is largely attributable to reduced consumer disposable income and is likely to be a direct consequence of slow growth in the domestic economy (NDT, 2017). This is significant given the importance of domestic tourism as the backbone of the tourism industry and may significantly limit the opportunities to grow the market.

In response, the NTSS (NDT, 2017) has adopted five pillars to grow both the domestic and international tourism markets: effective marketing, facilitating ease of access, the visitor experience, destination management practices and broad-based benefits. These pillars and associated tourism sector forecasts were proposed on the backdrop of the World Travel and Tourism Council macro-economic projections for the SA tourism sector (WTTC, 2017) (Table 2-6).

Table 2-6: Measurements and targets for the tourism sector in South Africa (NDT, 2017:17)

Indicators / measures of performance	2015 Baseline	2026 Target
Increase direct contribution to National Gross Domestic Product	R118 billion	R302 billion
Increase total (direct and indirect) contribution to National Gross Domestic Product	R375 billion	R941 billion
Increase the number of direct jobs supported by the sector	702 824	1 million
Increase the number of total (direct and indirect) jobs supported by the sector	1 551 200	2,2 million
Increase tourism export earnings	R115 billion	R359 billion
Increase capital investment	R64 billion	R148 billion

In this context, it is important to note that the NTSS explicitly recognises that:

- "South Africa's natural environment is one of its greatest tourism resources, and, therefore, the tourism industry needs to be actively involved in conserving and protecting it."
- "Although South Africa is doing relatively well in the number of Blue Flag Accredited beaches, there is still a need for further protection of our coastline." (NDT, 2017:7).

2.1.3 Players in the tourism value chain: The importance of SMME for transformation

Tourism is a complex industry which involves a wide range of businesses working together at different levels to provide goods and services for individuals or a group of people travelling away from home for purposes of business and trade, medical and religious reasons, and / or visiting friends and relatives (NDT, 2017). Participants in the tourism value chain (Figure 2-1) can be grouped into several categories:

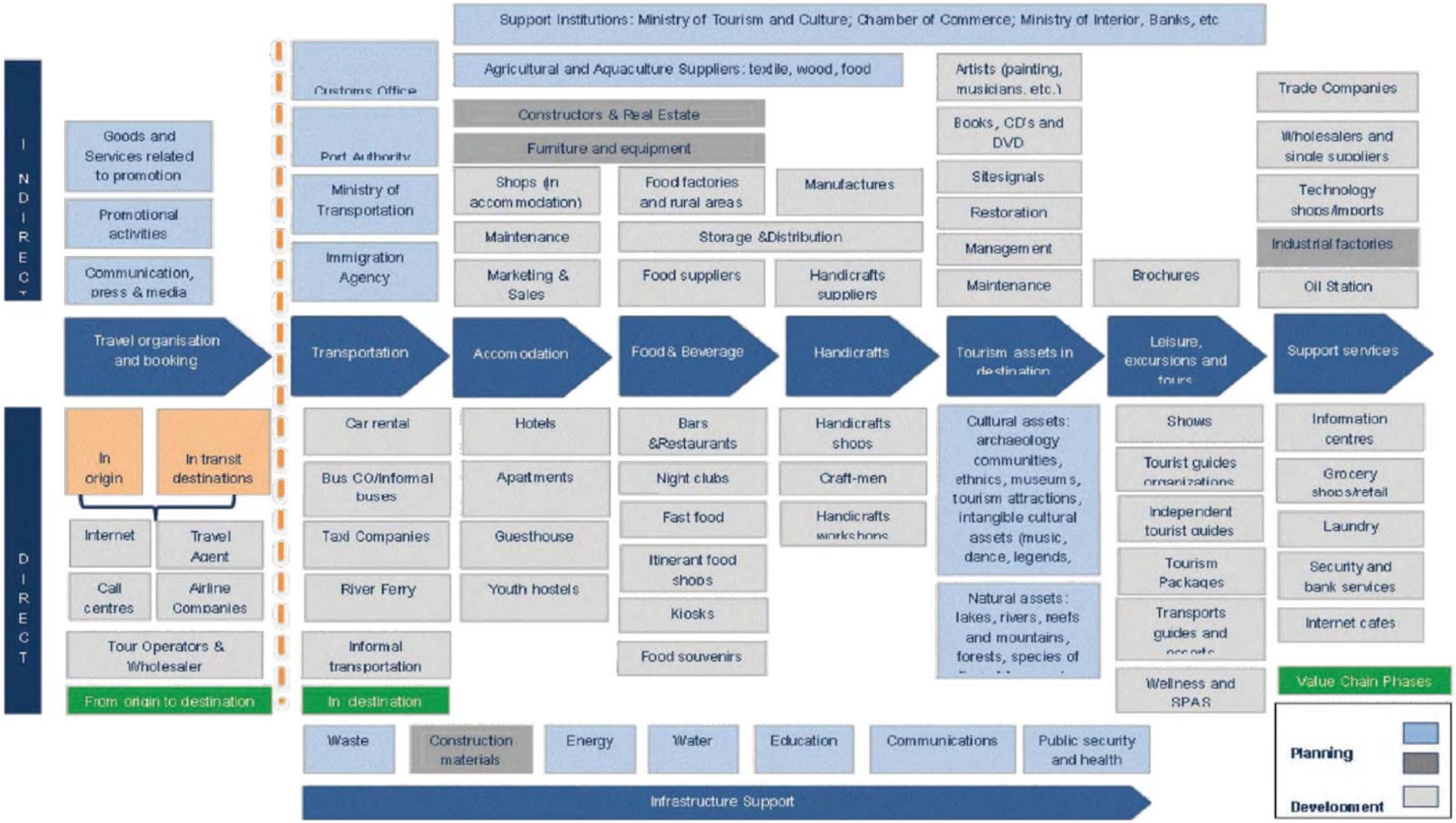
- Travel organisations and booking;
- Transportation (e.g. air, road, sea and rail transporters);
- Accommodation (e.g. hotels, backpackers, lodges, homestays, vacation rentals, caravanning and camping, and bed and breakfast establishments);
- Foods and beverages (from both food producers and suppliers to restaurants and less formal food service companies);
- Handicrafts;
- Tourism assets and destinations (including all forms of attractions from parks and heritage sites to casinos);
- Leisure, excursions and tours; and
- Support services (e.g. security, laundry, marketing and financial services).

For each category, both direct and indirect players can be identified (Figure 2-1). For instance, farmers (indirect) supply food to restaurants (direct), highlighting the difference between the travel and tourism industry and travel and tourism economy (Figure 2-2). One also needs to emphasise the support given by multiple other public sector departments and their partners, which are essential and have a high degree of influence on the delivery of a complete tourist experience, such as:

- The Department of Home Affairs around immigration policies, interaction with customs officials at ports of entry;
- The securing of a free and safe environment which is a competency of the South African Police Service (SAPS);
- The Department of Transport (DoT) on aviation and road infrastructure development;

- The Department of Cooperative Governance and Traditional Affairs (COGTA) in relation to support for local government / municipalities; and
- Other government departments such as the Department of Arts & Culture (DAC), the Department of Sport & Recreation (DSR), the Department of Water and Sanitation (DWS) and the Department of Environmental Forestry and Fisheries (DEFF), all of which play a crucial role to support tourism.

While structurally South Africa's travel and tourism industry is highly concentrated and dominated by a small elite group of large, mostly locally owned, tourism organizations, the vast majority of SA tourism enterprises – as in most countries – would be classified as Small, Medium and Micro Enterprises (SMME). As put by Rogerson (2005), the SA tourism industry can be described as involving a complex interaction of a large number of players, with a few large players and numerous SMMEs.



Source: OECD/UNWTO/WTO 2013

Figure 2-1: The tourism value chain (NDT, 2017:10).

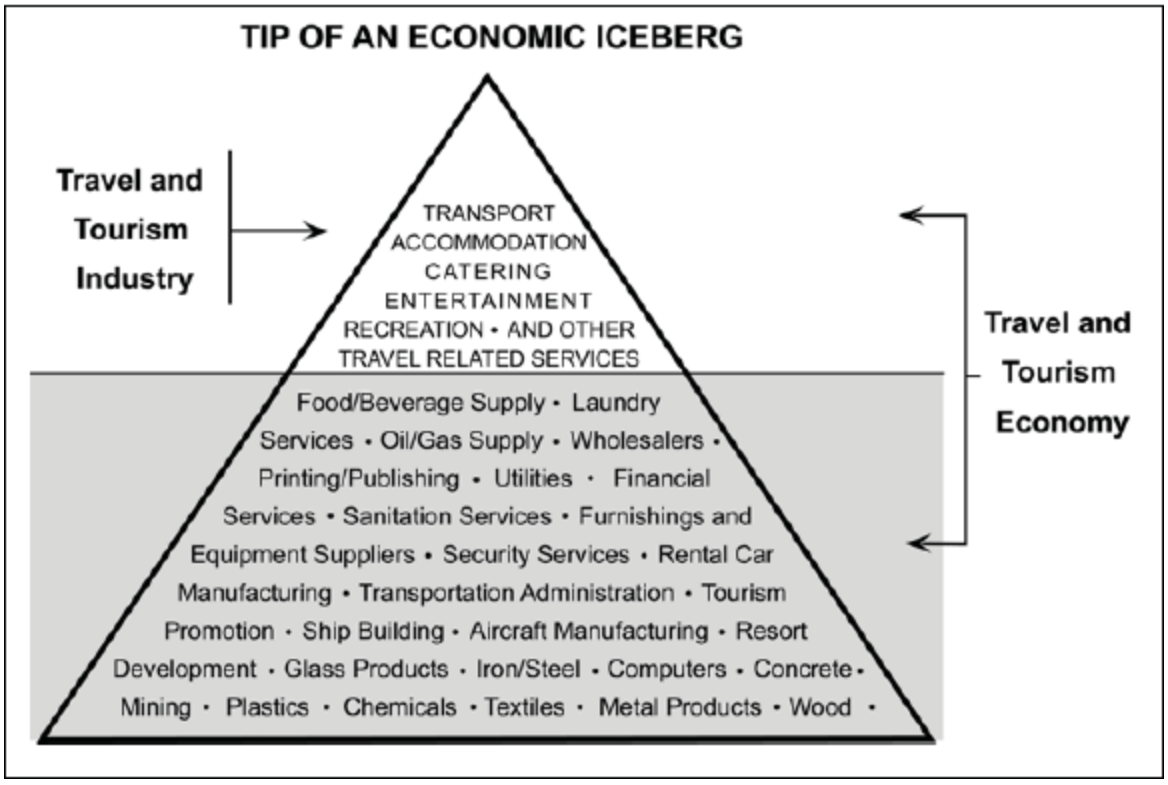


Figure 2-2: The two dimensions of tourism – (a) the travel and tourism industry and (b) the travel and tourism economy (Rogerson, 2005: 5; adapted from WTTC).

2.1.4 Sustainability in the tourism sector: The drive towards a green economy

Tourism is recognized as one (of 10) key economic sectors in greening the global economy, "driving the defining trends of the transition to a green economy, including increasing human well-being and social equity, and reducing environmental risks and ecological scarcities" (UNEP, 2011:5). 'Greening' of the tourism sector is expected to reinforce its employment potential given the human-resource intensive nature of the sector (UNEP, 2011). For South Africa, The World Travel and Tourism Council (WTTC) estimates that for every $1 million in Travel & Tourism spending, 51 jobs are supported (22 direct, 19 indirect, and 10 induced) (WTTC, 2013). According to UNEP (2011), well-designed tourism can support local economic development and reduce poverty.

The SA Department of Environmental Affairs (2010: 4) defines the green economy as "*a system of economic activities related to the production, distribution and consumption of goods and services that result in improved human well-being over the long term, while not exposing future generations to significant environmental risks or ecological scarcities*". It is an economy that "*results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities*" (UNEP, 2013: 9). The transition to a green economy is supported by the South African Government and viewed as "a sustainable

development path based on addressing the interdependence between economic growth, social protection and natural ecosystems" (DEA, 2010: 4). The Water Research Commission has established the Green Village and Economy Lighthouse in support of the green economy. It supports focused research that helps strengthen policies and generate green jobs towards a resource efficient, low carbon and pro-employment growth path.

While the tourism sector is seen as a key opportunity to drive the green economy, the green economy model has been identified as one of three action areas for stimulating the tourism sector, particularly in response to the global economic crisis of 2009 (Table 2-7) (NDT, 2011). The South African National Tourism Sector Strategy (NDT, 2017: 4) reports an "*Increasing interest in 'green' 'sustainable', responsible'* and *'ethical tourism',* noting that *"increasingly tourists are choosing to reduce negative environmental, economic and social impacts on the host country. They prefer to choose destinations showing clear benefits flowing to local communities and minimal environmental impact*".

Natural capital, together with the other forms of capital, is a key input for a wide range of economic sectors and is regarded as the core foundation in the transition to a Green Economy (Ten Brink *et al*., 2012). Understanding the dependence on, and impacts of, economic sectors, such as tourism, on natural capital is therefore crucial for a successful transition to a green economy.

Table 2-7: The tourism 'Roadmap to Recovery' (NDT, 2011)

Resilience	**Stimulus**	**Green Economy**
1. Focus on job retention and sector support	6. Create new jobs, particularly in small and medium enterprises (SMEs)	11. Develop green jobs and skills training
2. Understand the market and respond rapidly	7. Mainstream tourism in stimulus and infrastructure programmes	12. Respond effectively to climate change
3. Boost partnerships and competition	8. Review tax and visa barriers to growth	13. Profile tourism in all green economy strategies
4. Advance innovation and technology	9. Improve tourism promotion and capitalise on major events	14. Encourage green tourism infrastructure investment
5. Strengthen regional and interregional support	10. Include tourism in aid-for-trade and development support	15. Promote a green tourism culture in suppliers, consumers and communities

2.1.5 Pro-poor growth, SMMEs and transformation in the tourism sector

The 1996 White Paper on the Development and Promotion of Tourism in South Africa identifies tourism as having significant potential to serve as a tool for socio-economic upliftment. Rogerson (2006) notes five advantages inherent in tourism that make it an attractive sector with considerable potential for promoting pro-poor growth:

- It is a diverse industry offering wide scope for participation, including very importantly the participation of the informal sector;
- The customer comes to the product, providing considerable opportunities for linkages with other sectors;
- Tourism is highly dependent upon natural capital (such as wildlife and scenery) and culture, which are sometimes assets that are owned, controlled or expressed by disadvantaged communities;
- Tourism can be more labour intensive than manufacturing;
- Compared with many other economic sectors, a higher proportion of the benefits from tourism, in terms of jobs or entrepreneurship opportunities, accrue to women.

Pro-poor tourism is described as '*tourism that generates net benefits to the poor' and seeks to 'ensure that tourism growth contributes to poverty reductio*n' (Ashley *et al*., 2001: viii). Pro-poor tourism is not a specific type or sector of tourism, but rather an approach that seeks to "*unlock opportunities for the poor – whether for economic gain, other livelihood benefits, or participation in decision-making*" (Ashley *et al*., 2001: viii). Although relatively dated (Kirsten and Rogerson, 2002; Rogerson, 2005), reviews of the prospects for developing SMME in SA's tourism economy highlight both opportunities and constraints that appear to be still relevant today:

- A largely unexplored agenda for research on SMME development in South Africa's tourism sector;
- Relative neglect of SMMEs in tourism, compared with those engaged in manufacturing or trading activities;
- Many tourism SMME opportunities reside within the travel and tourism 'industry' – those economic sectors directly related to the tourism experience such as transport, accommodation, catering and recreation;
- The greatest opportunities in the short term appear to exist in supporting emerging SMME that are suppliers or contractors to existing enterprises;
- Marked geographical variations exist in SMME opportunities linked to tourism enterprises: SMME opportunities appear greater in urban areas with developed

infrastructure, whereas infrastructural deficiencies in rural areas appear to severely constrain opportunities for SMMEs;

- Government funding and support has enabled access to some opportunities for SMMEs;
- Limited access to finance, information and training has constrained SMME development in the tourism sector.

In other words, despite challenges and constraints, the tourism sector, and particularly its SMMEs, is uniquely placed to address some of historical inequalities facing many South Africans. The Tourism B-BBEE Charter Council was established to monitor and advise on the implementation of the gazetted code for B-BBEE. On 20 November 2015, the Amended Tourism B-BBEE Sector Code in terms of Section 9 (1) of the Broad-Based Black Economic Empowerment Amendment Act No. 46 of 2013 was gazetted[5]. This made Tourism the first sector in the economy of South Africa to develop and align a B-BBEE Sector Code.

2.1.6 Intermediate conclusion

The tourism sector relies on both the domestic and international tourism markets and generates significant socio-economic benefits to SA. The sector is based on a complex value chain with significant contributions of SMMEs, which explains why almost 10% of the SA workforce can be linked to tourism. Its success and future are subject to numerous local and international factors and trends that influence how tourists make decisions. The SA government recognises the importance of the tourism sector for the economy, especially for transformation and pro-poor growth, notably through the support and development of SMMEs throughout urban and rural areas. Furthermore, the 2017 NTSS recognises the critical importance of natural capital for the sustainability of the industry. Tourism sector is seen as a key opportunity to drive the green economy, while the green economy model is seen at the same time to be one of key action areas for stimulating the tourism sector, particularly in response to the global economic crisis of 2009.

[5] See more at http://www.gov.za/speeches/tourism-sector-boosts-transformation-15-mar-2016-0000 . Accessed in June, 2017.

2.2 Conceptualising the relationships between tourism and natural capital

This section provides a review of the conceptual foundations linked to business and natural capital (section 2.2.1) and the interactions between tourism and natural capital (section 2.2.2), with an in-depth focus on inland freshwater systems (from source to estuary) (section 2.2.3). The latter includes:

- A materiality analysis of the dependencies of identified tourism activity categories on natural capital and ecosystem services;
- A materiality analysis of the impacts of identified tourism activity categories on natural capital and ecosystem services;
- A typology of tourism activity categories based on their interactions with natural capital.

A review of values and valuation approaches and a review of the concepts underpinning ecosystem services are available in Annexures 7.4 and 7.5 respectively.

2.2.1 Business and natural capital: Unpacking inter-dependencies, risks / opportunities and costs / benefits

All businesses both depend (e.g. use of water in agriculture and mineral mining) (Figure 2-3) and impact, directly and indirectly, on natural capital stocks and the associated ecosystem services (Hanson *et al.*, 2012; Houdet *et al.*, 2012; Natural Capital Coalition, 2016; TEEB, 2012). Yet, such interactions do not all have the same consequences as natural capital stocks are divided into renewable and non-renewable assets: while metals and minerals are non-renewable natural capital assets (e.g. coal) whose exploitation can only lead to their eventual depletion (and the loss of the associated benefits), renewable natural capital assets, such as water resources and populations of species, can (theoretically) be sustainably managed in perpetuity.

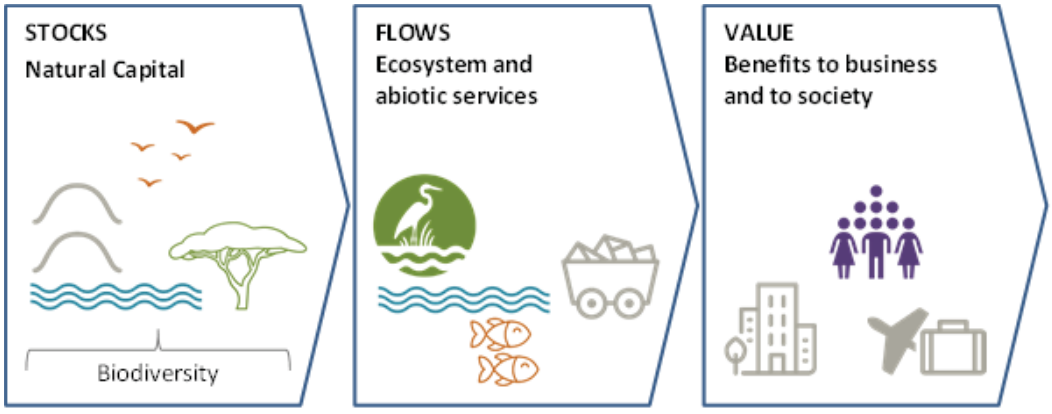


Figure 2-3: Natural capital, ecosystem and abiotic services and benefits to business and to society (Adapted from Natural Capital Coalition 2016).

This inter-dependency between business and natural capital creates costs and benefits for business and society, generating risks but also creating opportunities (Figure 2-4). Natural capital impacts and / or dependencies can directly affect business operations, which can generate positive (e.g. lower input costs) or negative effects (e.g. discontinued supply of raw materials, water shortages) (Natural Capital Coalition, 2016). Simultaneously, these impacts / dependencies can also positively (e.g. improved water quantity and quality due to business' efforts to sustainably manage its watershed) or negatively (e.g. air emissions) impact on some stakeholders or on society as a whole. Eventually, stakeholder and societal responses to these effects can create additional risks and opportunities to businesses. These interactions are illustrated in Figure 2-4.

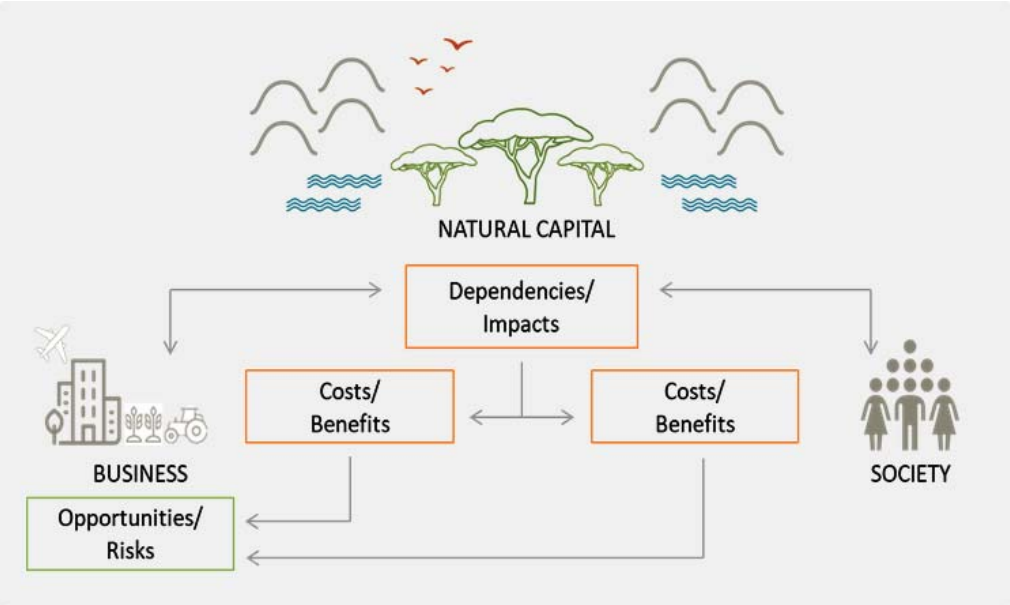


Figure 2-4: Conceptual model between business and natural capital – dependencies and impacts, costs and benefits, risks and opportunities (Adapted from Natural Capital Coalition 2016).

The business case for natural capital mainstreaming can be made by identifying the risks and opportunities that arise from impacts and / or dependencies on natural capital that might be invisible, overlooked, misunderstood, or under-valued. For instance, Table 2-8 provides examples of impact drivers linked to business inputs and outputs. Furthermore, natural capital risks and opportunities can arise in all areas of a business (operational, legal, regulatory, financing, reputational, marketing, and societal; see Table 2-9 for examples) and can occur at all stages of value chain (upstream / suppliers, direct operations, downstream / clients; see Table 2-10 for elements to consider when trying to measure and value natural capital at different stages of the value chain).

Table 2-8: Examples of natural capital impact drivers linked to business inputs and outputs (Natural Capital Coalition 2016)

Business input or output	Impact driver category	Examples of specific, measurable impact drivers
Inputs	Water use	Volume of groundwater consumed, volume of surface water consumed, etc.
	Terrestrial ecosystem use	Area of agriculture by type, area of forest plantation by type, area of open cast mine by type, etc.
	Fresh water ecosystem use	Area of wetland, ponds, lakes, streams, rivers or peatland necessary to provide ecosystem services such as water purification, fish spawning, etc., areas of infrastructure necessary to use rivers and lakes such as bridges, dams and flood barriers, etc.
	Marine ecosystem use	Area of aquaculture by type, area of seabed mining by type, etc.
	Other resource use	Volume of mineral extracted, volume of wild-caught mammals by species, etc.
Outputs	GHG emissions	Volume of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs), etc.
	Non-GHG air pollutants	Volume of fine particulate matter ($PM_{2.5}$) and course particulate matter (PM_{10}), volatile organic compounds (VOCs), mono-nitrogen oxides (NO and NO_2, commonly referred to as NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), etc.
	Water pollutants	Volume discharged to receiving water body of nutrients (e.g. nitrates and phosphates) or other substances (e.g. heavy metals and chemicals).
	Soil pollutants	Volume of water matter discharged and retained in soil over a given period.
	Solid waste	Volume of waste by classification (i.e. non-hazardous, hazardous and radioactive), by specific material constituents (e.g. lead, plastic), or by disposal method (e.g. landfill, incineration, recycling, specialist processing).
	Disturbances	Decibels and duration of noise, lumens and duration of light, etc. at site of impact.

Table 2-9: Examples of natural capital risks and opportunities for business (Natural Capital Coalition 2016)

Category	Examples of natural capital risks	Examples of natural capital opportunities
Operational Regular business activities, expenditures and processes	• Increased natural hazard costs (e.g. more frequent or severe storm damage due to degradation of coastal ecosystems and loss of their natural protection) • Increased security costs (e.g. due to social conflict over resources or pollution) • Increased raw material or resource costs (e.g. higher water charges) • Deteriorating supply chains due to increasing scarcity or more variable production of key natural inputs	• Reduce costs by investing in "green" infrastructure (e.g. protecting against natural hazards or improving water filtration by restoring wetlands) • Minimise of add value to waste and recapture valuable materials otherwise discarded • Reduce the costs of resource inputs (e.g. through efficiency gains or switching suppliers) • Ensure timely and reliable supply of raw materials
Legal and regulatory Laws, public policies and regulations that affect business performance	• Increased compliance costs (e.g. to reduce emissions) • Increased capital costs or production losses due to permit denials or delays • Increased fines, penalties, compensation, or legal costs (e.g. due to liability for natural capital impacts) • New regulations or license fees (e.g. higher charges for extracting ground water or for waste disposal)	• Reduce compliance costs by using resources more efficiently and reducing waste • Expedite process for permits and approval for operations • Reduce fines, penalties, compensation, or legal costs (e.g. by anticipating and avoiding negative impacts) • Reduce environmental fees and charges • Influence government policy
Financing Costs of and access to capital including debt and equity	• Increased financing costs (e.g. higher interest rates or harsher conditions) • Asset stranding (public and private equity) and non-performing loans	• Gain or maintain investor interest and confidence • Improve access to finance • Reduce financing costs • New "green funds" may be available in some cases
Reputation and marketing Company trust and relationships with direct business stakeholders such as customers, suppliers, employees	• Changing customer values or preferences may lead to reduced market share • Increased staff turnover, high recruitment and retention costs • Reduced loyalty of key suppliers or business service providers	• Emerging environmental markets and products may offer new revenue streams (e.g. carbon offsets, sale of surplus water rights, habitat credits) • Growing demand for credibly certified products (e.g. eco-labelled wood, seafood, apparel) • Differentiate your products to increase pricing power • Improve ability to attract and retain employees
Societal relationships with wider society (e.g. local communities, NGOs, government agencies & other stakeholders)	• Local communities may experience reduced access to, or availability of, natural capital or related ecosystem services as a result of business activities • People may experience health risks as an indirect result of business impacts on natural capital, for example through the effect of air pollution on respiratory diseases	• Local communities may benefit from how business manages natural capital, for example through improved recreational access of a managed wetland, or improved water quality from a managed water catchment

Table 2-10: Elements for consideration in measuring and valuing natural capital in business at different stages of the value chain (Natural Capital Coalition 2016)

Part of the value chain	Key points to consider
Upstream	• Upstream suppliers often represent your biggest natural capital impacts or dependencies and can be considerable areas of risk. • Considering upstream issues may help you comply with regulations in some jurisdictions that require companies to take responsibility for minimising adverse environmental impacts and their social consequences in their supply chains. • Assessing upstream impacts and dependencies can help inform the procurement strategy, reduce reputational risks, and create reputational opportunities. • Upstream issues can be more difficult to influence than direct operations, due to the need to negotiate with suppliers, but you will often have more control than downstream as you there is a contract between you and your suppliers which can be negotiated. • Upstream assessments may require additional effort to collect relevant impact data.
Direct operations	• Direct operations often may not represent your biggest natural capital impacts or dependencies. However, the impacts and dependencies of direct operations are likely to be more important for companies with large landholdings or direct footprints (e.g. extractives, agriculture). Most of the information needed for an assessment of direct operations is likely to be readily available. • You can measure the impacts and dependencies of direct operations more easily and on a more regular basis relative to other value-chain stages. • Greater influence over direct operations means it is possible to experiment with different options to reduce impacts and / or dependencies on natural capital.
Downstream	• Downstream stages of the value chain may represent a significant portion of a business' impacts on natural capital. • Assessing downstream impacts will be particularly relevant to customers and may be useful for public relations and marketing. • Downstream is often more difficult to influence than direct operations or upstream impacts and dependencies.

2.2.2 Natural capital and the tourism sector: A conceptual framework of interactions

The goal of this section is to propose a typology of tourism activity categories based on their interactions with natural capital. While this conceptual framework should be applicable to any analysis of tourism businesses and natural capital, the materiality of each type of interaction may vary according to the circumstances, including the specific business context, institutional arrangements and the receiving ecosystems, among other aspects.

The value chain framework of the NTSS (Figure 2-1; NDT, 2017) was used to identify the material impacts and dependencies of various tourism activity categories on natural capital. Table 2-11 presents the expected direct material dependencies of the different tourism activity categories to the three broad categories of ecosystem services (as per the CICES classification; see section 7.5) while Table 2-12 presents the expected direct material impacts of the different tourism activity categories to the same three broad categories of ecosystem services.

Key points that need to be highlighted are as follows:

- All tourism activity categories have impacts and dependencies on natural capital, not only tourism assets and destinations;
- Such inter-dependencies occur at the local, provincial, national and international levels, notably through glocal[6] supply chains;
- Cultural ecosystem services are drivers of tourism activities, either directly (tourism assets and destinations, accommodation, leisure, excursions and tours, travel organisations) or indirectly by attracting other activities (food and beverages, transport, infrastructure support);
- Provisioning services are enablers of many of these tourism businesses (e.g. food, textile, materials, fuels), and are often imported from elsewhere;
- Regulation and maintenance ecosystem services are critical for site-specific activities (e.g. river and coastal-based tourism) and the associated tourism assets which rely on them (e.g. regulation of extreme weather events, regulation / assimilation of wastes, regulation of erosion processes).

[6] The glocal concept reflects or characterizes both local and global considerations.

Table 2-11: Direct dependencies of the main tourism activity categories to provision, regulation and maintenance, and cultural ecosystem services

	Tourism activity category								
Dependencies (not applicable – NA, low, medium, high) **on**:	**Travel organisations and booking**	**Transportation**	**Accommodation**	**Food & beverages**	**Handicrafts**	**Tourism assets and destinations**	**Leisure, excursions and tours**	**Support services**	**Infrastructure support**
Provisioning services	Low / NA	High (fuels)	High (water, textile, wood, food)	Low to high (agriculture-related)	Low to high (wood, plastics)	Medium (materials)	NA to low	Low to high (variable)	High only for some (water and energy management, construction materials)
Regulation and maintenance services	Low to medium (weather-related)	NA to low / medium (water-based)	Low (urban) to high (rural, coastal, nature-based)	High (agriculture-related)	Low to high (depending on business practices)	Low to high (depending on business practices)	Low to high (depending on business practices)	Low to high (depending on business practices)	Low to high (depending on infrastructure design and management)
Cultural services	Low (business) to high (nature-based tourism)	Low to high (depending on destination)	Low to high (depending on business practices)	Low to high (depending on business practices)	Low to high (depending on business practices)	Low to high (depending on business practices)	Low to high (depending on business practices)	Low to high (depending on business management)	Low to high (depending on infrastructure design and management)

Table 2-12: Direct impacts of the main tourism activity categories to provision, regulation and maintenance, and cultural ecosystem services

	Tourism activity category								
Impacts (Not Applicable – NA, low, medium, high) **on:**	**Travel organisations & booking**	**Transportation**	**Accommodation**	**Food & beverages**	**Handicrafts**	**Tourism assets & destinations**	**Leisure, excursions and tours**	**Support services**	**Infrastructure support**
Provisioning services	NA	NA (potentially through land use changes)	Low to high (water, foods)	High (agriculture-related)	Low to high (native tree harvesting)	Medium (resource harvesting)	Medium (fuels, foods)	Low to high (variable)	High only for some (water and energy management, construction materials)
Regulation & maintenance services	NA	High (air emissions)	Low (urban) to high (rural, coastal, nature-based)	High (agriculture-related)	NA	High (weather regulation, etc.)	Low to medium (weather-related)	Mostly NA	High only for some (water, waste and energy management, public safety and health)
Cultural services	Medium to high (influence tourism choices)	Medium to high (influence tourism choices)	Low (urban) to high (rural, coastal, nature-based tourism)	NA to high (food and wine tourism)	NA	High (World Heritage Sites, etc.)	High (nature-based tourism)	Mostly NA	NA

2.2.3 Water ecosystem services and the tourism sector: Key links and challenges / opportunities

Inland water resources are the rivers, dams, lakes, wetlands, and subsurface aquifers, which, together with natural processes (such as rainfall and evaporation) and anthropogenic influences (such as human-originated abstraction and discharges), form the hydrological cycle. As freshwater water moves through a landscape, it interacts with different terrestrial ecosystems which directly influence various hydrologic attributes (quantity, quality, location and timing) and eventually influence the resulting hydrologic services which can be used by people (Brauman *et al.*, 2007). As shown in Figure 2-5, these hydrologic services can be grouped into five main categories: diverted water supply, in situ water supply, water damage mitigation, spiritual and aesthetic and supporting. While the latter cannot be regarded as an ecosystem service in itself (i.e. no direct link with people as per the discussion in section 2.2.3), the four other categories are relevant to the tourism industry and economy.

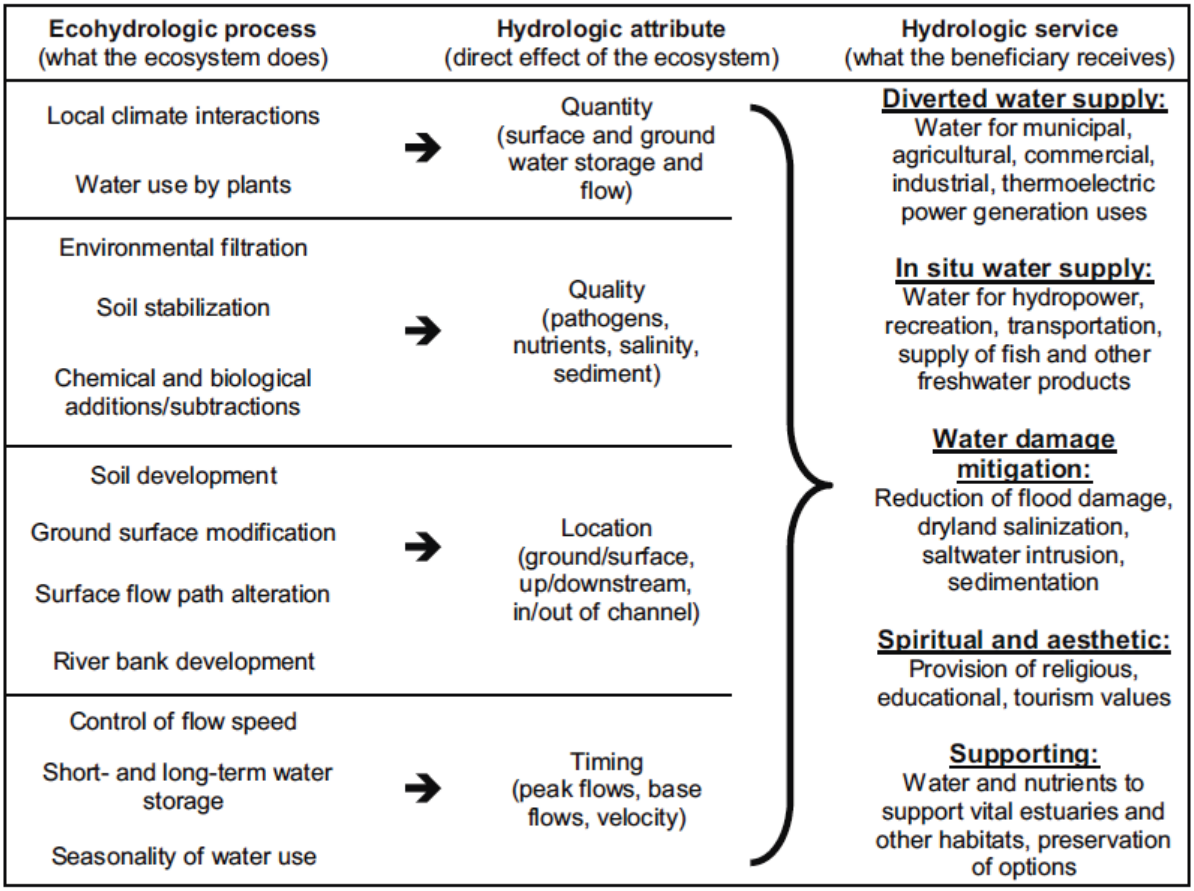


Figure 2-5: Relationship of hydrologic ecosystem processes to hydrologic services (Brauman *et al.*, 2007).

Water plays a key role in the tourism value chain, underpinning all of the previously identified tourism activity categories (Figure 2-1). Water and tourism are linked through multiple

pathways with diverted water supply – which is the water made available for human use through abstraction and treatment – being the primary one. The second important link between water and tourism is through *in situ* water supply (tourism assets in destination): This encompasses water and water resources that provide the location and means to water-based recreation and sporting events, as well as water-related tourism assets and destinations (e.g. waterfalls). Associated with this is the support that water provides to other tourism attractions, for example the presence of a stream in creating an attractive picnic area or the relationship between water resources and nature-based tourism. For example, a proportion of the economic value of tourism in the Kruger National Park has been ascribed to the rivers of the park (Turpie and Joubert, 2001). A third pathway or link between water and tourism is the potential damage impacts of high-water velocities and / or flooding.

In this context, a high-level analysis of the inter-dependencies between the four categories of hydrologic services and key tourism business categories can be summarised as follows:

- Table 2-13 presents the main dependencies of key tourism activity categories on hydrological services: Accommodation, food and beverages and tourism assets are the categories most dependent on diverted and *in situ* water supply. The dependence of various tourism activity categories on water damage mitigation and water-related spiritual and aesthetic services is a factor of their proximity to freshwater systems and / or their focus on water-based / -related activities.
- Table 2-14 shows the main impacts of key tourism business categories on hydrological services: The main sources of impacts on water supply, both *in situ* and diverted, are linked to the accommodation, food and beverages, and infrastructure support business categories. Depending on their location, design and / or management, most tourism categories impact on water damage mitigation and spiritual / aesthetic services.
- Table 2-15 highlights the expected primary value perspectives and types attached to the four categories of hydrologic services by different tourism categories: As can be expected (see annex 7.4), a great diversity of value perspectives and types can be expected to occur in the tourism industry and economy. While business, quantitative and monetary values prevail throughout, societal and qualitative values are expected to be higher for tourism categories in direct interaction with the target hydrologic service (e.g. tourism asset, accommodation) and / or involved in selling / delivering a product focused on the target hydrologic service (e.g. travel agent, leisure, excursions and tours, food and beverages).
- Table 2-16 summarises the tourism business benefits / costs and risks / opportunities linked to the four categories of hydrologic services: The primary risks appear to be

linked to the mismanagement of water source areas, improper design / location / management of infrastructures and tourism asset mismanagement.

Furthermore, mainstreaming natural capital considerations, especially water-related considerations, into the tourism sector could be tackled from a number of complementary perspectives:

- A tourism activity category perspective: i.e. focus on environmental management initiatives, notably to minimise resource inputs and negative environmental impacts (e.g. Amis and Solomon, 2016);
- A value chain perspective for a specific service or product (e.g. recreation tourism, adventure tourism, ecotourism): i.e. to promote environmental-compatible tourism offerings, from cradle to cradle;
- A tourism asset or destination perspective: i.e. to ensure the sustainable management of the underlying natural capital assets and associated ecosystem services.

Moreover, we would argue that sustainably managing hydrological services in the tourism industry and economy requires a freshwater ecosystem “source-to-sea” approach: that is, water source area stewardship, sustainable water infrastructure design and management, sustainable water use / management practices in various tourism businesses (accommodation, catering, recreation, etc.) and water ecological infrastructure stewardship at tourism asset / destinations.

Table 2-13: Level of dependency of tourism activity category to the four main hydrologic services

	Tourism activity category								
Dependencies (Not Applicable – NA, low, medium, high) **on:**	**Travel organisations & booking**	**Transportation**	**Accommodation**	**Food & beverages**	**Handicrafts**	**Tourism assets & destinations**	**Leisure, excursions and tours**	**Support services**	**Infrastructure support**
Diverted water supply	Low	NA	High (mostly urban)	High (agriculture-related)	NA	Low to high (depending on location)	NA to low	Low to high (variable)	High only for some (water and energy management)
In situ water supply	NA	NA	High (mostly rural)	High (agriculture-related)	Low	Low to high (depending on location)	Low to high (depending on business practices)	Low to high (depending on business practices)	Low to high (water management and hydroelectricity)
Water damage mitigation	NA (unless extreme weather event)	NA (unless extreme weather event)	Low to high (depending on location)	Low to high (depending on location)	NA (unless materials come from freshwater ecosystems)	Low to high (depending on location)	Low to high (depending on location)	Low to high (depending on location)	Low to high (depending on infrastructure design and management)
Spiritual and aesthetic	High (tourism products)	NA (unless tourism asset specific)	Low to high (depending on location)	NA unless specific tourism freshwater-based products	NA to high (depending on location)	Low to high (depending on location)	Low to high (depending on location)	NA	NA

Table 2-14: Level of impact of tourism activity category on the four main hydrologic services

	Tourism activity category								
Impacts (Not Applicable – NA, low, medium, high) **on:**	**Travel organisations & booking**	**Transportation**	**Accommodation**	**Food & beverages**	**Handicrafts**	**Tourism assets & destinations**	**Leisure, excursions and tours**	**Support services**	**Infrastructure support**
Diverted water supply	Low	NA	High (mostly urban)	High (agriculture-related)	NA	Low to high (depending on location)	NA to high (depending on business practices)	NA to high (variable)	High (for various users)
In situ water supply	NA	NA	High (mostly rural)	High (agriculture-related)	Low	Low to high (depending on location)	NA to high (depending on business practices)	NA to high (variable)	Low to high (roads, waste and water pollution)
Water damage mitigation	NA	NA	Low to high (depending on design and location)	Low to high (depending on location)	NA (unless materials come from freshwater ecosystems)	Low to high (depending on management and location)	Low to high (depending on management and location)	Low to high (depending on management and location)	Low to high (depending on infrastructure design and management)
Spiritual and aesthetic	High (tourism products)	Low to high (especially when travel to specific tourism assets)	Low to high (depending on design and location)	NA unless specific tourism freshwater-based products	NA to high (depending on location)	Low to high (depending on management and location)	Low to high (depending on management and location)	Low to high (depending on management and location)	Low to high (depending on infrastructure design and management)

Table 2-15: Expected prevailing value perspectives and types for different tourism activity categories with respect to the four main hydrologic services

	Tourism activity category								
Expected prevaling value perspective (business and societal) and types (qualitative, quantitative and monetary)	**Travel organisations & booking**	**Transportation**	**Accommodation**	**Food & beverages**	**Handicrafts**	**Tourism assets & destinations**	**Leisure, excursions and tours**	**Support services**	**Infrastructure support**
Diverted water supply	Business, quantitative	Business, quantitative	Business, quantitative and monetary	Business, qualitative, quantitative and quantitative	Business, quantitative and monetary	Business, quantitative and monetary	Business, quantitative and monetary	Business, quantitative and monetary	Business and societal, qualitative, quantitative and monetary
In situ water supply	Business, quantitative	Business, quantitative	Business, qualitative, quantitative and monetary	Business, qualitative, quantitative and quantitative	Business, qualitative, quantitative and monetary	Business, qualitative, quantitative and monetary	Business, qualitative, quantitative and monetary	Business, quantitative and monetary	Business and societal, qualitative, quantitative and monetary
Water damage mitigation	Business, monetary	Business, monetary	Business, monetary	Business, quantitative and monetary	Business, quantitative and monetary	Business and societal, qualitative quantitative and monetary	Business, quantitative and monetary	Business, monetary	Business and societal, qualitative, quantitative and monetary
Spiritual and aesthetic	Business and societal, qualitative, quantitative and monetary	Business, monetary	Business and societal, qualitative, quantitative and monetary (in proximity to water bodies)	Business and societal, qualitative, quantitative and monetary (for specific water-related products)	Business and societal, qualitative, quantitative and monetary (for specific water-related products)	Business and societal, qualitative quantitative and monetary	Business and societal, qualitative quantitative and monetary	Business, monetary	Business and societal, qualitative, quantitative and monetary

Table 2-16: Benefits / costs and risks / opportunities linked to the four main hydrologic services

	Diverted water supply	In situ water supply	Water damage mitigation	Spiritual and aesthetic
Benefits	Critical input into various tourism business categories, as such (drinking water) or as part of other products / services (e.g. water-based activities, foods and beverages)		Damage prevention or mitigation (assets located near water bodies / waterways)	Key attraction for tourists, linked to specific tourism asset and / or experience
Costs	Capital (infrastructure) and operating (management, repairs)		Repair / replacement costs of physical assets (e.g. buildings, roads, bridges, power lines) and lost revenues due to cancelled activities	Capital (infrastructure) and operating (management, repairs), but also potentially loss of revenues due to degraded tourism assets
Risks	Loss of water quantity / quality (source area mismanaged) and problems of delivery timing (climate change)		Increased water damages (e.g. flooding, landslides) and further revenue loss	Tourism asset mismanagement leading to value degradation / loss to users
Opportunities	Invest in / restore water factories (e.g. mountain grasslands) to maximise good quality water supply at the right times throughout the year		Invest / maintain water-related ecological infrastructure (e.g. wetlands) to maximise benefits and prevent tourism activities from being cancelled	Invest / maintain water-related ecological infrastructure (e.g. wetlands) and promote sustainable tourism activities

2.2.4 Intermediate conclusion

Businesses both depend and impact on natural capital, directly and indirectly, which can generate positive (benefits) and negative (costs) consequences for themselves and / or their stakeholders / society as a whole. Identifying, quantifying and managing the associated risks and opportunities, whether linked to suppliers, direct operations or clients, is critical to natural capital mainstreaming in business.

Values are very diverse and come from different cultural and institutional contexts. This diversity needs to be acknowledged, recognised and embedded in integrated valuation processes for effective, inclusive decision-making. However, the choice of an ecosystem service classification system has direct consequences for natural capital valuation and decision-making. It would lead to the (potential non-) identification of the source (environment), ecological end-point, use(s) and user(s) of ES for effective valuation.

Finally, tourism is recognized as one of the key sectors with the potential to support the transition to a Green Economy. All tourism activity categories have impacts and dependencies on natural capital, not only tourism assets and destinations. While cultural ecosystem services are drivers of tourism activities, either directly or indirectly by attracting other activities, provisioning services provide inputs to many tourism businesses and are often imported from elsewhere. Regulation and maintenance ecosystem services are critical for site-specific activities and the associated tourism assets which rely on them. Furthermore, there are three primary links between tourism and hydrologic services: water supply, water damage avoidance / mitigation and water-based tourism. Although the mainstreaming of natural capital considerations into the tourism sector can be tackled in a number of complementary ways, the sustainable use of hydrological services requires a freshwater ecosystem “source-to-sea” management approach, from the stewardship of water source areas and waterways to that of tourism assets / destinations.

2.3 The adaptive theory of change applied to complex tourism systems

Multiple models attempt to explain how tourism systems work. Models are simplified views of reality. They aim to describe how features, relationships or processes work within a given system. This section focuses on exploring how the resilience systems thinking / Panarchy / adaptive cycle / global change models have been applied to complex tourism systems). A

critical review of a selection of normative[7] models of tourism systems, and a short synthesis of adaptive theories of change in interactive socio-economic and ecological systems are available in Annexures 7.6 and 7.7 respectfully.

2.3.1 Resilience theory in tourism systems

Resilience theory is increasing applied to interpret linked human and environmental systems (Cochrane, 2010). It has been applied in a number of fields (e.g. agriculture, climate change, community development) and is "*increasingly accepted in policy planning affecting (and reflecting) societal change*" (Cochrane, 2010: 177). The tourism system is comprised of both social and natural elements and their interactions: that is, a social-ecological system. However, as noted by Becken (2013), while the concept of resilience provides a framework for understanding the impact of disturbances or stress on a system, it is not yet widely applied in the analysis of tourism.

Cochrane (2010:183) has applied resilience thinking to tourism in Asia to develop the sphere of tourism resilience which "*attempts to integrate the highly theoretical discussion of complexity and resilience into a more practical realm*". The model identifies and illustrates the principal elements of a resilient tourism system according to Cochrane (2010) (Figure 2-6).

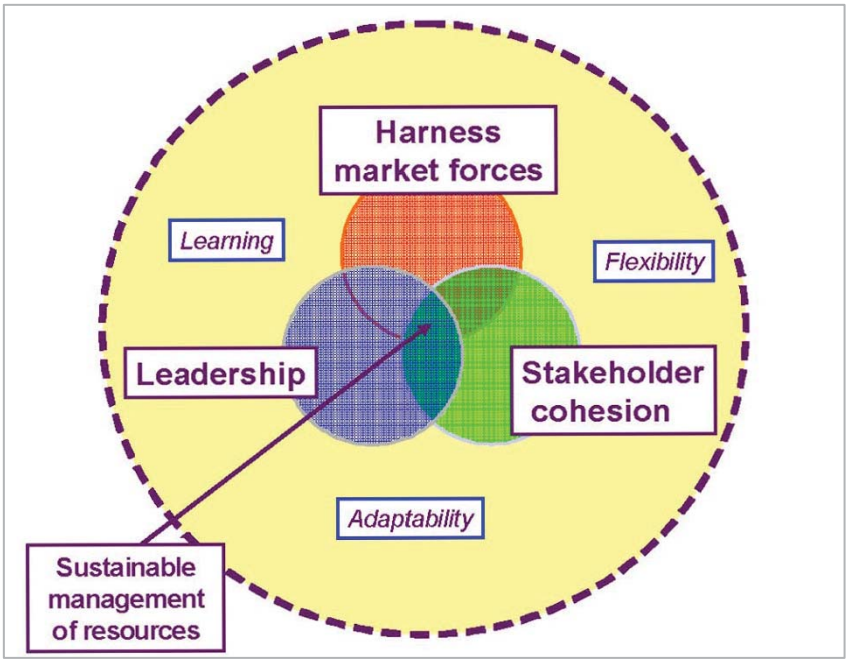


Figure 2-6: The Sphere of tourism resilience (Cochrane, 2010: 182).

[7] Normative theory: Hypotheses or other statements about what is right and wrong, desirable or undesirable, just or unjust in society.

Becken (2013) used resilience thinking to develop a framework for tourist destinations with a particular focus on climatic disturbances or stress, and their impacts on tourism activity sub-systems. The author applied the conceptual stability landscape model to primary data from the Queenstown-Wanaka destination in New Zealand to develop a tourism-specific framework for assessing resilience of tourist destinations. From the results, the author proposed 11 surrogates to describe the stability landscape of the Queenstown-Wanaka tourist destination in the face of climate variability and change that sufficiently capture the system dynamics (Table 2-17).

On 'assessing and planning resilience in tourism', Luthe and Wyss (2014:161-163) argue that:

- "*Tourism needs new strategies to cope with complex interrelated change impacts;*
- *Change processes and their interrelations have become more complex in a globalized, accelerated world, placing tourism under pressure to respond and adapt to various factors;*
- *Resilience has much explanatory power for tourism coping with change;*
- *There is a lack of resilience assessment and planning in tourism;*
- *Network governance provides a promising angle to tourism resilience;*
- *Resilience research in tourism should combine quantitative and qualitative methods;*
- *Adaptation and transformation processes to changing environmental, social and economic conditions require initiatives by various tourism actors with different functions in the tourism supply chain, and on different scales of governance, to be able to assess, plan and manage resilience overtime*".

Table 2-17: Resilience Surrogates for Resistance, Latitude and Precariousness for the Queenstown-Wanaka tourist destination in the face of climate variability and change (Becken, 2013: 521)

Stability landscape aspect	Surrogate	Description
Resistance	Weather sensitivity	Extent to which activities in the sub-system are limited by adverse climatic conditions
	Coping range	Level of critical threshold above or under which operation is not possible
Latitude	Product	Diversity of tourist activities that allows operation across many weather conditions
	Customers	Diversity of markets and segments
	Staffing	Degree of operational flexibility, and retention of experienced staff
	Access	Dependence on a particular location or resource

Stability landscape aspect	Surrogate	Description
	Information	Climatic information that is used in business decision making
	Networks	Connectedness of activity sub-system, within and across other sub-systems to allow diversification in the face of adverse conditions
	Competition	Degree to which flexibility is compromised by competition
Precariousness	Frequency	Extent to which operations in activity subsystem are disrupted under current climate conditions
	Climate change	Extent to which climate change will exacerbate climatic impacts

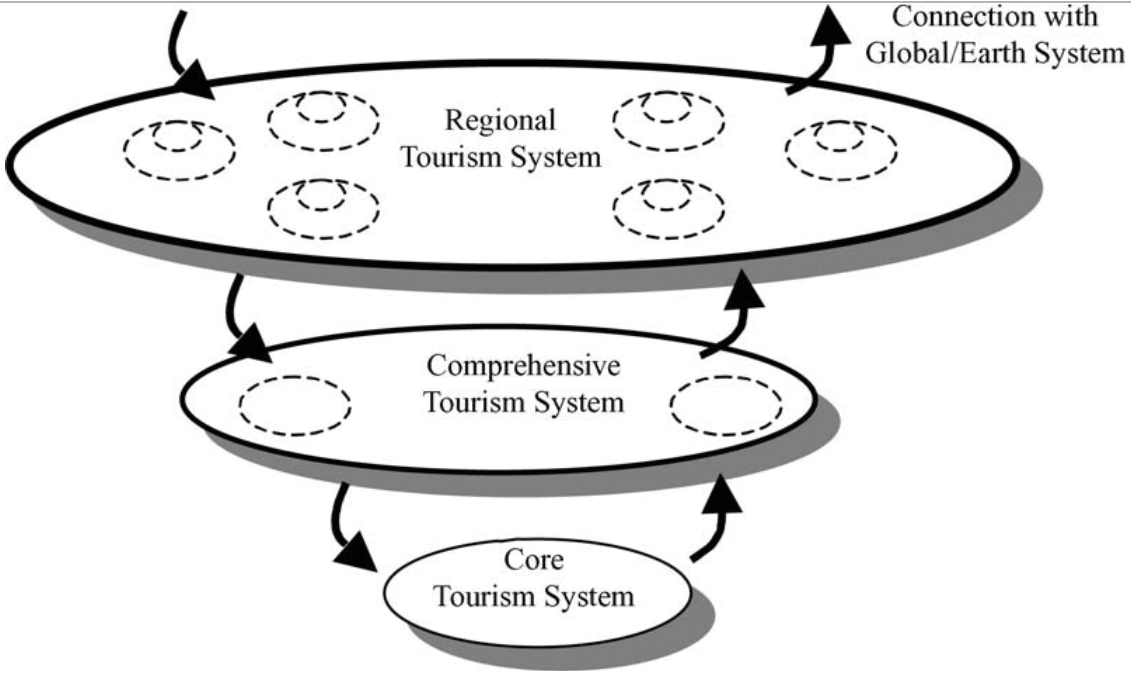
2.3.2 Tourism as a complex adaptive system

Tourism is a complex adaptive system, akin to a socio-ecological system, consisting of multiple interacting components. Such systems are "*are dynamic, operational realities, being changeable, largely unpredictable, and only minimally explainable by linear cause and effect science*" (Farrell and Twining-Ward, 2005:113). The alteration or disturbance of one component, from within or without the system, is likely to have repercussions throughout the system. For example, in a tourism system, the size, arrangement and character of the landscape, transport networks, residential areas, schools, hospitals, shopping facilities, hotels, recreation facilities and areas, water supplies, agricultural resources, tourists, the local population, safety and security elements, among others, are all intricately connected; a disturbance in one component may affect many of the other components (Farrell and Twining-Ward, 2005). The stability of complex adaptive systems ranges from stable to turbulent. If the system has insufficient resilience, the crossing of a threshold may occur in response to a particular pressure or system alteration. In a tourism system, pressures on the local environment, crime and safety elements, aggressive competition from rivals or political factors for example, may result in a threshold change (Farrell and Twining-Ward, 2005).

This view of the tourism system expands the more traditionally considered tourism system, 'the core tourism system', to include significant social, economic, geological, and ecological components, the comprehensive tourism system. Where the core tourism system is an "*assemblage of structures, goods, services, and resources directly contributing to the sector*", the comprehensive tourism system includes "*significant social, economic, geological, and ecological components, along with processes and functions that complement its totality and*

are essential to its sustainability" (Farrell and Twining-Ward, 2004: 279). The comprehensive tourism system "*gives far greater significance to vital ecosystem goods and services, structures and functions, local society, its perceptions and aspirations, and a host of other components*" than the core system view.

Cochrane (2010) further argues that tourism systems are excellent examples of complex socio-ecological systems, given the "*dependency of tourism on natural resources, its interlinked elements of economics, politics, psychology, anthropology and ecology, its cross-cultural, cross-sectoral and multi-scalar characteristics and its international linkages"* (Cochrane, 2010: 175). From this perspective, an understanding of complex systems and the associated systems thinking are seen as vital in tourism management for transitioning towards sustainability (Farrell and Twining-Ward, 2004). This implies that a broader of view of what constitutes the tourism system is needed in moving toward sustainable tourism. Farrell and Twining-Ward (2004) further suggest that the tourism system can be represented as a hierarchical nesting of one system level within another (drawing from Panarchy theory) (Figure 2-7). To consider only those structures, goods and services directly associated with the tourism sector activity would be insufficient.



"*In this model, the comprehensive tourism system encompasses multiple system levels from the core, to the global or Earth system, all interrelated, open and hierarchical. The lower levels are semi-autonomous, facilitating some connection and transfer to the level above which is slower moving and largely unaffected by many lower level disturbances. However, small changes in one level may occasionally have unpredictable, sometimes profound effects on other parts of the same system level, triggering a cascade of repercussions which may be significantly greater than the initial disturbance*".

Figure 2-7: The Tourism Panarchy (Farrell and Twining-Ward, 2004: 279).

Further, the tourism system is seen as nested within the ecosystem. Attention to the structure and dynamics of the ecosystem is needed in effecting a transition to sustainable tourism (Farrell and Twining-Ward, 2004). Relying only on business knowledge, economics and some social science is inadequate for studying such systems. Several tools and concepts developed for the study of ecology, sustainability science and global change science are thus useful in analysing the comprehensive tourism system. Farrell and Twining-Ward (2004) further note the importance of the adaptive ecosystem cycle theory, scenario planning, simulation models, integrated assessment models, integrated landscape planning, regional information systems, and resilience analysis and management. Accordingly, we can use the adaptive cycle as a model for conceptualising patterns of changes in tourism systems.

2.3.3 Global change models applied to tourism

As an open or interconnected system, tourism is influenced by both external and internal events and is vulnerable to global changes, such as population movements, climate change, pollution and transport developments. Mullis *et al*. (2011:16) argue that a systems approach applied to sustainable tourism reveals "*many interrelated factors that change over time affecting travel and tourism offerings*" and suggest that major shifts in the leisure and tourism sector should be expected in the future. For example, on the demand side "*political instability, war, terrorism, global economic recession, volatile oil prices, growing competition, and an increase in knowledge and experience among travellers drives transformation*" (Mullis *et al*., 2011: 39). On the supply side, determinants include "*damaging natural phenomena and human-induced disasters, pursuit of more sustainable forms of tourism, climate change, and significant advancements in information technology*" while other threats include "*lack of market differentiation, loss of biological and cultural diversity, and destination dependence on tourism*" (Mullis *et al*., 2011: 39). Luthe and Wyss (2014) further identify both slow change processes (such as climate change) and prompt change impacts (such as economic crises) and suggest that these two forms of change require different innovations, adaptation strategies and structural transformations.

The potential impacts of global changes on the tourism industry are not well understood, studied or modelled due to the uncertainty and complexity of tourism systems and tourist demand reactions. There are multiple direct and indirect drivers of change affecting tourism systems and interactions between drivers and these interactions may occur simultaneously, overall and / or create feedback loops. Nevertheless, tourism is noted for its substantial adaptive capacity. At the same time, this strength prevents accurate predictive or simulation modelling of the impacts of global changes.

Moreover, systems' thinking is increasing applied to model the tourism system in the context of global change, both environmental and socio-economic. For example, in protected area management, Miller *et al*. (2014) apply systems' thinking to model drivers of change within iconic national parks. They draw on the idea of multiple capitals, social, environmental and artefactual (built) capital in describing the interdependencies within the system (Figure 2-8). Walsh *et al*. (2013: 320) further note that dynamic systems models have been used in several studies to model or examine the relationships between tourism, ecosystems, the economy, policy and cultural change: "*such models simulate, predict, or mediate conditions given specified feedbacks between key parameters*".

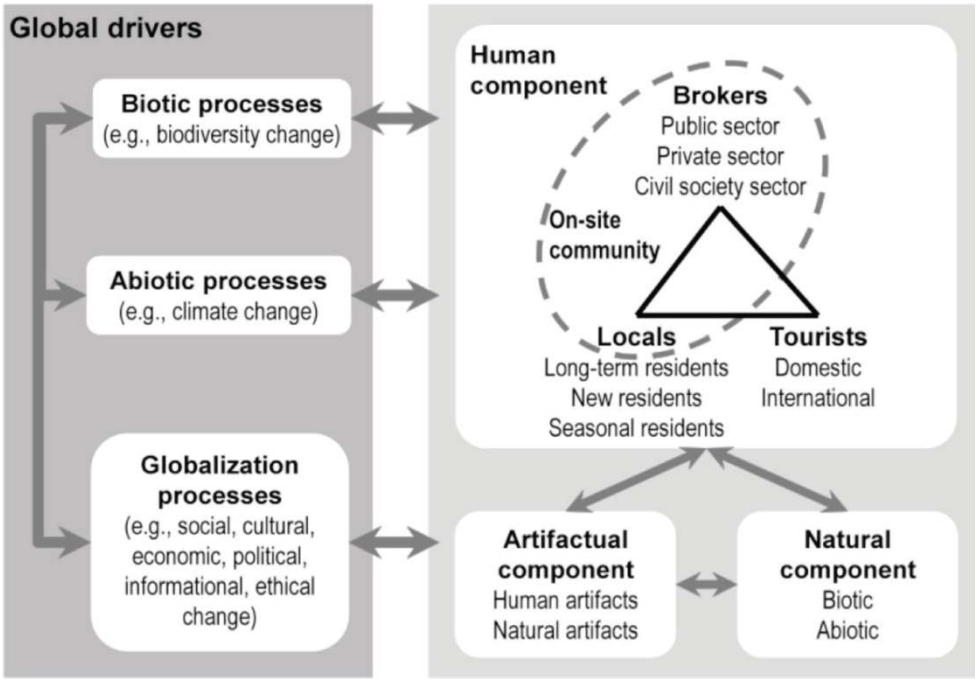


Figure 2-8: Conceptual framework of a national park system (Miller *et al*., 2014: 261).

For instance, Wash *et al*. (2013: 320) propose a 'biocomplexity framework' to examine the threats to iconic national parks in the context of global change, noting that "*(h)ow tourism is shaped by global change, shifts in ecosystem goods and services, changes in land use and land cover, and the corresponding patterns and dynamics of iconic landscapes and behavioral shifts of iconic species is our fundamental concern*" (Figure 2-9). The authors present a dynamic simulation model for the Galapagos National Park as an applied example (Figure 2-10).

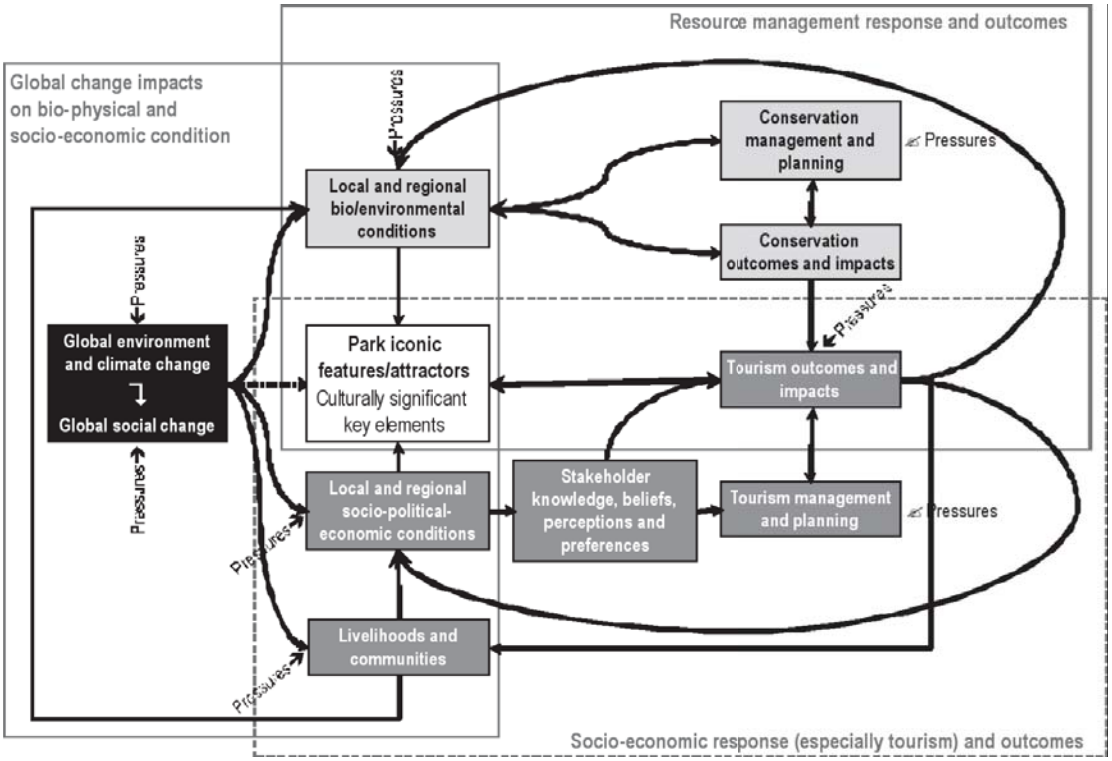


Figure 2-9: A biocomplexity framework for exploring coupled natural-human components of iconic national park systems towards addressing vulnerability (Walsh *et al*., 2013: 314).

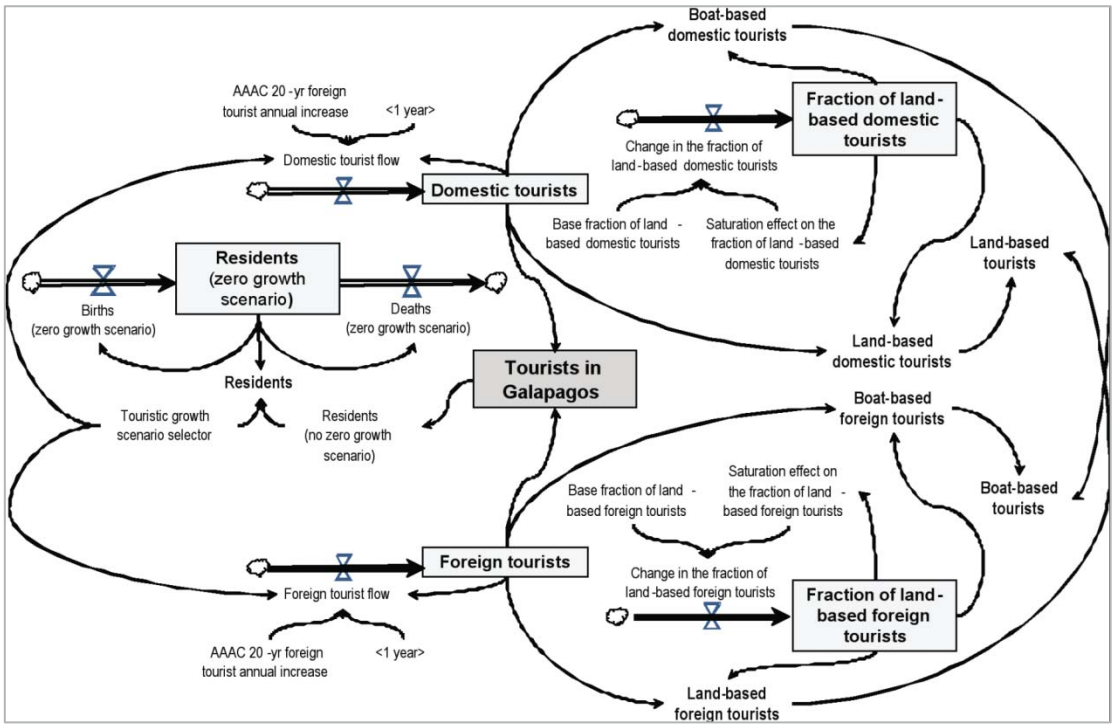


Figure 2-10: A preliminary example of a dynamic systems model for the Galapagos Islands (Walsh *et al*., 2013: 319).

The impact of climate change on tourism has also received increasing attention. There are several areas of focus in the field of modelling related to climate change and tourism (Hamilton *et al*., 2005):

- Statistical models of the behaviour of certain groups of tourists as a function of weather and climate;
- Models that relate the fates of particular tourist destinations to climate change;
- Models to define indicators of the attractiveness to tourists of certain weather conditions;
- Models that combine elements of the above.

In an assessment of quantitative approaches to evaluating the effects of climate change on tourism, Rosselló-Nadal (2014) finds that climate change can be assessed:

- Through changes in physical conditions essential to tourism;
- By using climate indexes to measure the attractiveness of tourist destinations; and,
- By modelling tourism demand with the inclusion of climate determinants.

The review highlights several points:

- Temperature has been the most frequently used variable to reflect climate change;
- Different approaches reveal a non-linear relationship between tourism and temperature, particularly an inverted u-shape between temperature and tourism demand;
- The search for a more comfortable climate appears to be one of the main motivations determining global tourism flows;
- A high level of uncertainty remains within statistical models, given the difficulties involved in forecasting social phenomena in the medium and long run.

The impacts of drought on tourism have also been modelled in a drought-tourism / recreation vulnerability framework proposed by Thomas *et al*. (2013) (Figure 2-11). The tourism / recreation sector is viewed as being particularly sensitive to hydrological and socio-economic (when demand for water exceeds water supply) droughts, but, the authors argue, the impact of drought on the tourism / recreation sector is not adequately reflected in drought impact statistics: The relationship between the tourism / recreation sector and drought is regarded as complex, dynamic, and spatially variable. Using stakeholder engagement to capture the linkages between tourism activities and drought and incorporating systematically collected drought monitoring data, the framework aimed to evaluate potential impacts towards comprehensive planning and adaptation solutions (Thomas *et al*., 2013).

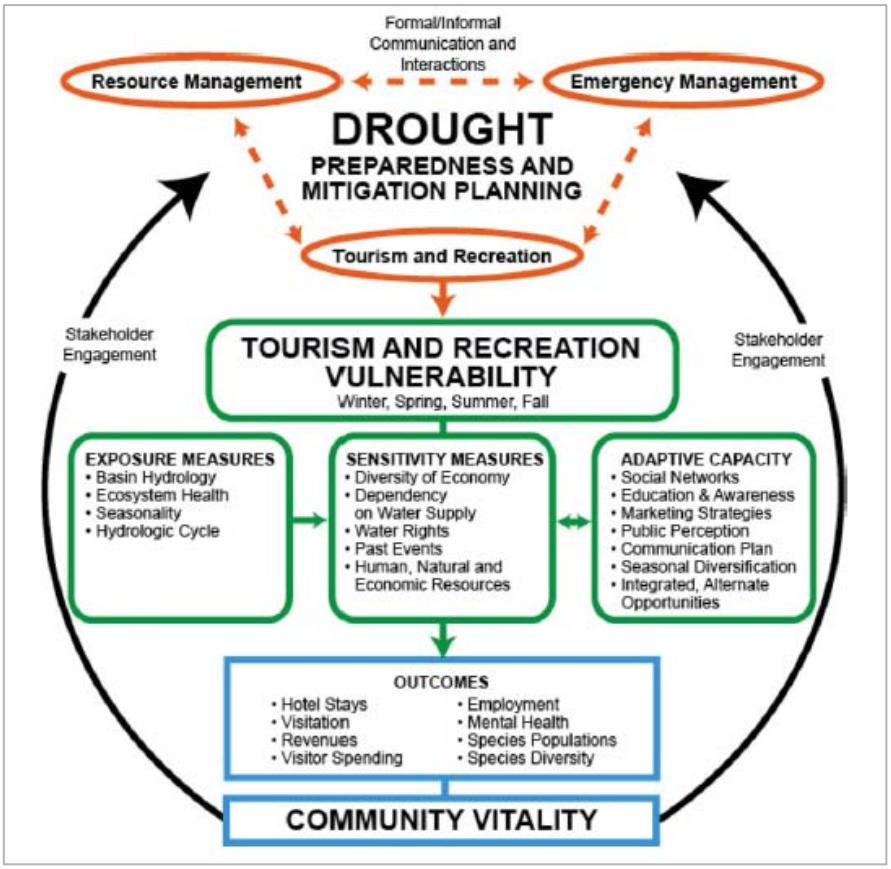


Figure 2-11: Drought-tourism / recreation conceptual framework (Thomas *et al*., 2013:4).

2.3.4 Intermediate conclusion

This section offers a review of existing models of tourism systems in the light of the latest 'theory of change' thinking. This has led us beyond normative tourism models towards adopting the Panarchy concept by which processes that govern natural, human, and social-ecological systems are linked via adaptive cycles of growth, accumulation, restructuring, and renewal. Traditional tourism models see tourism as easily controllable (top down management approach), with tourism players functioning in a formally, coordinated manner to form a unified whole. This type of model is argued as too deterministic, linear and restrictive. Accordingly, a 'systems approach' to tourism models is required to provide refreshing perspectives to any tourism concept (e.g. destination capitals, pro-poor tourism, sustainable tourism).

Indeed, tourism systems are complex adaptive systems akin to socio-ecological systems. These systems are characterized by multiple, interacting components; cause and effect relationships that are often non-linear and unclear; system dynamism; 'butterfly effects' (being disproportionally affected by external events); and vulnerability to multiple shocks. The 'core' tourism system is not separable from the social, ecological and political systems. This model of tourism gives far greater significance to vital ecosystem goods and services, structures and

functions, local society, its perceptions and aspirations, and a host of other components than the traditional model. The tourism system is influenced by a diversity of pressures / drivers, often interacting with each and acting simultaneously on the tourism system. The complex adaptive view of tourism thus focuses on adaptation rather than mitigation.

This has major implications for our research project which aims to investigate (a) the links between natural capital, tourism and global change, with a focus on freshwater aquatic ecosystems, and (b) the influence such links have on the development potential of the tourism sector and its contribution to generating economic benefits and supporting SMME development:

- First, a complex system approach to tourism inherently suggests that water-related drivers of change and variables hold non-linear relationships with the various components / structures and processes of tourism systems;
- Second, the Panarchy model focuses our attention on trying to identify (a) which phase of the adaptive cycle various nested tourism systems may lie and / or transition towards and (b) what are the potential traps for each nested system (e.g. rigidity trap of the conservation phase and the poverty trap of the reorganization phase).
- Third, a 'pathways' approach to sustainability acknowledges that there are alternative, competing pathways towards multiple sustainable tourism futures, which emphasises the role of power relationships between stakeholders in the framing of sustainability discourses / policies and the adoption / implementation of the associated strategies and activities. It thus embraces the diversity of perceptions / values regarding the meaning of sustainability in the context of tourism systems, which range from weak sustainability principles to the conservation of critical natural capital and / or the prioritisation of pro-poor outcomes.

2.4 Policy review with respect to tourism, natural capital and SMME development

The policy review focused on the following key aspects:

- Tourism and SMME development: national level policy analysis;
- Tourism and freshwater-related natural capital: key gaps in national-level policy;
- Review of best practice in business water footprint management;
- The insurance values of freshwater-related ecological infrastructure;
- Economic Policy Instruments (EPI) related to freshwater-related ecological infrastructure.

Tourism and SMME development: national level policy analysis

The South African government's national strategy for the development and promotion of the small business sector in South Africa was formally endorsed by parliament in early 1995. The Government has continued to play its part in the setting of broad national tourism policies to guide SMME and tourism sector development. Among the many legislature present, it was found that those of note include the Tourism White Paper of 1996, the Tourism Act 2014, and the Amended Tourism Sector Code for Broad-Based Black Economic Empowerment in the tourism sector. The state has also put in place many measures in terms of policy, strategies and legislature in order to bolster the efforts of growing the SMME economy in the country. The Amended Small Business Act of 2013 and the 1995 Small Business Development White Paper account for policy documents that guide SMME support in the country. Institutionally, the Small Enterprise Development agency, under the Department of Trade and Industry plays a significant role in SMME advancement. Similarly, the Department of Tourism and the Tourism Business Council of South Africa have key roles to play in the tourism industry.

The White Paper on the National Strategy for the Development and Promotion of Small Business in South Africa highlighted that "*small, medium and micro enterprises represent an important vehicle to address the challenges of job creation, economic growth and equity in our country*" (DTI, 1995). The Strategy recognised several important outcomes for the development of small, medium and micro enterprises (SMMEs) sector, by focusing not only on creating employment for an unoccupied labour force, but also on improving skills through business exposure.

For the tourism sector, the NTSS (2017) has been focusing on:

- "*programmes to attract more black entrepreneurs to enter the industry and own and operate SMMEs throughout the sector";*
- *strategies and programmes to promote businesses with a BBBEE scorecard and to encourage businesses to improve their scores and reach the tourism charter targets;*
- *a people development plan, including training, effectively to produce the required sector skills at all levels, but particularly management and entrepreneurship skills;*
- *a programme to set, adhere to and measure attainment of 'responsible tourism' standards."*

However, the recent qualified audit opinion for the Department of Tourism and the underperformance of the Expanded Public Works Programme (EPWP) is of concern for job creation linked to the development of tourism infrastructure and for skills development within

the tourism sector. The Minister of Tourism recently noted (October 2019) that the EPWP "*is a crucial programme of the department which focuses on job creation linked to the development of tourism infrastructure and skills development within the tourism sector. The EPWP capital projects have experienced many challenges, amongst them, is poor project implementation and other systems failures. These challenges in the EPWP capital projects led to the department incurring fruitless and wasteful expenditure*"[8].

In as much as there is policy and institutional support for tourism SMMEs, key gaps remain. The support needs of SMMEs operating in the tourism economy are far from homogeneous. Rogerson (2008) argues that policy interventions for supporting tourism SMMEs must also recognise difference and the specific and varied needs among tourism SMMEs. The review indicates a need for a policy framework for tourism SMMEs that is sensitive to a range of circumstances pertaining to SMMEs of different types and sizes as well as the support requirements of SMMEs, namely access to finance, markets, information and training.

Tourism and freshwater-related natural capital: key gaps in national-level policy

At the national level, the National Tourism Sector Strategy (NTSS, 2017) has very limited focus on environmental issues, besides raising concerns over the impacts on inbound tourist numbers of possible carbon taxes on the aviation industry and the need for South Africa to appear to be a responsible tourism destination to help mitigate this risk. In practice, this involves funding activities to support environmental management activities of a selection of tourism businesses and assets (e.g. support to protected area management).

In other words, there is no clear recognition of the importance of water source areas and ecological infrastructure linked to freshwater assets (rivers, wetlands) as key enablers of tourism activities and the associated businesses and jobs. Furthermore, while the Department of Environmental Affairs has a few tourism interventions as part of its Biodiversity Economy Strategy[9], there is no dedicated programme to integrate water-related ecological infrastructure (from source areas to sea) into the tourism sector, as a whole and for specific regions or destinations.

[8] URL: https://www.tourism.gov.za/AboutNDT/Ministry/News/Pages/Minister_Kubayi-Ngubane_concerned_about_performance_and_audit_outcome_at_the_Department_and_SAT.aspx, accessed on October 14, 2019.
[9] URL: http://thegamechanger.co.za/pilot-projectslubombolubombo-2/, accessed on October 14, 2019.

Review of best practice in business water footprint management

In their report "Integrating Green Innovations in Business", Amis & Solomon (2016) argue that businesses can make use of green innovations to manage their water footprint, including:

- "*Supply augmentation through the use of efficient innovative technologies and infrastructure in a cost-effective manner. Localized water enhancement technologies such as rainwater harvesting, storm water capture and small water reclamation provide useful strategies for water supply augmentation and resource planning.*
- *Demand management entails the introduction of technologies or business strategies that promote water use efficiency, and conservation. Such technologies or business model innovations reduce the need for new supplies, increase reliability and decrease the cost of pollution control with wastewater control. Technologies that help to improve demand management range from water efficient appliances to drip irrigation, to smart controllers. Behavior change in water resource management can be encouraged by technologies such as smart metering, for real time sense of water use.*
- *Governance of water is important for securing access to reliable water supply and for reducing demand. There are technologies that can help to improve the overall water governance arrangements, which is a key requirement for strategic water management. Methodologies that promote advanced data collection and smart metering are examples of technologies that enable water utilities to accurately measure supply and track demand, identify leaks and other obstacles in their distribution channel*s".

While many of such innovations are already used by tourism businesses, especially in the context of nature-based tourism and in water-scarce areas, there are no statistics available on the adoption of such innovations, to the best of our knowledge, which could suggest that more systematic planning and support could be promoted regionally and at a national level.

The insurance values of freshwater-related ecological infrastructure

The impacts of climate related events on tourism, such as floods, can be significant. For instance, the landfall of Tropical Storm Dando resulted in a severe flood event in the Lowveld region of the Limpopo Province in South Africa from 17 to 19 January 2012, with over 500 mm of rainfall recorded over a 24-hour period (Fitchett *et al*., 2016). In a study of the economic costs of the floods on tourism Fitchett *et al*. (2016:187) report:

"*The Mopani District Municipality declared a local state of disaster following these floods. Interviews conducted with 24 lodges and conservation establishments indicate a total direct cost of R58.92 million, 'costs' of loss of business of R4.230 million, and an increase in long-term expenses, including insurance, adaptation and mitigation, of R458 600... Damage ranged*

from the loss of household contents to the complete destruction of all buildings on the property. The capacity for tourism establishments to recover from the floods depended primarily on the type and value of their insurance. Additional strain was placed on tourism establishments through the damage to roads, poor water supply during the floods, the removal of trees, and a loss of the aesthetic quality of the region. This case study provides a valuable insight into the nature and severity of the impacts of floods on the South African tourism sector, and contributes to projecting impacts of global climate change on tourism in developing countries"

This case study highlights the importance of safeguarding / restoring freshwater-related ecological infrastructure (e.g. for risk mitigation, from avoidance to minimisation of damages) during the strategic planning, design, construction and management of physical assets and infrastructures, especially for the tourism industry and / or assets.

There is a growing body of literature on the insurance benefits of freshwater-related ecological infrastructure (Pringle *et al*., 2018), notably in terms of:

- Flood attenuation: For instance, grasslands assist in flood attenuation by reducing run-off and improving infiltration, while the ability of riparian vegetation to attenuate floods varies according to discharge and the width of the riparian corridor in comparison to the stream channel (overall roughness of the vegetation and flow resistance dissipate the kinetic energy of floods); and
- Drought Mitigation: Ecosystem functioning affects the availability of water in terms of both quality and quantity. Increased availability of water in a catchment can delay the onset of drought. Effective water source area and ecological infrastructure management is therefore of direct interest to the insurance industry and its clients, as it may ultimately reduce their risk.

Linking and mapping strategic water source areas (Figure 2-12) to key tourism destinations and assets (e.g. Mpumalanga highlands and Kruger National Park), which may be threatened by a number or a combination of anthropogenic impact drivers (e.g. urban and industrial wastewater, coal mine water pollution, land use change due to agriculture), should be a priority.

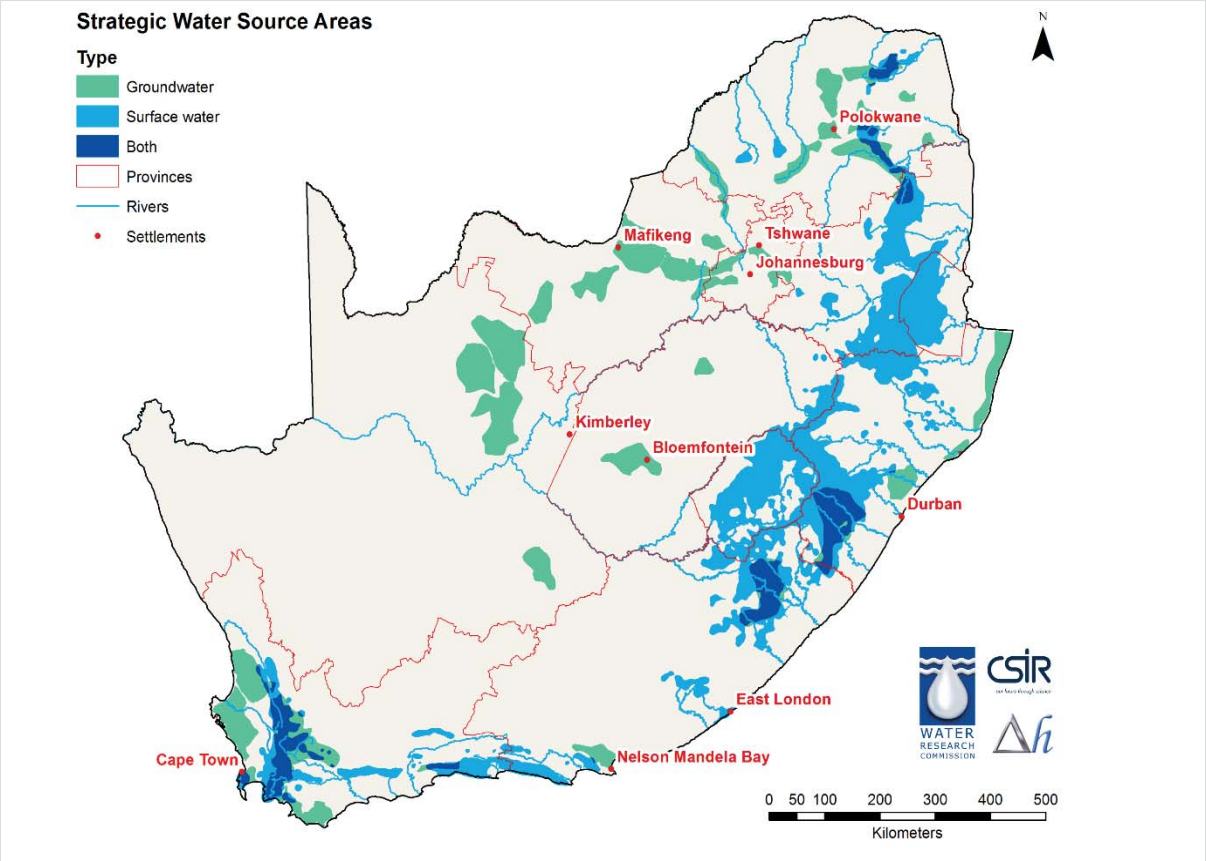


Figure 2-12: Strategic Water Source Areas (DWS, 2019)

Note: About 50% of South Africa's water resources originate from 10% of the country's land, but many of these "water factories" are under threat. These areas support >50% of the population, >64% of national economic activity and supply ±70% of irrigation water (DWS, 2019).

Economic Policy Instruments (EPI) related to freshwater-related ecological infrastructure

As explained by Maila *et al*. (2018), a "*policy instrument is the term used to describe the methods used by governments to achieve a desired effect as envisaged in policy. Three types of environmental management policy instruments exist: regulatory instruments, suasion instruments and economic instruments. Regulatory instruments are by far the most commonly used environmental policy instruments internationally. Examples include laws of a rationing or prescriptive nature; and regulations that permit or license resource use, planning controls or performance standards. Suasion instruments are ethical or discretionary instruments that use moral and direct persuasion to promote appropriate behaviour. Economic instruments… seek to influence behaviour and decision-making through introducing economic incentives or disincentives. Their purpose is two-fold: to achieve policy objectives and to earn revenue, the so-called double-dividend*." The authors identify seven types of EPIs, relevant to water management:

- A basket of policy relevant (equity, efficiency, sustainability) water use charges;

- Green infrastructure management systems;
- Eco-restoration (or rather like-for-like markets linked to environmental authorisation processes and the mitigation hierarchy, e.g. wetland offset trading);
- Waste discharge charges;
- Industrial wastewater charges;
- Pollution deposit-refund system;
- Water pollution permit trading.

While all approaches may be useful to promote, if implemented cost-effectively and efficiently with socio-economic and ecological co-benefits, there is a particular EPI we would like to highlight: Payment for Ecosystem Services (PES) schemes. While there has been many attempts to implement PES schemes, many have failed or have had very limited positive impacts (Maila *et al*., 2018). Experience with PES shows that it is most likely to succeed where the following conditions are present (Fripp, 2014):

- There is a clear demand (need) for ecosystem services, which have financial value to one or more stakeholders;
- Provision of ecosystem services is threatened;
- Specific resource management actions offer feasible solutions;
- Effective brokers or intermediaries exist;
- Resource tenure is clear, and contracts can be enforced;
- Outcomes of actions can be independently monitored and evaluated.

Examples include (Maila *et al*., 2018):

- "*The city of New York opted to support farmers carrying out watershed protection upstream in the Catskill Mountains in order to reduce the high cost of treating water downstream closer to the city;*
- *Nestle, a multinational drinks company, operates a scheme for subsidising farmers to avoid the use of nitrates in the area from which its bottled water Vittel is drawn;*
- *In Quito, Ecuador, and in several smaller cities in Honduras and Costa Rica, the water utility and electric power companies pay local people to conserve the watersheds from which water is drawn;*
- *In Venezuela, the power producer CVG-Edelca pays a proportion of its revenues towards the preservation of the Rio Caroni watershed*".

Water Fund schemes (Box 4-1) follow a similar concept to PES, but deviate from some of the PES criteria (Goldman-Benner *et al*., 2012). They are collective action mechanism, where

groups of water related service users transfer resources to upstream communities and land stewards. A water fund adopts a PES approach, but specifically uses a trust fund managed by an external entity for the financial management component of the scheme (Goldman-Benner *et al*., 2012).

Box 4-1: Water funds

For more than 15 years, water funds have helped communities improve water quality by bringing water users together to collectively invest in upstream habitat protection and land management, and mobilize innovative sources of funding. As a permanent governance, investment and source water protection implementation mechanism, water funds provide the framework for collective action, connecting land stewards in rural areas and water users in urban areas to share in the value of healthy watersheds. The Nature Conservancy has a portfolio of 29 funds in operation as of the publication of this report and approximately 30 in design.

Nairobi, Kenya (Abbel *et al*., 2017)

The Upper Tana River Basin is of critical importance to the Kenyan economy. Covering an area of approximately 1.7 million hectares, the Upper Tana supplies 95 percent of Nairobi's drinking water, sustains important aquatic biodiversity, drives agricultural activities that feed millions of Kenyans and provides half of the country's hydropower output. The basin has experienced high population growth and declining sustainability of agriculture, resulting in the conversion of forest to cropland and decreasing land per capita. Smallholder farms are the largest upstream water user in aggregate of Upper Tana Basin water. Hydropower generation is the second largest upstream user of water, though the water is returned to the river. The unchecked expansion of farming, quarrying and dirt road construction across the Upper Tana over the last 40 years has led to land degradation. Consequently, elevated sediment loads are entering the river system, impacting the delivery of water to Nairobi water users and reducing the storage capacity of reservoirs. In response to these challenges, the Upper Tana-Nairobi Water Fund was launched to implement a holistic set of source water protection activities with the objectives of increasing water yields, reducing sediment, and promoting sustainable food production and increased household incomes in farming communities across the project areas. In order to mobilize funding, a comprehensive analysis integrated investment planning techniques with watershed modelling tools to prioritize where to work. Non monetized benefits, including pollinator habitat and carbon storage, were identified and the overall cost-to-benefit analysis concluded that, even by conservative estimates, the

selected watershed interventions could ultimately deliver a two-to one return on investment over a 30-year timeframe. By recognizing the multiple embedded values of a healthy watershed, and involving the key stakeholder groups, the water fund was able to design a collective action program whereby investing together made the most financial sense. Many of these projected benefits are already being measured through demonstration interventions.

Greater Cape Town Water Fund (Stafford *et al*., 2018)

The Greater Cape Town Water Fund aims to bring together private and public sectors stakeholders alongside local communities around the common goal of restoring the surface water and aquifer catchments which supply the water of the region. The Water Fund aims to support and align with existing government initiatives and act as a catalyst for systemic change in catchment management by cost effective use of on the ground resources, strengthened capacity, and robust monitoring and evaluation. In addition, the Water Fund will stimulate funding and implementation of catchment restoration efforts and, in the process create jobs and momentum to protect globally important biodiversity and build more resilient communities in the face of climate change.

As argued by Stafford *et al*. (2018), an investment of R372 million ($25.5 million USD) will generate annual water gains of 50 billion litres (50 Mm^3) a year within five years compared to business-as-usual — equivalent to one-sixth of the city's current supply needs — increasing to 100 billion litres a year (100 Mm^3) within 30 years. Water gains are achieved at one-tenth the unit cost of alternative supply options. The results of this business case demonstrate that restoring the ecological infrastructure of priority sub-catchments through invasive alien plant removal is a cost-effective and sustainable means of augmenting water for the Greater Cape Town Region.

In the uMngeni catchment, financing mechanisms to support the implementation of catchment management and restoration efforts with a view to securing the hydrological services of the catchment are being investigated. Investment in the ecological infrastructure (EI) of the catchment has been proposed to maintain and increase critical water-related ecosystem services, essential for sustaining human well-being and economic development (Pringle *et al*., 2015). Financing is a key challenge to investment in the EI of the uMngeni catchment. As noted by Pringle *et al*. (2015:5): "*state funding of investments in EI is critically important. However, a diverse mix of funding sources may better mitigate risk, stabilise the availability of funding and facilitate higher levels of investment in EI. Furthermore, state funding is often*

focused on job creation. Evolving to more diverse and private funding can create more employment and livelihood opportunities".

Pringle *et al*. (2015) identified various opportunities for funding EI investment in the uMngeni River catchment, including:

- *"Continuation of existing initiatives such as the Natural Resource Management, LandCare and Invasive Alien Clearing Programmes as well as the integration of the M&E and feedback mechanisms discussed earlier;*
- *The inclusion of EI investment costs into water pricing instruments;*
- *The use of existing and emerging water governance structures, such as the Catchment Management Agency, to fund investment in EI;*
- *Building the costs of EI investment into the capital cost of infrastructure development projects;*
- *The use of private finance to fund investments in EI. This may include the use of water bonds or creating incentives for institutional investors.*
- *The use of offsets to finance investment in EI;*
- *The creation of multi-stakeholder partnerships, which include both the public and private sectors, and the development of Memorandums of Understanding between departments".*

With regard to 'water pricing strategies', Umgeni Water – the local water service utility – is exploring a fund to finance investment in the EI of the catchment generated through an additional charge attached to the water tariff. While it has been suggested that EI investment in the catchment should be funded as a single programme administered by a legal entity such as Public Benefit Organisation (Pringle *et al*., 2015), it appears at this stage, that funds generated through a charge added to the water tariff, and the associated catchment management activities, would be managed internally by Umgeni Water.

The eThekwini Municipality (lower uMngeni catchment) have expressed an interest in establishing a Water Fund to address water security issues through ecological infrastructure interventions as a component of the municipality's integrated water management program. The Nature Conservancy has entered into a Memorandum of Agreement (MOA) with the municipality to help facilitate this process. A scoping assessment is underway to determine the geographic area for a pilot catchment for an eThekwini Water Fund. Ultimately, the objective will be to replicate the pilot to achieve protection of all key catchment critical for supplying water to the municipality.

3 CONTEXT AND METHODOLOGY

Building on the findings from the literature review (chapter 2), a multi-pronged methodological approach has been adopted to investigate:

- The links between natural capital, tourism and global change, with a focus on freshwater aquatic ecosystems, and
- The influence such links have on the development potential of the tourism sector and its contribution to generating economic benefits and supporting Small, Medium and Micro-enterprise (SMME) opportunities.

This multipronged approach involved undertaking research at both:

- The national level (section 3.1):
    - National level economic modelling of water-related global change scenarios for the tourism economy (section 3.1.1);
    - National level stakeholder engagement (section 3.1.2);
- The level of two case study sites (section 3.2):
    - Characterising of the case study sites in the context of the Panarchy model (section 3.2.1);
    - Ecosystem service supply, demand and stress modelling according to different water-related glocal[10] change scenarios (section 3.2.2);
    - Economic impact modelling of the tourism system according to the different water-related glocal change scenarios (section 3.2.3);
    - Assessment of opportunities and challenges for community-based tourism development through a soft systems thinking approach incorporating community surveys, participatory action research and social learning techniques (section 3.2.4).

3.1 National level research

Our research methodology at the national level involved a combination of stakeholder engagement, through the 2030 Tourism and Natural Capital Working Group (section 3.1.2), review / analysis of how current public policies integrate natural capital and SMME considerations (section 2.4) and macro-economic modelling of the economic impacts of water-related global change scenarios on the tourism economy (section 3.1.1).

[10] Reflecting or characterized by both local and global considerations.

3.1.1 National level economic modelling of water-related scenarios for the tourism economy

As an open or interconnected system, tourism is influenced by both external and internal events and is vulnerable to global changes. Slow change processes (e.g. climate change) and prompt change impacts (e.g. economic crises, terrorist attacks) require different innovations, adaptation strategies and structural transformations. Tourism systems experience a wide range of influences and stress factors simultaneously (e.g. Cochrane, 2010). From this perspective, this activity involved:

- Adapting the adaptive cycle / Panarchy theory to the tourism sector in South Africa;
- Selecting water-related global change scenarios for impact modelling at the national level;
- Exploring the economic impacts of these scenarios for the tourism sector and the broader South African economy through the modelling of the compounded impacts of different climate change scenarios on tourism spending by 2030, using evidence-based assumptions, the 2011 Quantec database for economic impact multipliers[11] and the 2016 baseline data (WTTC, 2017) of direct GDP contribution of tourism and travel industries.

3.1.2 Stakeholder engagement: The 2030 Tourism and Natural Capital Working Group

Responding effectively to the realities of tourism in an era of global change requires a sound understanding of the dependencies of the tourism sector on natural capital and information on the risks and opportunities linked to natural capital and global change. Yet, the relationship between the tourism sector and natural capital, as well as the risks and opportunities linked to global change, are not well understood in South Africa. While the NTSS recognises the critical importance of well-managed natural assets for the tourism industry in SA (see section 2.1;

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[11] An intervention into an economy (on any scale) not only creates direct benefits to the investor, but has spill-over effects on the other economic agents. These spill-over effects could be positive or negative. Three types of economic impacts are generally assessed:

- The direct economic effects are generated when the new business creates new jobs and purchases goods and services to operate the new facility. Direct impact results in an increase in job creation, production, business sales, and household income;
- The indirect economic effects occur when the suppliers of goods and services to the new businesses experience larger markets and potential to expand. Indirect impacts result in an increase in job creation, Gross Geographic Product (GGP), and household income; and
- The induced economic effects represent further shifts in spending on food, clothing, shelter and other consumer goods and services as a consequence of the change in workers and payroll of directly and indirectly affected businesses. This leads to further business growth / decline throughout the local economy.

We have used the modified South African Social Accounting Matrix (SAM) and associated impact multipliers for 2011 – provided by Quantec – as the primary database for our Macro-economic Impact Model.

NDT, 2017), there does not seem to be an explicit recognition of up-stream dimensions (i.e. need to conserve or restore water source areas) of the tourism economy's dependency on hydrological services. Accordingly, the research team proposed the formation of an informal platform that brings together industry stakeholders, decision-makers and research institutions to actively engage around the issues of tourism, natural capital and global change in South Africa: A 2030 Tourism and Natural Capital Working Group was launched in September 2017, through the invitation of target stakeholders within the tourism and natural capital space.

3.2 Case study level research

Two case study sites were selected to help answer the research questions of this study: (a) the uMngeni River Catchment (Dusi Canoe Marathon and Inanda Dam) and (b) the Olifants River Catchment (Loskop Dam and the associated recreational fishing activities) (Figure 3-1). The case studies provided an opportunity to better understand the complex relationships (existing and potential) between global drivers of change and tourism systems. The specific focus of the case studies was the influence of water-related stresses (especially in terms of water quality) on the tourism system and the potential SMME opportunities associated with the tourism sector.

3.2.1 Characterisation of the case study tourism systems

This activity involved characterising the tourism systems at both case study sites, and included:

- Describing the socio-economic context;
- Describing the ecological context;
- Applying the adaptive cycle / Panarchy model to the tourism system.

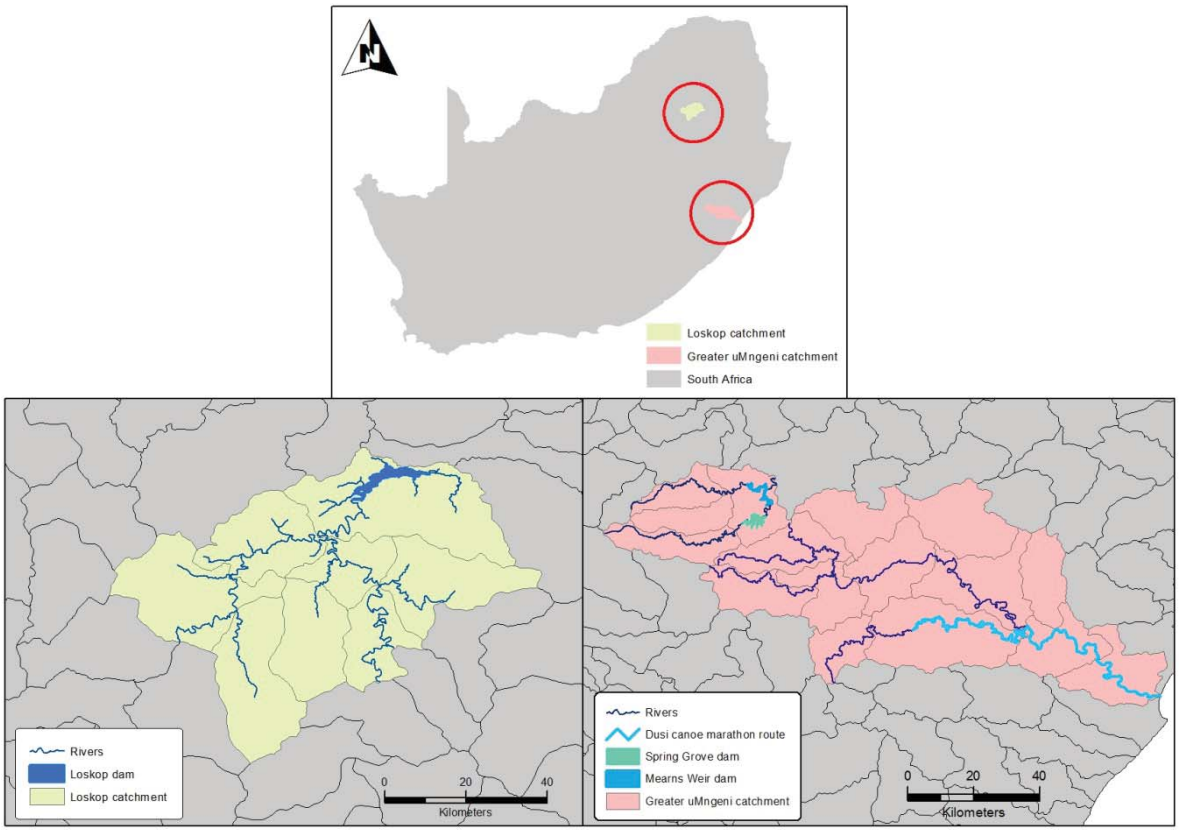


Figure 3-1: Delineation of the greater uMngeni and Loskop Dam catchments.

3.2.2 Ecosystem service supply, demand and stress modelling according to different glocal change scenarios

This activity aimed to model the potential supply of ecosystem services (ES), their potential demand and the associated stresses (supply / demand ratio) at the case study sites. This involved the following steps:

- Assessing the capacity of different land uses to provide different ecosystem services;
- Assessing the supply of potential ecosystem services;
- Assessing the demand for ecosystem services;
- Assessing ecosystem services under stress.

This enabled the project team to understand the current ES-related needs and stresses facing the tourism economy at the target sites. Different global – local (glocal) change scenarios were also modelled to explore future risks and opportunities.

3.2.2.1 Assessing the condition of different land uses

The supply of ecosystem services may be influenced by the type, extent and condition of the ecosystem. Not all ecosystems provide all services, nor do they provide the same service equally well. Important supply areas for ecosystem services were derived based on land cover

maps, available spatial data sets and expert judgement, and the likely level of service delivery scaled according to ecosystem type, condition and extent.

Catchment delineation

The catchments of the study sites, located within the KwaZulu-Natal and the Mpumalanga provinces, were delineated using quaternary catchment boundaries (Figure 3-1). Due to the inter-basin transfer that occurs from both Springrove Dam and Mearns Weir into the uMngeni catchment, the Mearns Weir and uMngeni catchments were aggregated to form a single "greater uMngeni catchment", with the view of including all influences on the uMsunduzi and uMngeni Rivers which host the Duzi Canoe Marathon. The Loskop Dam catchment was delineated by selecting all quaternary catchments that contribute flow to the dam (Figure 3-1).

Identification of the location and extent of relevant ecosystems

A frequently implemented approach to mapping ecosystem services involves the utilization of existing land cover data. Different land cover types can be quantified according to their relative ability to supply different services. This type of information can be further refined by establishing the proportion or area of the different land cover types and their condition. The result of this refinement is a detailed ecosystem services map based on land cover distribution that identifies areas of higher or lower ecosystem service supply (Maes *et al.*, 2016).

A key consideration for mapping ecosystem services within the greater uMngeni and Loskop Dam catchments is the present ecological state of the landscape and the level to which the ecosystems are transformed / modified from their natural condition. Irreversibly modified land cover categories (transformed) are of limited interest in the context of this study and the 'condition' of these land cover categories was not evaluated. Evaluation of condition was conducted for natural or semi-natural ecosystems including grassland, indigenous forest, low shrubland, thicket / dense bush, wetland and woodland / open bush ecosystems. Detailed land cover classes from the national 2013/2014 Department of Environmental Affairs (DEA) 72 class land cover dataset (© GeoTerraImage) were collapsed into two broad land cover categories (natural and transformed) based on expert judgement and guided by the objectives of this research. The initial DEA land cover categories were combined to provide these broader categories as detailed in Annexure 7.8.1. This data, together with a number of additional spatial data layers, such as a refined wetland layer, derivatives from multispectral satellite imagery, accessibility and vulnerability surrogate layers were also used to help determine condition of natural ecosystems.

Ecosystem condition

Ecosystem condition plays an important role in the capacity of an ecosystem to reliably deliver important services (Maes *et al*., 2016). Degradation of ecosystems limits their ability to provide these services. It is therefore important, when attempting to evaluate the contribution of ecosystems to a given service, to not only identify the location and extent of ecosystems, but also to establish the condition of ecosystems. Indicators of condition vary between ecosystems. For example, 'Highveld grassland' is considered degraded if vegetation basal cover is low, while in an arid or semi-arid environment, this would not be an appropriate indicator. A number of condition indicators were identified as part of this proposed method and applied using specific methods developed for each of the land cover categories. Using these indicators, the condition of natural ecosystems (grassland, indigenous forest, low shrubland, thicket / dense bush, wetlands and woodland / open bush) was determined using the various methodologies outlined below.

Forest

The ecological condition of forest ecosystems is difficult to establish remotely given the inability of earth observation technologies to 'see' patterns and processes occurring beneath the canopy. For this reason, a number of surrogate data sets and assumptions were used to provide an indication of the most likely condition status. The foremost assumption is that forest condition is a function of both vulnerability and accessibility.

Vulnerability

The impact of a wide variety of peripheral human influences together with direct utilization of forest resources can detrimentally affect the functioning of forest ecosystems. Forest fragmentation is a well described phenomenon that has been shown to be related to declining forest ecosystem condition and hence decrease the ability of the forest to deliver ecosystem services. The edge to area ratio of forest patches has been widely used to assess forest fragmentation and to describe the vulnerability of forest ecosystems to the impacts of edge effects.

The edge to area ratio concept functions on the premise that forest condition is most impacted at or near the edge, while further into the forest, ecological patterns and processes are protected / buffered by areas closer to the edge. The greater the proportion of the forest that is located close to the edge, the more of the total forest area is likely to be exposed to degrading influences. Patches with elongated shapes or indented perimeters have higher perimeter-area ratios than patches of the same area with compact shapes and unbroken perimeters. In addition, small patches generally have higher perimeter-area ratios than large

patches. This concept was applied in evaluating forest vulnerability within the study areas. Thresholds of vulnerability were determined for edge to area ratios based on literature and known practical examples. These were used to score the vulnerability of forest patches using a 1-5 system.

Accessibility

In attempting to model forest condition, edge to area ratios are not sufficient in themselves, as different factors influence the degree to which forests are utilised and impacted. A vital element to consider is accessibility as not all forests are accessible for utilization to the same degree. For the purposes of this assessment, the assumption that the ability to easily access forests dictates the level to which the forest is impacted was used. For example, forest patches that are in close proximity to public roads and settlements were assumed to be more accessible than those located further away from human activity and thus are likely to be more intensively utilised and hence more exposed to disturbances.

In addition, land tenure was similarly considered as an influencing factor to the accessibility of forest patches. It was assumed that forests on privately owned land are less accessible than those on government land – which in most cases is less accessible than communally owned land – and that forests in protected areas are the least accessible (for resource extraction).

In order to apply this thinking to a condition model, accessibility to forest patches was assessed using the following criteria (max and min given here, but this is actually a range of values that were calculated using a matrix):

- All forest patches located on communal tenure land and that intersect a 1 km buffer of roads and settlements were considered to be the most accessible and were allocated the ‘most accessible’ score (1);
- Forest patches located on private land or in formally protected areas and well away from road and settlement were considered to be relatively inaccessible to people harvesting forest resources and were assigned a ‘least accessible’ score of 5.

Forest condition was then scored by multiplying the vulnerability of the forest patch by a weighting of 2 and multiplying its accessibility by a weighting of 3, summing the products and dividing by 5 to achieve a combined forest condition score reflecting ecological condition categories A-E.

Grassland, Woodland, Shrubland and Bushland

A condition index was used to determine the condition of grassland, woodland and bushland ecosystems. The index was based on Normalised Differential Vegetation Index (NDVI) values. NDVI is an index most often used to evaluate the presence of live green biomass on the ground. This index has limitations with respect to the differentiation of species and vegetative groups. However, in the context of this study, where water-related services are of importance, vegetative cover is the primary condition consideration and the NDVI is able to adequately differentiate between areas of dense and sparse cover. It is therefore a useful indicator of condition in ecosystems where the absence of vegetation is a key indicator of degradation. Grasslands, Woodlands, Shrublands and Bushlands are considered to be such ecosystems, particularly where heavy grazing pressure is a degradation driver.

Summer multi-temporal Sentinel-2 / Landsat8 imagery was used to derive a single vegetation condition classification raster, where the best NDVI values for each pixel across the three different years were used. This ensured that the best NDVI value was selected for condition assessment and the process was safeguarded against short term vegetation cover loss (e.g. due to fire, etc.). NDVI scores were calibrated against known areas of degradation and good condition ecosystems. Based on this calibration, NDVI values for each of the four ecosystems was classified into condition categories, possibly ranging from 1 (poor / degraded), to 5 (good/natural). Examples of threshold NDVI values for each of the four ecosystem categories are shown in Table 3-1. This example stems from previous ecosystem condition mapping that was conducted within the uMngeni catchment (these example thresholds do not necessarily apply in this study). Once the baseline was established, it was modified where appropriate using existing degradation data such as donga erosion. It was also modified by mapping selected specific degradation activities such as sand mining along water courses.

Table 3-1: Example of NDVI thresholds (taken from a previous project) used for determining good, fair and poor categories of grassland, woodland and thicket ecosystems

	NDVI score thresholds		
Land cover class	**Poor**	**Fair**	**Good**
Grassland	0.331170	0.369600	0.609800
Thicket / Dense bush	0.347877	0.394177	0.607161
Woodland / Open bush	0.276792	0.361196	0.511743

Wetlands

The condition of wetland ecosystems were determined using the approach described in Pringle *et al*. (2017). This approach is based on a condition assessment method, developed

by Kotze (2016), that determines Present Ecological State on an individual wetland basis. We then developed a GIS approach based on these methods to assess wetland condition on a catchment scale. These approaches rely on specific spatial layers:

- A layer depicting the location and extent of wetlands;
- A layer indicating their immediate 'zone of influence';
- A land cover / land-use layer.

A 200 m buffer was applied to wetlands within study catchments. This 200 m buffer served to represent the immediate 'zone of influence' and is believed to be the area where changes in land use have the most impact on wetland condition. Impact scores were allocated to respective land cover classes based on the impact that the specific land cover is believed to have on a wetland, if, (1) occurring within the wetland itself, or (2) occurring within the buffer area. Hence a score was allocated to each wetland based on the extent of the different land cover classes within its boundary and 200 m buffer. Kotze (2016) used a general list of land cover types; in this study the 72 land cover classes within the DEA land cover dataset were refined to achieve a similar result. The scores utilised in Pringle *et al*. (2017) are illustrated in Annexure 7.8.2.

Within each wetland, a combined or overall impact score of each land cover category was calculated using different weightings for each impact: i.e. vegetation was given a weighting of 2, Hydrology a 3 and Water quality a 2. The formula to calculate the impact of land cover on wetlands is therefore:

$$Overall\ Impact\ Score = \frac{(Hydrology\ IS * 3 + Water\ Quality\ IS * 2 + Vegetaion\ IS * 2)}{7}$$

An impact magnitude score was calculated by multiplying the overall impact score of each land cover category by the percentage extent of the corresponding land cover in the wetland area. This was converted back to a score out of 10 by dividing the product by 100. For example, if Annual Commercial Crops has an impact intensity score of 7.6 and covered 61% of the wetland then the impact magnitude will be 7.6*61/100= 4.6. This score was calculated for each land cover within the wetland. A 'total magnitude of impact' score was then calculated by summing the impact magnitude scores for all the land cover categories occurring in the wetland to provide a score out of 10.

Assessing the impacts of land cover categories in the 200 m buffer followed the same procedure as that for within wetlands. Impacts of land cover within the 200 m buffer were, however, determined using scores for different impacts namely: water quantity modification, pattern / increased peak discharges and water quality. As with wetlands, the extent of land cover categories occurring in the buffer area was converted to a percentage of each feature's total area.

A combined or overall impact score was calculated using the average of the 'Pattern: increased peak discharges' and 'Water Quality' scores. A magnitude of impact for each land cover type present was calculated by multiplying the overall impact score for each land cover category by the proportional extent of that land cover type in the wetland buffer area. All individual impact magnitude scores were then added to derive an ecological impact score for land cover within the buffer to determine the total magnitude of impact for each buffer.

The impact score of the buffer was then used to reduce the overall impact score of land cover types within the buffer based on the following multipliers: Low extent = 1 (i.e. impact score remains the same); Moderately low = 0.9; Intermediate = 0.8; Moderately high = 0.7; High = 0.6 (i.e. the buffering capacity is still largely intact and the impacts of surrounding land-uses are reduced). For example, if the combined magnitude of impact scores from the land cover within the buffer is 4.1 and the extent of the natural buffer around the wetland is moderate then the adjusted score will be calculated as 4.1 * 0.8 = 3.28.

The methodology outlined by Kotze (2016) uses an excel spreadsheet to calculate a combined overall score based on the total impact score from land cover types in the wetland and the total impact score from the wetland's buffer. This is done where the higher score has a dominant effect, but is adjusted by the lower score. The overall score is used to determine the Present Ecological State category from A (Natural), B (Near Natural / slightly modified), C (moderately modified), D (Highly Modified), E / F (effectively completely modified). For example, if the overall impact score was 8.9, the wetland is classified as an F category.

Riparian areas

Riparian areas perform a variety of functions that are of value to society and the natural environment, including enhancement of water resources, river channel stability, sediment / nutrient trapping, flood control and provision of habitat for specialized plant and animal species. Riparian areas may range from a few metres wide near streams to more than a kilometre in floodplains. The condition of riparian areas is important as they provide important buffers against flooding, improve water quality, promote precipitation to infiltrate groundwater

rather than being lost to surface run-off and reduce soil erosion and river sedimentation. Hence, riparian areas in good condition possess increased ability to provide the abovementioned services.

The 1:50 000 national river coverage was used as baseline spatial data for the delineation of riparian areas. The Height Above the Nearest Drainage (HAND) method was used to determine and identify riparian zones along all river courses within the greater uMngeni and Loskop study catchments. The HAND model is a spatial technique used to generate flood inundation areas along river courses (Nobre *et al*., 2011). The model involves utilizing a Digital Elevation Model and a user defined height to generate potential areas along the river that are susceptible to inundation and flooding (i.e. riparian areas). The HAND model is a drainage normalized version of a digital elevation model. The method utilizes drainage-normalized topography and flow paths to delineate the relative vertical distances (drop) to the nearest river. The HAND-delineated relative drop is an effective distributed predictor of flood potential, which is directly related to the river stage height (Nobre *et al*., 2011).

Once riparian areas were spatially identified, the National Department of Water and Sanitation (DWS) Present Ecological State spatial coverage was used to determine the condition of identified riparian areas. Condition of riparian zones was scored according to DWS catchment Present Ecological State scores (Table 3-2). Riparian zones were segmented and scored according to the relevant Present Ecological State score of the quaternary catchment that the riparian zone falls within. Condition of riparian areas also takes into consideration sand mining activities along river courses. Sand mining activities within study areas were mapped and used as a superseding condition indicator to Present Ecological State scores. Hence, any riparian zone that has sand mining activities located within it was allocated a low condition score irrespective of the Present Ecological State score.

Table 3-2: Example of Present Ecological State categories to be allocated to riparian areas

Present Ecological State category
A (Natural)
B (Near Natural / slightly modified)
C (moderately modified)
D (Highly Modified)
E / F (effectively completely modified)

Integration of ecosystem condition layers

Individual natural ecosystem condition layers were then combined by conducting a spatial merge in order to generate an integrated condition layer. This layer was used to generate summarized statistics of natural ecosystem condition based on the surface area of the associated ecosystem condition category (A-E). This layer can similarly be used to visually represent natural ecosystem condition within the study areas.

3.2.2.2 Assessing the supply of potential ecosystem services

This activity involved assessing supply indexes for different types of ecosystem services by the different land-uses in the study areas. This requires multiplying condition scores for different ecosystems (see section 3.2.2.1) with the current capacity of different land-uses for supplying ES. The scores for the latter are based on practitioner and expert opinion (0: no capacity; 1: low / limited capacity; 2: medium / average capacity; 3: high / significant capacity) and highlight that different land-uses provide different levels of ecosystem services. For instance, wetlands can assimilate and dilute nutrients, while grasslands provide fodder / grazing services.

Assessed ecosystem services included:

- Water supply: e.g. stream flow, dry season base flow, quick flow / surface run-off;
- Water quality: e.g. dilution, assimilation, avoidance of sedimentation / erosion control (sediment yield);
- Recreation / tourism: e.g. water-based activities (swimming, canoeing, boating), birdwatching, walking / hiking;
- Habitat provision (contributing to biodiversity conservation).

To simplify the ecosystem service supply index modelling, only one score for each ecosystem service category was given for each land use.

3.2.2.3 Assessing the demand for ecosystem services

This activity involved first assessing, through desktop research, the number of people (ecosystem service users or beneficiaries) living in each quaternary catchment for the greater uMngeni and Loskop Dam catchments. This was done by:

- Identifying which ‘small place areas’ fall into each of the two catchments and extracting these for processing into two layers from the selection of small place areas which fall into each quaternary. Merging the two sets of selected ‘small place areas’ into a single layer.
- Merging Loskop and greater uMngeni quaternary catchments into a single layer.

- Calculating the original area of each of the features in the 'small place areas' layer.
- Extracting Census 2011 population data for the selected 'small place areas' and adding this to the 'small place areas' layer's attribute table through a table join.
- Spatially intersecting the 'merged catchments' layer with 'merged small place areas' layer. This spatially allocates full small places and portions of small places to individual quaternary catchments.
- Calculating the new intersect area of each of the features in the new output layer (small place areas intersect). This provides the new area of small places which have been subdivided through the intersect process.
- Calculating population density per small place – adding a field to the attribute table called population density. Calculating the population density by applying the formula (population / original area).
- Calculating the final population per small place portion – adding another field to the attribute table using the formula (population density x intersect area).
- Calculating total population per quaternary catchment – summarising the quaternary catchment field of the attribute table.

Once the ecosystem service users / beneficiaries were determined, several assumptions were made, based on practitioner and expert opinion, regarding their preferences for ecosystem services in the study areas. The relative importance of each ecosystem service for the population was assessed according to the following rating: Critical importance = 4; High importance = 3; Medium importance = 2; and Low importance = 1. We then modelled ecosystem service demand indexes by multiplying the number of beneficiaries with their corresponding relative level of dependency of the different target ecosystem services.

3.2.2.4 Assessing ecosystem services under stress

Finally, we assessed which ecosystem services are under stress at the study sites. This involved producing ecosystem service supply – demand ratios, which highlight which ecosystem services are over- and under-supplied. Furthermore, we modelled future risks / opportunities for water supply and demand through the modelling of different scenarios up to 2030.

3.2.3 Economic impact survey and modelling

For this activity, data collection approaches were adapted to the context of each case study. For the uMngeni catchment / Dusi Canoe Marathon case study, there were several sources of existing data (secondary data) to draw from; whereas the Loskop Dam case study was supported by greater primary data collection.

The uMngeni catchment case study involved a mixture of primary and secondary data collection. Annual Economic Impact Assessments by Tourism KZN, a survey of canoeists undertaken by the KZN Canoe Union and regular water quality monitoring and reporting (Umgeni Water, uMsunduzi Municipality, DUCT) provided relevant, reliable secondary data. Primary data collection included a survey of enterprises (suppliers) associated with the Dusi Canoe Marathon event and interviews with stakeholders to explore the impact of the event on local business and the economy.

For the Loskop Dam case study primary data collection (in collaboration with the University of Limpopo) included three main elements:

- A fishing competition participant survey, and
- A local tourism enterprise survey;

Information on the fishing competitions held as Loskop Dam (e.g. the number of participants, value of prizes) was collected from the various fishing competition organisers.

In addition, a fish health survey was conducted by an MSc student (University of Limpopo) as part of this research project with the aim of evaluating ecosystem health and the effect it may have on tourism. Building on previous studies of fish health in Loskop Dam, the survey served to monitor changes in the water quality, fish health, and prevalence of pansteatitis and occurrence of fish parasites of a number of fish species found in the dam (Shakwane, 2018). The specific objectives of the survey were to:

- Assess water quality at Loskop Dam;
- Assess fish health using the Health Assessment Index (HAI) protocols and inverted parasite index (IPI);
- Identify ecto-endoparasites of selected fish species to link to fish health;
- Determine the prevalence of pansteatitis by examining different fish species; and
- Determine if there is a correlation between fish length and pansteatitis.

The results of this study were used to inform the economic modelling scenarios and applied as a basis for determining real water quality to correlate with tourists' and local communities' perceptions of water quality in Loskop Dam and the impacts for tourism.

To undertake the economic modelling of the impacts of the different water-related glocal change scenarios on tourism for the two study sites, the Natural Capital Protocol (Natural capital Coalition, 2016)[12] was used as a framework to frame, scope, measure and value the

[12] The Protocol offers a standardized framework to identify, measure and value impacts and dependencies on natural capital.

economic impacts of the chosen scenarios. Table 3-3 provides an overview of the methods applied in the assessment of the Dusi Canoe Marathon and Loskop Dam tourism systems (see Annexures 7.2 and 7.3 for a selection photos of the case study areas).

Table 3-3: Overview of methods and valuation techniques, Dusi Canoe Marathon and Loskop Dam case studies

Issue	Dependency of business or society	Chosen valuation technique
River water level (Dusi Canoe Marathon case study)	Event participants: quality of experience, equipment costs; impacts participant numbers and return entrants	Questionnaire / survey / expert opinion to establish the links between water levels and entrant numbers
	Event organizers: revenue – entrant numbers impact revenue	Market based – revenue forgone with reduced entrants
	Regional impact: participant and spectators numbers impact regional revenue (accommodation and other spending categories) and jobs	Regional economic impact (using SAM and impact multipliers)
River / Dam water quality (both case studies)	Participants: health and / or health costs, quality of experience impacts on participant numbers and return entrants	Questionnaire / survey / expert opinion to establish the links between water quality and entrant numbers
	Organizers: revenue – entrant numbers impact revenue, ability to attract new entrants	Market based – revenue forgone with reduced entrants
	Regional impact: participant and spectators numbers impact regional revenue (accommodation and other spending categories) and jobs	Regional economic impact modelling (using SAM and impact multipliers)

3.2.4 Assessment of opportunities and challenges for community-based tourism development

3.2.4.1 Assessment of community perceptions

This component of the study explored the perceptions of communities regarding tourism potential and its capacity to contribute to SMME development and economic transformation, as well as perceptions of communities about the connections between ecosystem condition and tourism potential. These were explored through the two case studies, namely the uMngeni River system (Inanda Dam) and the Olifants River system (Loskop Dam).

a) **The Inanda Dam case study** (uMngeni River) involved the collection of a combination of primary and secondary data:
   - Primary data collection included a survey of owners and employees of tourism-related enterprises in the Inanda Dam area. The survey was used to explore local perceptions about the condition of aquatic ecosystems (in particular water quality) and the impact this has on their enterprises. The survey also explored the respondents understanding of tourism, and its potential to deliver economic growth and SMME development in the area that has limited alternative economic development opportunities. The survey involved a questionnaire that incorporated open and closed ended questionnaires, administered in an informal discursive style. Six interviews were conducted with a range of owners and staff at tourism enterprises (Table 3-4), with between one and three respondents participating in each interview. The information was analysed qualitatively and the results are reported in Chapter 4 (Section 4.3.1).
   - Secondary data sources included records from several organisations operating in the tourism sector the uMsunduzi-uMngeni River region. For example, Durban Green Corridors (DGC) is a not-for-profit organisation, operating in the eThekwini and Inanda Dam region, with the aim of addressing youth development, economic upliftment and environmental stewardship[13]. DGC offers cultural, sports and adventure, and nature-based activities from three venues within the region: the Green Hub (Blue Lagoon – uMngeni River estuary), eNanda Adventures (Inanda Dam – on the uMngeni River, day 2 finish of the Dusi Canoe Marathon) and iSithumba Adventures (Valley of a 1000 Hills – the uMngeni River meets the Msunduzi River in the valley, and the Dusi Canoe Marathon runs through the valley). The DGC tours incorporate visits to community-based small businesses within the eNanda Valley, providing food and beverage, handicrafts, cultural attractions, leisure / entertainment and accommodation, to support

[13] See http://www.durbangreencorridor.co.za/ for further information.

and encourage pro-poor economic development and showcase the natural and cultural attractions of the Inanda Valley. A summary of the key findings from this secondary data is reported in Chapter 4 (Section 4.3.1).

Table 3-4: Respondents in the Inanda Dam tourism development potential survey

Stakeholder	Description
Masimbone Bead Workers	A community group producing traditional bead work, comprising four women as the core members. An additional 15 to 20 women join the group temporarily when big orders are received. The beads are mainly sold through an agent in Durban, but also at sporting and recreational events held at Inanda Dam.
Ezweni Lodge	The Lodge is owned and operated by two successful entrepreneurs and business owners who are originally from Inanda. The lodge offers accommodation for 10 to 12 tourist and caters for the local and international tourist market. Three or more people are employed at the Lodge depending on bookings. The Lodge encourages tourists to enjoy a number of surrounding community enterprises such as taverns, Inanda Adventure Park, and craft producers, etc. This has helped to foster goodwill and support from the local community for the enterprise and tourists while visiting.
Inanda Adventure Park	The Park is a Durban Green Corridor initiative.
Egugweni Guest Lodge	Owned by a Durban based business woman originally from Inanda, employing one permanent staff member. A small operation catering mainly for domestic tourists, but would like to expand if she can market the Lodge more effectively.
Wushwini Art Centre	A well-known craft centre marketing art and music from artists from all over southern Africa. Drawing a wide range of domestic and international tourists. Also provides internship opportunities for youth from the region.
SAC Entertainment and Fashion	A young entrepreneur building a business catering for a range of tourism services including guiding, entertainment and fashion. Recognises the importance of collaboration with other young entrepreneurs in the area. Works closely with Ezweni Lodge.

b) **The Loskop Dam case study** relied on primary data collection in the absence of relevant secondary data sources. The primary data collection included two main elements:

- A community survey of the Dennilton Community members who largely make up the employees at the local tourism enterprises including Forever Resorts Loskop Dam which is the largest of the tourism operations in the area (Table 3-5). The aim of the survey was to explore community member perspectives on local tourism, community tourism enterprise (SMME) opportunities, the water quality of Loskop Dam, and the implications this has for tourism development and SMME potential. A total of 40 interviews were conducted using a questionnaire that incorporated open and closed ended questionnaires, administered in an informal discursive style with individual respondents. The information was analysed quantitatively and qualitatively. The outcomes of the assessment are incorporated into the results and discussions presented in Chapter 4 (Section 4.3.2).
- The three beneficiary communities from the land claim on the Loskop Nature Reserve were engaged on their perspectives on tourism, tourism SMME opportunities and the water quality of Loskop Dam (Table 3-5). As a result of the successful land claim, the beneficiary communities are being incorporated into a co-management agreement for the management of operations at the Nature Reserve. Part of the co-management agreement is the sharing of benefits generated from the Nature Reserve. The community engagement was undertaken in the form of a series of workshops to explore current awareness about tourism and SMME development opportunities that would generate benefits for the land claim beneficiary communities. The representatives largely comprised members of the Communal Property Associations and the local youth group. Their awareness and capacity in terms of environment and tourism was extremely limited. They did however express a strong desire to learn more about tourism as well as the environment, and to develop their capacity to become involved in tourism SMME development. The outcomes of these discussions are reported in Chapter 4 (Section 4.3.2).

Table 3-5: List of stakeholders engaged during the Loskop Dam assessment

Stakeholder	Description
Dennilton Community	Benefit from permanent employment at Forever Resort and other local tourism and service enterprises. Additional direct benefits from the annual fishing competitions held at the Dam include: • Temporary jobs – extra staff are hired by Forever Resorts for fishing competitions (casual positions) • Fish to eat.
Land claim beneficiary communities – Loskop Dam Nature Reserve: • Dindela Communal Property Association (CPA) • Rampolodi CPA • Mmamarumu CPA	Co-management agreements in the process of being finalised and signed. The communities will received 60% of benefits from the Loskop Dam Nature Reserve (when there are profits). Tourism operations in the Reserve are currently very limited and developing the tourism potential would be a way of significantly increasing the profits to be shared with the communities.

3.2.4.2 Community empowerment through social learning

The study also incorporated a capacity development component in the case study areas, which focused on the empowerment of local youth groups as a building block to support their effective involvement in sustainable tourism. A soft systems thinking and social-learning approach was applied to engage and empower target community stakeholder groups within the case study communities. Soft systems thinking is an approach to analyse complex problem situations (such as climate change adaptation and building resilience in socio-ecological systems) and identifying acceptable changes to manage or improve the situation. This involves participatory information gathering, analysis and debate in order to carefully understand the problem and its intricate components, and to identify alternative scenarios for tourism and SMME development. This process also incorporated innovative techniques such as simulation games, experiential-based learning activities and landscape and value chain mapping approaches. These activities were undertaken with community youth groups at each of the case study sites, the outcomes are summarised in section 4.3. A synthesis of the capacity building activities and outcomes is provided in Annexure 7.10).

4 RESULTS AND DISCUSSION

This chapter presents the results of our research at the national level (section 4.1) and for the two case-study sites the uMngeni River and Olifants River tourism systems (sections 4.2 and 4.3).

4.1 National level water-related global change scenarios and the associated impacts on tourism

To help us better understand how water-related global changes may affect the tourism economy in SA, we have:

- Applied the adaptive cycle / Panarchy theory to the national tourism system (section 4.1.1);
- Selected water-related global change scenarios for impact modelling at the national level (section 4.1.2); and
- Explored the potential economic impacts of these scenarios for the tourism sector and the broader SA economy through the modelling of the compounded impacts of different climate change scenarios on tourism spending by 2030 (section 4.1.3).

4.1.1 Applying the adaptive cycle model to the South Africa tourism economy today: What future(s)?

At a macro-level, it is possible to distinguish different, recent evolution phases for the tourism and travel industries in South Africa:

- Pre-1994: **Apartheid isolationism**, characterised by limited domestic tourism;
- 1994(±) - 2000: **Early democratic SA** characterised by an immediate and dramatic rise in the number of visitors to SA;
- 2001-2009: **Continued growth phase up to the financial crisis**. After the September 11 (2001) terror attacks in New York, SA was seen as a safe destination. This resulted in a 2002 boom, with total foreign tourist arrivals growing by an unprecedented 11.1% to 6.4 million; and
- 2009-2017 / ongoing: The tourism and travel industries are **in search of new growth pathways after the financial crisis**. Tourism is perceived by government as one of the sectors expected to grow the economy, create jobs and contribute to the development of rural areas.

Table 4-1 summarises the different development phases for the travel and tourism industries from late Apartheid until 2017.

Table 4-1: The history of tourism in South Africa from an adaptive cycle perspective

	Timeframe / period			
	Before 1994 **Apartheid isolationism**	**1994-2000** **Early democracy**	**2001-2009** **Continued growth phase up to financial crisis**	**2009-2017/ ongoing** **In search of new growth pathways**
Key characteristics	Tourism potential (marketing, jobs, foreign income, entrepreneurship) largely ignored by government. Domestic travel only for white people.	Nascent democracy, after the peaceful elections of 1994 => an immediate and dramatic rise in the number of visitors to SA. Drive for rural development and transformation (tourism seen as an opportunity). 5.8 M annual foreign visitors in 1998 from 3.4 M in 1994.	Consolidation phase up to world financial crisis (decrease in domestic and foreign tourists), SA seen as a safe destination after Sep 11, 2001 terror attacks in NY, 2002 International Tourism Growth Strategy, marketing directed at increasing the number of tourists arrivals, increasing spend, increasing length of stay and promoting geographical spread of tourists; 2002 saw a boom, with total foreign tourist arrivals growing by an unprecedented 11.1% to 6.4 million; 30 million domestic trips undertaken in 2002 compared to the 33 million in 2008.	Renewed focus on tourism after financial crisis: The 2010 World Cup's increased infrastructure supply; formally recognised as one of the areas expected to contribute to the development of, among others, rural areas and culture (craft) by growing the economy and creating jobs. South Africa continues to be strongly perceived as being a destination offering 'adventurous' and a 'natural wildlife experience': with increased focus on business events and meetings, regional hubs to increase market penetration for leisure, and increased recognition of domestic tourism; 2017 National Tourism Sector Strategy: Aim to make South Africa one of the top 20 global tourism destination by 2020. But purchasing power decreases in SA will affect domestic market + brand SA suffering from political controversies and fear of violence (xenophobia, gender-based violence)
Adaptive cycle phase	**Quick conservation – reorganisation transition**		**Exploitation / consolidation phase**	**Reorganisation / consolidation phase?**

What are the possible futures or pathways for the travel and tourism industries up to 2030? The World Travel and Tourism Council (WTTC, 2017) make various forecasts for the SA tourism and travel industries (2016 baseline data):

- The direct contribution of travel and tourism industries to Gross Domestic Product (GDP) was R127.9bn (USD8.7bn), 3.0% of total GDP in 2016 and is forecast to rise by 2.7% in 2017, and to rise by 4.5% per annum, from 2017-2027, to R204.4bn (USD13.9bn), 3.8% of total GDP in 2027 (Figure 4-1).
- The total contribution of travel and tourism industries to GDP was R402.2bn (USD27.3bn), 9.3% of GDP in 2016, and is forecast to rise by 2.5% in 2017, and to rise by 4.2% pa to R624.2bn (USD42.4bn), 11.5% of GDP in 2027 (Figure 4-1).
- In 2016 travel and tourism industry directly supported 716,500 jobs (4.6% of total employment). This is expected to rise by 3.6% in 2017 and rise by 4.1% pa to 1,110,000 jobs (6.0% of total employment) in 2027 (Figure 4-2).
- In 2016, the total contribution of travel and tourism industry to employment, including jobs indirectly supported by the industry was 9.8% of total employment (1,533,000 jobs). This is expected to rise by 6.7% in 2017 to 1,636,500 jobs and rise by 4.2% pa to 2,459,000 jobs in 2027 (13.2% of total).
- Visitor exports generated R128.3bn (USD8.7bn), 9.9% of total exports in 2016. This is forecast to grow by 4.4% in 2017, and grow by 7.3% pa, from 2017-2027, to R271.3bn (USD18.4bn) in 2027, 14.4% of total (Figure 4-3).

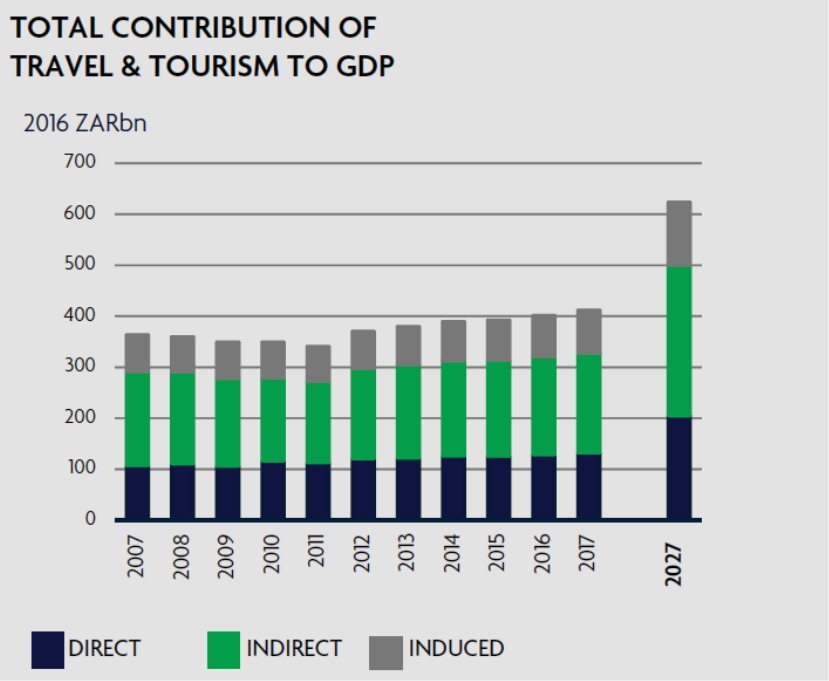


Figure 4-1: Total contribution of travel and tourism industries to SA GDP (WTTC, 2017:1).

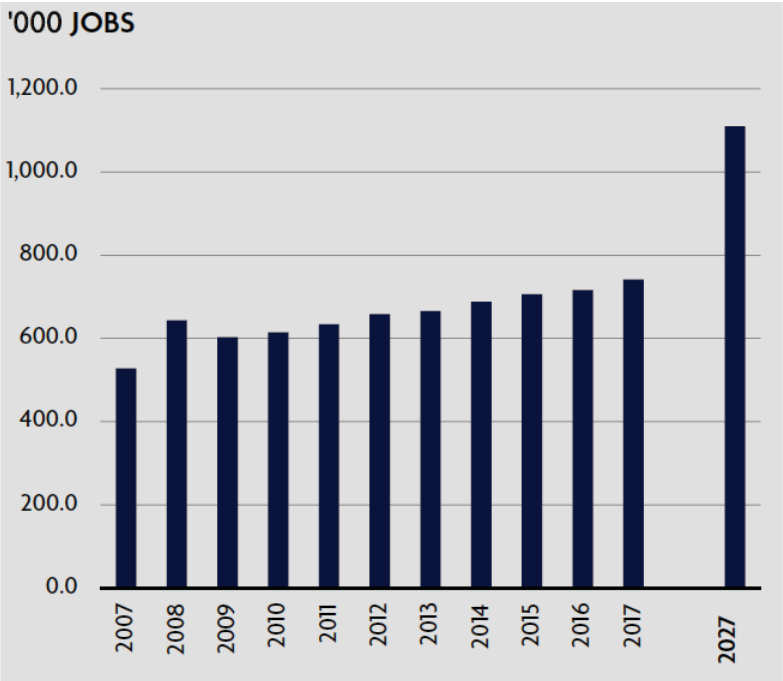


Figure 4-2: Direct contribution of travel and tourism industries to SA employment (WTTC, 2017:4).

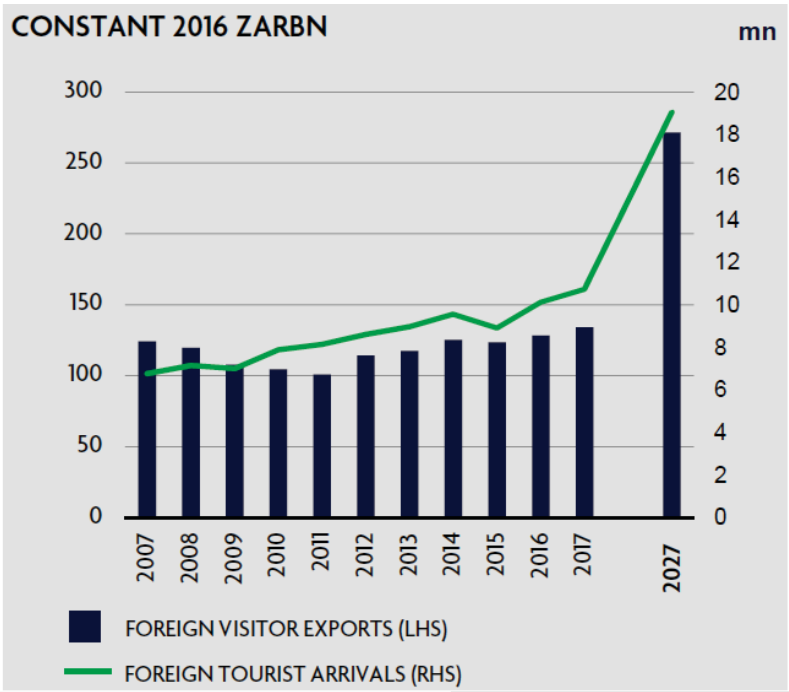


Figure 4-3: Foreign visitor exports and foreign tourist arrivals (WTTC, 2017:5).

Moreover, the SA National Department of Tourism (NDT, 2017) has (seemingly[14]) ambitious targets for the tourism sector by 2026 (Table 4-2). For instance, direct contribution to GDP is

[14] One may question the impact of inflation on future GDP contribution of the tourism sector.

expected to rise from R118 billion (2015) to R302 billion (2026) while the number of direct jobs is expected to rise from 702k (2015) to around 1 million (2026).

Table 4-2: Measurements and targets for the tourism sector in South Africa (NDT, 2017:17)

Indicators / measures of performance	2015 Baseline	2026 Target
Increase direct contribution to National Gross Domestic Product	R118 billion	R302 billion
Increase total (direct and indirect) contribution to National Gross Domestic Product	R375 billion	R941 billion
Increase the number of direct jobs supported by the sector	702 824	1 million
Increase the number of total (direct and indirect) jobs supported by the sector	1 551 200	2,2 million
Increase tourism export earnings	R115 billion	R359 billion
Increase capital investment	R64 billion	R148 billion

However, various events or factors at the international, national and local level could prevent these positive forecasts from materialising. For instance, at the international level, economic crises in the main 'source countries' of foreign tourist arrivals could have severe effects on SA foreign tourist arrivals and exports. Locally, water shortages (e.g. water crisis in the city of Cape Town in early 2018, which raised fear of tourists staying away due to water use restrictions[15]) and increased water pollution[16] could also deter visitors. While some reports estimated that the industry could suffer a R1bn loss due to decline in arrivals and spending during, and in the wake of, the Cape Town water crisis[17], others claimed that it grew only by 1% in 2017, after growing more than 7% in 2016[18]. To illustrate this potential volatility in the economic contribution of the tourism and travel industries, one can model how different rates of growth may impact on the direct GDP contribution of these industries (Table 4-3).

[15] There are many popular articles addressing the impacts of the Cape Town water crisis on tourism, including:

- URL: http://ewn.co.za/2018/02/04/cape-town-s-water-crisis-hitting-tourism-officials, accessed on February 5, 2018.
- URL: https://www.reuters.com/article/us-safrica-drought-tourism/cape-towns-water-crisis-hitting-tourism-officials-idUSKBN1FM1PO, accessed on September 13, 2019;
- URL: http://www.sabcnews.com/sabcnews/cape-town-water-crisis-threatens-tourism-industry/, accessed on September 13, 2019.

[16] e.g., **E**astern Cape rivers are 'deadly sewers' – URL:
Concerns over water quality may force organisers to move Dusi date; URL: https://www.news24.com/SouthAfrica/News/concern-over-water-quality-may-force-organisers-to-move-dusi-date-20190512, accessed on September 13, 2019.

[17] URL: https://www.iol.co.za/weekend-argus/news/water-crisis-leaves-r1bn-hole-in-tourism-coffers-18353457, accessed on September 13, 2019;

[18] URL: https://www.businessinsider.co.za/the-impact-of-the-cape-town-drought-on-tourism-was-rather-tiny-2018-7, accessed on September 13, 2019.

Table 4-3: Volatility in tourism's economic contributions (*authors' own calculations, R Bn)*

Scenarios		Adaptive cycle phase	Potential annual growth (%)	Adjusted GDP (direct contribution) in 1 year	Leisure spending (66.2% of total spend)	Business spending (33.8% of total spend)	Foreign domestic spending (46.1% of total spend)	Domestic tourists spending (53.9% of total spend)
1	Status quo	Conservation / consolidation	0.0%	127.900	84.670	43.230	58.962	68.938
2			1.0%	129.179	85.516	43.663	59.552	69.627
3			2.0%	130.458	86.363	44.095	60.141	70.317
4	Growth	Exploitation phase	5.0%	134.295	88.903	45.392	61.910	72.385
5			7.0%	136.853	90.597	46.256	63.089	73.764
6			10.0%	140.690	93.137	47.553	64.858	75.832
7	Crisis	Release / collapse	-5.0%	121.505	80.436	41.069	56.014	65.491
8			-7.0%	118.947	78.743	40.204	54.835	64.112
9			-10.0%	115.110	76.203	38.907	53.066	62.044

Note: Changes in tourism and travel direct contribution to GDP (as a proxy for tourist numbers and spending) according to various growth scenarios (baseline R127.9 Bn direct GDP contribution in 2016; baseline data, ratio of leisure vs. business spending and ratio of foreign vs. domestic spending from WTTC, 2017).

4.1.2 What changes in hydrological services can be expected in South Africa under different climate change scenarios?

"Without intervention, national water deficit will be around 17% by 2030 (deficit could be between 2 700 and 3 800 million m^3/annum)", the Department of Water and Sanitation told a ministerial interactive session on transformation in Boksburg on February 15, 2019[19]. As argued by Gössling *et al*. (2012:11), "*even though tourism increases global water consumption, direct tourism-related water use is considerably less than 1% of global consumption, and will not become significant even if the sector continues to grow at anticipated rates of around 4% per year (international tourist arrivals)*". Yet, the *"situation differs at the regional level because tourism concentrates traveller flows in time and space, and often-in dry destinations where water resources are limited."* Indeed, the negative impacts of water shortages or restrictions on tourism activities have been documented in many cases throughout the world (e.g. closure of water and snow-based[20] activities; e.g. Scott *et al*., 2006). If one considers the indirect water requirements of tourism, such as for the production of food, building materials and energy (which remain inadequately understood; Gössling *et al*., 2012), water shortages at the local level could have even more significant impacts on tourism in drought-prone regions than expected (e.g. increase in the price of input costs, such as foods).

Furthermore, expected changes in global precipitation patterns due to climate change will have significant impacts for already water scarce destinations, such as several SA provinces (e.g. Western Cape which is one of the country's primary foreign tourist destinations[21]). The SA Department of Environmental Affairs (DEA) recognises six hydrological zones in SA (DEA, 2013) (Figure 4-4):

- Zone 1: The Limpopo, Olifants and Inkomati Water Management Areas (WMAs) in the northern interior (Limpopo / Olifants / Inkomati);
- Zone 2: The Pongola-Umzimkulu WMA in KwaZulu-Natal in the east (Pongola-Umzimkulu);
- Zone 3: The Vaal WMA in the central interior (Vaal);
- Zone 4: The Orange WMA in the north west (Orange);

[19] URL: http://www.dwa.gov.za/MinisterSession/Presentations/Ministerial%20interaction%20on%20Transformation%20v1%20(4)%2015%20Feb%202019.pdf, accessed on September 16, 2019.

[20] e.g., closure of ski resorts in California during the water droughts which started in 2011: URL:http://fortune.com/2015/04/09/6-industries-hurt-the-most-by-the-california-drought/, accessed on February 5, 2018.

[21] Water use restrictions could deter foreign visitors from visiting Cape Town – URL: http://ewn.co.za/2018/02/04/cape-town-s-water-crisis-hitting-tourism-officials, accessed on February 5, 2018.

- Zone 5: The Mzimvubu-Tsitsikamma WMA in the south east (Mzimvubu-Tsitsikamma);
- Zone 6: The Breede-Gouritz and Berg Olifants WMAs in the south west (Breede-Gouritz / Berg).

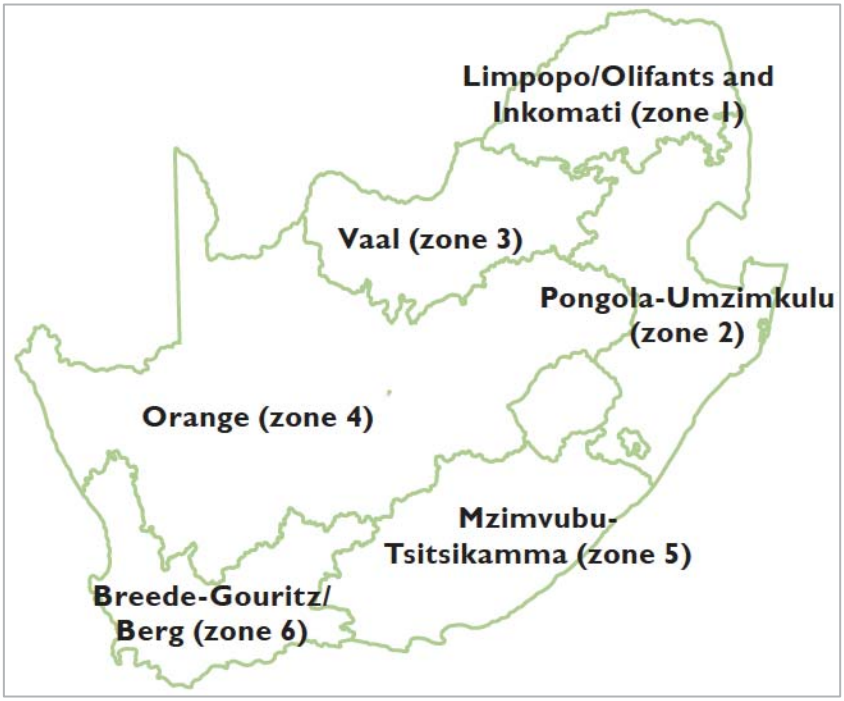


Figure 4-4: The 6 hydrological zones in South Africa (DEA, 2013:13).

Note: Six hydrological zones have been developed as part of the National Water Adaptation Strategy process, reflecting boundaries defined by water management areas (WMAs) in South Africa and grouped according to their climatic and hydrological characteristics.

Furthermore, four main climate change scenarios up to 2050 (and beyond) have been developed for SA (DEA, 2013), namely:

- Warmer (<3°C above 1961-2000) and wetter with greater frequency of extreme rainfall events;
- Warmer (<3°C above 1961-2000) and drier, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events;
- Hotter (>3°C above 1961-2000) and wetter with substantially greater frequency of extreme rainfall events;
- Hotter (>3°C above 1961-2000) and drier, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.

Each scenario would have different implications for rainfall projections in the different aforementioned hydrological zones (Table 4-4), with scenario 4 (hotter and drier) presenting the highest risk score overall due to a substantial increase in the frequency of drought events

and greater frequency of extreme rainfall events (see Table 4-5 which rates each scenario according to three weighted criteria: extreme rainfall events, extreme drought events, temperature change). The spatial variability in climate change risks is further explained in Table 4-6 to Table 4-13, which present the implications of the four climate change scenarios for key hydrological services (*in situ* water supply, diverted water supply, spiritual and cultural, water damage mitigation) in the six SA hydrological zones. Key findings include:

- *In situ* water supply: Climate change scenarios 1 and 3 are expected to be positive for *in situ* water supply while change scenarios 2 and 4 are expected to be negative (Table 4-6 and Table 4-7).
- Diverted water supply: Climate change scenarios 1 and 3 are expected to be positive for diverted water supply while scenarios 2 and 4 are expected to be negative (Table 4-8 and Table 4-9).
- Spiritual and aesthetic hydrological services: Similarly to the two previous hydrological services, climate change scenarios 1 and 3 are expected to be positive for these hydrological services while scenarios 2 and 4 are expected to be negative (Table 4-10 and Table 4-11). This is because extreme droughts events are expected to lead to the degradation of tourism destination sites (e.g. loss of wildlife in protected areas).
- Water damage mitigation: The situation differs for this hydrological service, with all climate change scenarios expected to be negative (i.e. more frequent extreme rainfall events leading to more water-related damages to infrastructure / physical assets) (Table 4-12 and Table 4-13), particularly scenario 3 (hotter and wetter).

However, one must take into consideration the climate variability of each hydrological zone, which implies that some hydrological zones will suffer much more than others in different climate change scenarios. For instance, the Breede-Gouritz / Berg hydrological zone could be expected to suffer particularly from extreme drought events (less *in situ* and diverted water supply[22]) in climate change scenarios 2 (warmer and drier) and 4 (hotter and drier) (e.g. increased frequency of extreme drought events such as the current water crisis in the city of Cape Town where a possible “day zero”, with no more water supply was feared for a long period of time[23]).

[22] Diverted water supply – water made available for human use through abstraction and treatment see section 2.2.5 for descriptions of the hydrologic service categories.
[23] URL: http://coct.co/water-dashboard/, accessed on February 6, 2018.

Table 4-4: Rainfall projections for each of South Africa's six hydrological zones (DEA, 2013:18)

Scenario	Limpopo/ Olifants/ Inkomati	Pongola-Umzimkulu	Vaal	Orange	Mzimvubu-Tsitsikamma	Breede-Gouritz/ Berg
1: warmer/ wetter	↑ spring and summer	↑ spring	↑ spring and summer	↑ in all seasons	↑ in all seasons	↓ autumn, ↑ winter and spring
2: warmer/drier	↓ summer, spring and autumn	↓ spring and strongly ↓ summer and autumn	↓ summer and spring and strongly ↓ autumn	↓ summer, autumn and spring	↓ in all seasons, strongly ↓ summer and autumn	↓ in all seasons, strongly ↓ in the west
3: hotter/wetter	Strongly ↑ spring and summer	Strongly ↑ spring	↑ spring and summer	↑ in all seasons	Strongly ↑ in all seasons	↓ autumn, ↑ winter and spring
4: hotter/ drier	Strongly ↓ summer, spring and autumn	↓ spring and strongly ↓ summer and autumn	↓ summer and spring and strongly ↓ autumn	↓ summer, autumn and spring	↓ all seasons, strongly ↓ in summer and autumn	↓ all seasons, strongly ↓ in the west

Table 4-5: Climate change scenario risk modelling

Note: Authors' own qualitative rating based on three criteria: Temperature change, extreme drought events, extreme rainfall events)

Rating of risk of occurrence: Low – 1; medium – 2; High – 3									
Scenarios		**Temperature change**		**Extreme drought events**		**Extreme rainfall events**		**Overall climate change scenario risk score (max. 9)**	**Overall climate change scenario risk weighted average score (max. 3)**
		Score	**Weighting**	**Score**	**Weighting***	**Score**	**Weighting**		
1	Warmer (<3°C above 1961-2000) and wetter with greater frequency of extreme rainfall events.	1	25%	1	50%	2	25%	4	1.25
2	Warmer (<3°C above 1961-2000) and drier, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events.	1	25%	2	50%	2	25%	5	1.75
3	Hotter (>3°C above 1961-2000) and wetter with substantially greater frequency of extreme rainfall events.	2	25%	1	50%	3	25%	6	1.75
4	Hotter (>3°C above 1961-2000) and drier, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.	2	25%	3	50%	2	25%	7	2.50

* Higher than others because of the dry nature of SA climate.

Table 4-6: The implications for *in situ* water supply of the four climate change scenarios per hydrological zone (*authors' own analysis*)

Scenarios		Hydrological service	Potential risks	Potential change in risk per hydrological zone					
				Limpopo / Olifants / Inkomati	**Pongola-Umzimkulu**	**Vaal**	**Orange**	**Mzimvubu-Tsitsikamma**	**Breede-Gouritz / Berg**
1	Warmer (<3°C above 1961-2000) and wetter with greater frequency of extreme rainfall events.	***In situ* water supply**	Less *in situ* water supply leading to water shortages and cuts / increased water access and management costs for tourism business	Lesser (spring and summer)	Lesser (spring)	Lesser (spring and summer)	Lesser (all seasons)	Lesser (all seasons)	Higher (autumn), lesser (winter and spring)
2	Warmer (<3°C above 1961-2000) and drier, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events.			Higher (summer, spring, autumn)	Higher (spring) / much higher (summer and autumn)	Higher (summer and spring) / much higher (autumn)	Higher (summer, autumn, spring)	Higher (all seasons) / much higher (summer and autumn)	Higher (all seasons) / much higher in the west
3	Hotter (>3°C above 1961-2000) and wetter with substantially greater frequency of extreme rainfall events.			Much lesser (spring / summer)	Lesser (spring)	Lesser (spring / summer)	Lesser (all seasons)	Much lesser (all seasons)	Lesser (winter and spring) / higher (autumn)
4	Hotter (>3°C above 1961-2000) and drier, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.			Much higher (summer, spring, autumn)	Higher (spring) / much higher (summer and autumn)	Higher (summer and spring) / much higher (autumn)	Higher (summer, autumn, spring)	Higher (all seasons) / much higher (summer and autumn)	Higher (all seasons) / much higher in the west

Table 4-7: Impact rating for *in situ* water supply of the four climate change scenarios per hydrological zone

Note: Authors' own analysis; rating system: -3: high positive; -2: medium positive; -1: low positive; 1: low negative; 2: medium negative; 3: high negative

Scenarios		Hydro-logical service	Potential risks	Potential impact scores per hydrological zone						
				Limpopo / Olifants / Inkomati	Pongola-Umzimkulu	Vaal	Orange	Mzimvubu-Tsitsikamma	Breede-Gouritz / Berg	Average score per scenario
1	Warmer (<3°C above 1961-2000) and wetter with greater frequency of extreme rainfall events.	***In situ* water supply**	Less *in situ* water supply leading to increased water access and management costs for tourism business / water utilities	-1	-1	-1	-1	-1	-0.5	**-0.92**
2	Warmer (<3°C above 1961-2000) and drier, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events.			1	1.5	1.5	1	1.5	1.5	**1.33**
3	Hotter (>3°C above 1961-2000) and wetter with substantially greater frequency of extreme rainfall events.			-2	-1	-1	-1	-2	-0.5	**-1.08**
4	Hotter (>3°C above 1961-2000) and drier, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.			2	1.5	1.5	1	1.5	1.5	**1.50**

Table 4-8: The implications for diverted water supply of the four climate change scenarios per hydrological zone (*authors' own analysis*)

Scenarios		Hydrological services	Potential risks	Potential change in risk per hydrological zone					
				Limpopo / Olifants / Inkomati	**Pongola-Umzimkulu**	**Vaal**	**Orange**	**Mzimvubu-Tsitsikamma**	**Breede-Gouritz / Berg**
1	Warmer (<3°C above 1961-2000) and wetter with greater frequency of extreme rainfall events.	**Diverted water supply**	Less water available for diverted water supply (shortages and cuts) / increased water access and management costs for tourism business	Lesser (spring and summer)	Lesser (spring)	Lesser (spring and summer)	Lesser (all seasons)	Lesser (all seasons)	Higher (autumn), lesser (winter and spring)
2	Warmer (<3°C above 1961-2000) and drier, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events.			Higher (summer, spring, autumn)	Higher (spring) / much higher (summer and autumn)	Higher (summer and spring) / much higher (autumn)	Higher (summer, autumn, spring)	Higher (all seasons) / much higher (summer and autumn)	Higher (all seasons) / much higher in the west
3	Hotter (>3°C above 1961-2000) and wetter with substantially greater frequency of extreme rainfall events.			Much lesser (spring / summer)	Lesser (spring)	Lesser (spring / summer)	Lesser (all seasons)	Much lesser (all seasons)	Lesser (winter and spring) / higher (autumn)
4	Hotter (>3°C above 1961-2000) and drier, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.			Much higher (summer, spring, autumn)	Higher (spring) / much higher (summer and autumn)	Higher (summer and spring) / much higher (autumn)	Higher (summer, autumn, spring)	Higher (all seasons) / much higher (summer and autumn)	Higher (all seasons) / much higher in the west

Table 4-9: Impact rating for diverted water supply of the four climate change scenarios per hydrological zone

Note: Authors' own analysis; rating system: -3: high positive; -2: medium positive; -1: low positive; 1: low negative; 2: medium negative; 3: high negative

Scenarios		Hydro-logical services	Potential risks	Potential impact scores per hydrological zone						
				Limpopo / Olifants / Inkomati	Pongola-Umzimkulu	Vaal	Orange	Mzimvubu-Tsitsikamma	Breede-Gouritz / Berg	Average score per scenario
1	Warmer (<3°C above 1961-2000) and wetter with greater frequency of extreme rainfall events.	**Diverted water supply**	Less water available for diverted water supply / increased water access and management costs for tourism business	-1	-1	-1	-1	-1	-0.5	**-0.92**
2	Warmer (<3°C above 1961-2000) and drier, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events.			1	1.5	1.5	1	1.5	1.5	**1.25**
3	Hotter (>3°C above 1961-2000) and wetter with substantially greater frequency of extreme rainfall events.			-2	-1	-1	-1	-2	-0.5	**-1.25**
4	Hotter (>3°C above 1961-2000) and drier, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.			2	1.5	1.5	1	1.5	1.5	**1.50**

Table 4-10: The implications for spiritual and aesthetic hydrological services of the four climate change scenarios per hydrological zone (*authors' own analysis*)

Scenarios		Hydro-logical services	Potential risks	Potential change in risk per hydrological zone					
				Limpopo / Olifants / Inkomati	**Pongola-Umzimkulu**	**Vaal**	**Orange**	**Mzimvubu-Tsitsikamma**	**Breede-Gouritz / Berg**
1	Warmer (<3°C above 1961-2000) and wetter with greater frequency of extreme rainfall events.	**Spiritual and aesthetic**	Loss of value(s) for tourism destination assets due to change in frequency of drought events (e.g. drought impacts on wildlife population / distribution of species)	Lesser (lower frequency)	Lesser (lower frequency)	Lesser (lower frequency)	Lesser (lower frequency)	Lesser (lower frequency)	Higher frequency (autumn), lesser frequency (winter and spring)
2	Warmer (<3°C above 1961-2000) and drier, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events.			Higher (greater frequency)	Higher (greater frequency)	Higher (greater frequency)	Higher (greater frequency)	Higher (greater frequency)	Higher (greater frequency), especially in the west
3	Hotter (>3°C above 1961-2000) and wetter with substantially greater frequency of extreme rainfall events.			Much lesser (much lower frequency)	Much lesser (much lower frequency)	Lesser (lower frequency)	Lesser (lower frequency)	Lesser (lower frequency)	Lesser (winter and spring) / higher (autumn)
4	Hotter (>3°C above 1961-2000) and drier, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.			Much higher (much higher frequency)	Much higher (much higher frequency)	Much higher (much higher frequency)	Much higher (much higher frequency)	Much higher (much higher frequency)	Much higher (much higher frequency), especially in the west

Table 4-11: Impact rating for spiritual and aesthetic hydrological services of the four climate change scenarios per hydrological zone

Note: Authors' own analysis; rating system: -3: high positive; -2: medium positive; -1: low positive; 1: low negative; 2: medium negative; 3: high negative

Scenarios		Hydrological services	Potential risks	Potential impact scores per hydrological zone						
				Limpopo / Olifants / Inkomati	Pongola-Umzimkulu	Vaal	Orange	Mzimvubu-Tsitsikamma	Breede-Gouritz / Berg	Average score per scenario
1	Warmer (<3°C above 1961-2000) and wetter with greater frequency of extreme rainfall events.	**Spiritual and aesthetic**	Loss of value(s) for tourism destination assets due to change in frequency of drought events (e.g. drought impacts on wildlife population / distribution of species)	-1	-1	-1	-1	-1	-0.5	**-0.92**
2	Warmer (<3°C above 1961-2000) and drier, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events.			1	1	1	1	1	1.5	**1.08**
3	Hotter (>3°C above 1961-2000) and wetter with substantially greater frequency of extreme rainfall events.			-2	-2	-1	-1	-1	-0.5	**-1.25**
4	Hotter (>3°C above 1961-2000) and drier, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.			2	2	2	2	2	2.5	**2.08**

Table 4-12: The implications for water damage mitigation of the four climate change scenarios per hydrological zone (*authors' own analysis*)

Scenarios		Hydro-logical services	Potential risks	Potential change in risk per hydrological zone					
				Limpopo / Olifants / Inkomati	**Pongola-Umzimkulu**	**Vaal**	**Orange**	**Mzimvubu-Tsitsikamma**	**Breede-Gouritz / Berg**
1	Warmer (<3°C above 1961-2000) and wetter with greater frequency of extreme rainfall events.	**Water damage mitigation**	Increased damages to tourism-related infrastruc-tures / assets due to change in frequency of extreme rainfall events	Higher (greater frequency)	Higher (greater frequency)	Higher (greater frequency)	Higher (greater frequency)	Higher (greater frequency)	Higher (greater frequency)
2	Warmer (<3°C above 1961-2000) and drier, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events.			Slightly higher (somewhat greater frequency)	Slightly higher (somewhat greater frequency)	Slightly higher (somewhat greater frequency)	Slightly higher (somewhat greater frequency)	Slightly higher (somewhat greater frequency)	Slightly higher (somewhat greater frequency)
3	Hotter (>3°C above 1961-2000) and wetter with substantially greater frequency of extreme rainfall events.			Much higher (substantially greater frequency)	Much higher (substantially greater frequency)	Much higher (substantially greater frequency)	Much higher (substantially greater frequency)	Much higher (substantially greater frequency)	Much higher (substantially greater frequency)
4	Hotter (>3°C above 1961-2000) and drier, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.			Higher (greater frequency)	Higher (greater frequency)	Higher (greater frequency)	Higher (greater frequency)	Higher (greater frequency)	Higher (greater frequency)

Table 4-13: Impact rating for water damage mitigation of the four climate change scenarios per hydrological zone

Note: Authors' own analysis; rating system: -3: high positive; -2: medium positive; -1: low positive; 1: low negative; 2: medium negative; 3: high negative

Scenarios		Hydro-logical services	Potential risks	Potential impact scores per hydrological zone						
				Limpopo / Olifants / Inkomati	Pongola-Umzimkulu	Vaal	Orange	Mzimvubu-Tsitsikamma	Breede-Gouritz / Berg	Average score per scenario
1	Warmer (<3°C above 1961-2000) and wetter with greater frequency of extreme rainfall events.	**Water damage mitigation**	Increased damages to tourism-related infrastructures / assets due to change in frequency of extreme rainfall events	1	1	1	1	1	1	**1.00**
2	Warmer (<3°C above 1961-2000) and drier, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events.			0.5	0.5	0.5	0.5	0.5	0.5	**0.50**
3	Hotter (>3°C above 1961-2000) and wetter with substantially greater frequency of extreme rainfall events.			2	2	2	2	2	2	**2.00**
4	Hotter (>3°C above 1961-2000) and drier, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.			1	1	1	1	1	1	**1.00**

4.1.3 Modelling the impacts on climate change scenarios on tourism industries and their contribution to the national economy

As showed in their recent literature review (Hoogendoorn and Fitchett, 2018: 742), climate affects the seasonality of tourism, tourists' selection of destinations, available tourist activities and attractions, and the overall satisfaction of a vacation: "*Climate change therefore has the potential to reduce the sustainability and long-tern viability of global tourism*". As further shown by Hoogendoorn *et al*. (2016), tourism businesses and tourists can perceive risks and behave differently when faced with water-related climate change. In the towns of St Francis Bay and Cape St Francis, while tourism accommodation establishments were predominantly concerned with day-to-day changes in weather, investing in small-scale infrastructural changes to improve the comfort of their guests, tourists demonstrated greater concern for the risk of flooding, sea-level rise and the degeneration of the beaches. The authors argue that this may lead to tourists perceiving insufficient investment in adaptation at accommodation establishments, hence resulting in decreased tourist visitations in the short-term in favour of destinations perceived as better prepared.

Accordingly, one can expect that the impacts of the aforementioned climate change scenarios (section 4.1.2) on different tourism stakeholder groups (foreign visitors, domestic tourists, tourism business, water utilities) will be different (Table 4-14). One could expect limited direct negative impacts from deteriorating water quality on tourists and tourism businesses (except for water-based tourism assets and activities[24]). Bottled water would be a readily available alternative (though at additional costs) while water utilities would act as buffers for tap water and industrial / business water consumption (unless they fail[25]). On the other hand, one could expect extreme drought and rainfall events to directly affect tourist numbers, especially foreign visitors whose behaviours can change quickly based on negative perceptions about the climate and weather of potential destinations (e.g. Becken, 2010; Nicholls *et al*., 2008).

[24] e.g. article entitled "Concern over water quality may force organisers to move Dusi date" – URL: https://www.news24.com/SouthAfrica/News/concern-over-water-quality-may-force-organisers-to-move-dusi-date-20190512, accessed on September 13, 2019.
[25] Ibid [13]: sewage treatment works failure in the Eastern Cape.

Table 4-14: The impacts of extreme events (extreme drought, extreme rainfall, water shortage / cut, ever decreasing water quality) on selected tourism stakeholder groups

Note: authors' own qualitative rating

Rating of impact: Low – 1 Medium – 2; High – 3				
Impacted stakeholders	Extreme drought event	Extreme rainfall event	Water shortage / cut	Ever decreasing water quality
Foreign visitors (numbers)	3	3	3	1
Domestic tourists (numbers)	2	2	2	1
Tourism business (revenues)	2	2	3	1
Tourism business (investments / expenses)	3	2	2	1
Water utilities (revenues loss / operating expenses)	3	1	3	3
Average	**2,60**	**2,00**	**2,60**	**1,40**

Table 4-15 presents the potential, expected impacts of the four climate change scenarios for SA (DEA, 2013) on tourism spending for both foreign and domestic tourists. While scenario 1 is assumed to have very limited / no impact on the number of tourists, scenario 4 is expected to decrease the attractiveness of SA tourist destinations and potentially reduce domestic tourism as well (e.g. due to infrastructure damages due to more frequent extreme rainfall events). Using 2016 baseline data (WTTC, 2017) of direct GDP contribution of tourism and travel industries, we have modelled the compounded impacts of different climate change scenarios on tourism spending, under different tourism sector growth assumptions (irrespective of any change in external variables), using the assumptions in tourist spending per climate change scenario presented in Table 4-15 (i.e. 1%, 5% and -5%). Table 4-16 thus highlights the potential volatility in tourism and travel spending in SA, with climate change scenario 4 leading to the highest decreases in direct GDP contributions under any growth scenario. Furthermore, Table 4-17 presents the implications of this volatility for the direct, indirect and induced economic contribution of the tourism and travel industries while Table 4-18 does the same for their direct, indirect and induced employment contribution. As can be expected, climate change scenario 4 weakens job creation prospects for these industries, which would be particularly problematic in times of recession (e.g. overall declines in number of tourists worldwide).

Table 4-15: Potential impacts of different climate change scenarios for South Africa on tourists spending

Note: Authors' own assumptions; rating: no impact – 0; Low: -1%; medium: -5%; High: -10%

Scenarios		**Overall climate change scenario risk score (max. 9)** *(from Table 5)*	**Overall climate change scenario risk weighted average score (max. 3)** *(from Table 5)*	**Tourists spending (proxy for drop in numbers)**	
				Domestic	Foreign
1	Warmer (<3°C above 1961-2000) and wetter with greater frequency of extreme rainfall events.	4.00	1.25	0	0
2	Warmer (<3°C above 1961-2000) and drier, with an increase in the frequency of drought events and somewhat greater frequency of extreme rainfall events.	5.00	1.75	-1%	-1%
3	Hotter (>3°C above 1961-2000) and wetter with substantially greater frequency of extreme rainfall events.	6.00	1.75	-1%	-5%
4	Hotter (>3°C above 1961-2000) and drier, with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events.	7.00	2.5	-5%	-10%

Table 4-16: Impacts of different climate change scenarios on direct GDP contribution *(authors' own assumptions and modelling)*

Tourism economy baseline – direct GDP contribution (R Bn direct GDP in 2016; WTTC, 2017)			**127.9**		**Changes in tourist spending due to different climate change scenarios (%)** *(authors' assumptions, Table 4-15)*		**Changes in tourist spending due to different climate change scenarios (R Bn)**		**Net tourist spending under different climate change and sector growth scenarios (R Bn)**		
Climate change scenarios	**Adaptive cycle phase**		**Assumed annual growth (%)**	**Adjusted GDP in 1 year**	**Domestic**	**Foreign**	**Domestic**	**Foreign**	**Domestic**	**Foreign**	**Total**
1	Status quo	Conservation / consolidation	1.0%	129.179	0%	0%	0.00	0.00	69.63	59.55	129.18
2				129.179	-1%	-1%	-0.70	-0.60	68.93	58.96	127.89
3				129.179	-1%	-5%	-0.70	-2.98	68.93	56.57	125.51
4				129.179	-5%	-10%	-3.48	-5.96	66.15	53.60	119.74
1	Growth	Exploitation phase	5.0%	134.295	0%	0%	0.00	0.00	72.39	61.91	134.30
2				134.295	-1%	-1%	-0.72	-0.62	71.66	61.29	132.95
3				134.295	-1%	-5%	-0.72	-3.10	71.66	58.81	130.48
4				134.295	-5%	-10%	-3.62	-6.19	68.77	55.72	124.48
1	Crisis	Release / collapse	-5.0%	121.505	0%	0%	0.00	0.00	65.49	56.01	121.51
2				121.505	-1%	-1%	-0.65	-0.56	64.84	55.45	120.29
3				121.505	-1%	-5%	-0.65	-2.80	64.84	53.21	118.05
4				121.505	-5%	-10%	-3.27	-5.60	62.22	50.41	112.63

Table 4-17: Direct and indirect GDP impacts of the tourism economy according to different growth and climate change scenarios *(authors' own assumptions and modelling)*

Tourism economy baseline – direct GDP contribution (R Bn direct GDP in 2016; WTTC, 2017)			**127.9**		**GDP at basic values per R1 million final demand (South Africa) (Quantec database multipliers, 2011; R Bn)**						
Climate change scenarios	**Adaptive cycle phase**		**Assumed annual growth (%)**	**Adjusted GDP in 1 year**	**Initial Impact**	**First Round**	**Direct Impact**	**Indirect Effect**	**Direct and Indirect Impact**	**Induced Impact**	**Economy-wide Impact**
1	Status quo	Conservation / consolidation	1.0%	129.179	66.024	25.533	91.557	24.884	116.441	31.380	147.821
2				129.179	65.363	25.278	90.642	24.635	115.277	31.066	146.343
3				129.179	64.146	24.807	88.953	24.176	113.130	30.488	143.617
4				129.179	61.201	23.668	84.869	23.066	107.935	29.088	137.023
1	Growth	Exploitation phase	5.0%	134.295	68.639	26.545	95.183	25.870	121.053	32.623	153.676
2				134.295	67.952	26.279	94.231	25.611	119.842	32.297	152.139
3				134.295	66.686	25.790	92.476	25.134	117.610	31.695	149.305
4				134.295	63.624	24.606	88.230	23.980	112.210	30.240	142.450
1	Crisis	Release / collapse	-5.0%	121.505	62.102	24.017	86.118	23.406	109.524	29.516	139.040
2				121.505	61.480	23.776	85.257	23.172	108.429	29.221	137.650
3				121.505	60.335	23.334	83.669	22.740	106.409	28.677	135.086
4				121.505	57.565	22.262	79.827	21.696	101.523	27.360	128.883

Table 4-18: Direct and indirect employment impacts of the tourism economy according to different growth and climate change scenarios *(authors' own assumptions and modelling)*

Tourism economy baseline – direct GDP contribution (R Bn direct GDP)			**127.9**		**Employment: Total number per R1 million final demand (South Africa) (Quantec database multipliers, 2011; R Bn)**						
Climate change scenarios	**Adaptive cycle phase**		**Assumed annual growth (%)**	**Adjusted GDP in 1 year**	**Initial Impact**	**First Round**	**Direct Impact**	**Indirect Effect**	**Direct and Indirect Impact**	**Induced Impact**	**Economy-wide Impact**
1	Status quo	Conservation / consolidation	1.0%	129.179	485515	134661	620176	125594	745770	173718	919488
2				129.179	480660	133315	613975	124338	738312	171981	910293
3				129.179	471707	130832	602539	122022	724560	168778	893338
4				129.179	450048	124824	574873	116419	691292	161028	852320
1	Growth	Exploitation phase	5.0%	134.295	504743	139994	644738	130568	775306	180598	955904
2				134.295	499696	138595	638291	129262	767552	178792	946345
3				134.295	490389	136013	626402	126854	753256	175462	928718
4				134.295	467872	129768	597640	121030	718669	167405	886075
1	Crisis	Release / collapse	-5.0%	121.505	456673	126662	583334	118133	701467	163398	864865
2				121.505	452106	125395	577501	116951	694452	161764	856217
3				121.505	443685	123059	566744	114773	681517	158751	840268
4				121.505	423313	117409	540722	109503	650225	151462	801687

Furthermore, Table 4-19 compares tourism GDP and employment projects in 2027 of the WTTC (2017) and of our own projections. It seems that the WTTC assumes constant, significant growth in tourism and travel spending over that period, not considering any extreme events or climate change scenario. Our own modelling results highlight the additional effects of the various climate change scenarios on tourism GDP and employment projects in 2027. While these results should be interpreted with caution[26], they emphasise that climate change, characterised by water-related extreme events, can negatively affect any growth pathway for the tourism and travel industries. Their effects would be particularly acute when the tourism spending / sector growth rate is low or negative (i.e. in times of global, regional or national economic crisis).

However, we need to underline that the results of this scenario modelling:

- Are not accurate predictions[27], they are possible futures open for further questioning and debate[28];
- Correspond to economy-wide projects which mask spatial and temporal disparities and variabilities in SA, especially in areas where tourism activities play an overbearing role in the local economy.

Accordingly, modelling water-related global change impacts on tourism at the local level, making use of more precise data sets, will likely better explain the relationships between changes in water-related ecosystem services and tourism in the context of climate change.

[26] Both our economic growth and climate change impact assumptions and the underlying Social Accounting Matrix assumptions could be questioned or debated. Although SAM multiplier analysis is a useful tool to analyse the economic contribution of spending associated with any sector, it has some limitations, which need to be considered when interpreting the multipliers:

- Firstly, multipliers assume that the industries in the economy use inputs, and produce outputs, in fixed proportions – the model is therefore technologically static;
- Secondly, multipliers do not take induced changes in relative prices into account;
- Thirdly, multipliers assume that labour and capital are available in unlimited quantities.

[27] There are many assumptions in these models: (a) the impact multipliers used are from a Quantec database, (b) sector growth scenarios could be very different, (c) the actual impacts of water-related changes on tourism could vary significantly in space and time.

[28] The research team discussed these models with the Tourism and Natural 2030 Working Group: See section 4.1.4.

Table 4-19: Difference in tourism GDP and employment projections for the World Travel & Tourism Council (2017) and the authors' own projections

Tourism economy baseline – direct GDP contribution (R Bn direct GDP)			127.9		Tourism GDP and employment projections using Quantec database multiplier, 2011								
Climate change scena-rios	Adaptive cycle phase		Assumed annual growth (%)	Adjusted GDP in 1 year	Net tourist spend due to different climate change scenarios (R Bn)	Adjusted GDP in 2030 (R Bn)	Adjusted net tourist spend due to different climate change scenarios in 2030 (R Bn)	WTTC 2017 direct tourism GDP projection for 2027 (R Bn)	Difference between tourism GDP projections for WTTC 2017 and the ones under the climate change scenarios in 2027 (R Bn)	Adjusted economy-wide GDP impact in 2030 (R Bn)	WTTC 2017 direct tourism employment projections for 2027 (number of employees)	Adjusted economy-wide employment impact in 2030 (number of employees)	Difference between tourism employment projections for WTTC 2017 and the ones under the climate change scenarios in 2027 (numbers of employees)
1	Status quo	Con-serva-tion / consoli dation	1.0%	129.179	129.18	142.694	142.694	271.300	128.606	163.287	1110000	1015687	94313
2				129.179	127.89	142.694	141.267	271.300	130.033	161.654	1110000	1005530	104470
3				129.179	125.51	142.694	138.636	271.300	132.664	158.643	1110000	986801	123199
4				129.179	119.74	142.694	132.270	271.300	139.030	151.359	1110000	941491	168509
1	Growth	Exploi-tation	5.0%	134.295	134.30	218.752	218.752	271.300	52.548	250.322	1110000	1557066	-447066
2				134.295	132.95	218.752	216.565	271.300	54.735	247.818	1110000	1541496	-431496
3				134.295	130.48	218.752	212.531	271.300	58.769	243.203	1110000	1512783	-402783
4				134.295	124.48	218.752	202.773	271.300	68.527	232.036	1110000	1443323	-333323
1	Crisis	Release / collapse	-5.0%	121.505	121.51	72.750	72.750	271.300	198.550	83.248	1110000	517827	592173
2				121.505	120.29	72.750	72.022	271.300	199.278	82.416	1110000	512648	597352
3				121.505	118.05	72.750	70.681	271.300	200.619	80.881	1110000	503100	606900
4				121.505	112.63	72.750	67.435	271.300	203.865	77.167	1110000	480000	630000

4.1.4 Stakeholder engagement: The 2030 Tourism and Natural Capital Working Group

The research team proposed the formation of a forum to bring together industry stakeholders, decision-makers and research institutions to actively engage around the issues of tourism, natural capital and global change in South Africa. A 2030 Tourism and Natural Capital Working Group was launched in September 2017, through the invitation of target stakeholders within the tourism and natural capital space. The group met four times during the course of the project.

The objective of the first meeting was to explore the rationale and aims for a working group on tourism and natural capital. The group agreed that a similar forum does not currently exist and that for sustainable tourism to be effectively taken forward, collaboration between actors across the tourism and natural capital space is imperative. The 2030 Tourism and Natural Capital Working Group decided that its potential aims were to:

- Assist the tourism sector in understanding its dependencies and impacts on natural capital;
- Assist the tourism sector in understanding the risks and opportunities linked to natural capital;
- Share experiences, case studies and perspectives on natural capital integration into the tourism sector;
- Influence public and private sector decision and policymakers at the national, provincial and local levels towards developing and implementing a strategy and action plan for Tourism and Natural Capital by 2030.

To that end, the following meetings aimed at establishing what work is being undertaken in the sustainable tourism space. The Working Group then agreed that:

- The presentations and sharing of the work being done (including our own work on the impacts of different climate change scenarios on tourism in SA) in the sustainable tourism space was informative and valuable;
- There are several points of potential collaboration between projects and organizations;
- There are many initiatives within the sustainable tourism space;
- Many of these initiatives are disconnected from one another and other work / projects in the same field;
- A way to share information on initiatives and learnings and to connect different actors (initiatives) both within and external to the tourism sector is needed – co-ordination and knowledge of activities within the tourism space is needed.

Based on the work and experiences shared, the Working Group members agreed to work together to mainstream sustainable tourism practices for the protection and sustainable use (including rehabilitation) of 'ecological infrastructure' through a best case model / case study approach – 'i.e. demonstrate a sustainable tourism landscape / system'. They agreed to develop a funding proposal targeted for multi-stakeholder type projects to design and operationalize a 'model tourism system' of sustainable tourism practices. However, time and resource constraints prevented the Working Group from going beyond a draft position statement.

4.2 Case study analysis: Water-related scenarios and the associated economic impacts on local tourism

Water plays a key role in the tourism value chain. Water and tourism are linked through multiple pathways with diverted water supply – which is the water made available for human use through abstraction and treatment – being the primary one. The second important link between water and tourism is through *in situ* water supply (tourism assets in destination) – this encompasses water and water resources that provide the location and means to water-based recreation and sporting events, as well as water-related tourism assets and destinations (e.g. waterfalls). Associated with this is the support that water provides to other tourism attractions, for example the presence of a stream in creating an attractive picnic area or the relationship between water resources and nature-based tourism. The availability of water and the quality of water are both important elements in the tourism value chain. Water quality is particularly important in the case where water resources provide the location and means to water-based recreation and sporting events, as well as water-related tourism assets and destinations (e.g. waterfalls). This section presents the results of the research undertaken at the two case study sites, the Dusi Canoe Marathon of the uMngeni-Msunduzi River (section 4.2.1) and the Loskop Dam recreational fishing tourism activities (section 4.2.2).

4.2.1 uMngeni River Catchment – The Dusi Canoe Marathon

The results of the Dusi Canoe Marathon event case study are organised as follows:

- Characterisation of the case study in the context of the Panarchy model (section 4.2.1.1);
- Ecosystem service supply, demand and stress modelling according to different water-related glocal change scenarios (section 4.2.1.2);
- The economic impacts of tourism, including those of the different water-related glocal change scenarios (section 4.2.1.3).

4.2.1.1 Characterisation of the case study in the context of the Panarchy model

This section is organised as follows:

- Introduction to tourism in the study area (section 4.2.1.1.1);
- Introduction to the Dusi Canoe Marathon tourism system (section 4.2.1.1.2);
- An adaptive cycle model of the Dusi Canoe Marathon (section 4.2.1.1.3).

4.2.1.1.1 Tourism in the case study region

In terms of tourism, the uMngeni area (uMgungundlovu and eThekwini districts) receives the highest proportion of visitors to the KwaZulu-Natal (KZN) Province (Tourism KwaZulu-Natal, 2017a). In 2015, the share of total foreign visitors in KZN going to destinations in the uMgungundlovu and eThekwini districts is as follows: 59% in Durban, 13% in the North Coast and 11% in Pietermaritzburg (Figure 4-5).

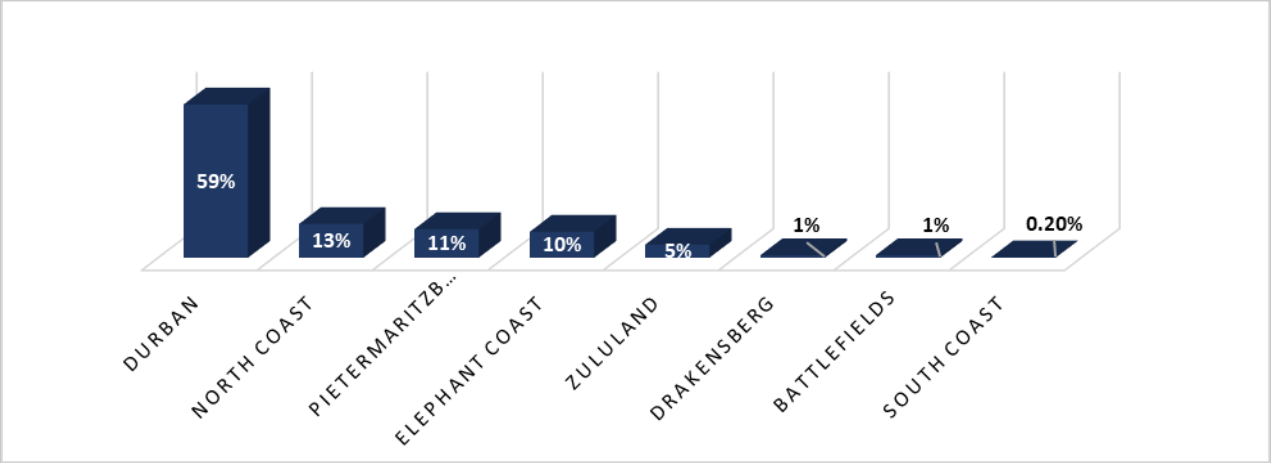


Figure 4-5: Destinations visited in KZN – Foreign Tourists, 2015 (Tourism KwaZulu-Natal, 2017a).

Various tourism attractions rely on natural resources in the uMngeni catchment area, especially water-based natural capital. Such activities include, but are not limited to, beach and sea associated activities (fishing, whale watching, estuary boat cruises), river paddling, bird watching, fly fishing, and river / dam swimming). The area is a hub for water sports, including the famous Midmar Mile and Dusi Canoe Marathon that draw thousands of participants each year. Many tourism activities and thus tourism SMMEs in the area are dependent on water related activities directly and indirectly. These activities and the supporting services offered by various businesses within the catchment play a meaningful role in the success of the SMMEs.

According to the Provincial Spatial Economic Development Strategy, tourism products of provincial importance include arts and crafts routes of the Midlands Meander and water-based natural attractions. Table 4-20 provides a summary of the key attractions in the uMngeni catchment as per importance or level of impact on the tourism industry. Sports and events are recognised as a tourism attraction in the uMngeni Local Municipality. Canoeing is one such sport and the Dusi Canoe Marathon is one such event. Water-based sporting events, such as the Dusi Canoe Marathon and Midmar Mile, attract many visitors and contribute to the local economy.

Table 4-20: Tourist attractions in the uMngeni Municipality in accordance to impact (uMngeni Local Municipality, 2011)

Primary Tourist Attractions	Midlands Meander
	Howick Falls Precinct
	Midmar Dam
	Nature Based Attractions
Secondary Attractions	Zulu Mphophomeni Tourism Experience
	World's View
	Hilton Meander
	Golf Courses
	Heritage and Culture
	Sports and Events
Visitor facilities	Diverse hospitality enterprises
	Broad spectrum of accommodation establishments
	Visitor Information Centres

4.2.1.1.2 The Dusi Canoe Marathon tourism system

The Dusi Canoe Marathon is an annual three-day paddling race held along the uMsunduzi and uMngeni Rivers[29] between Pietermaritzburg and Durban, South Africa (Figure 4-6). The event is an example of water-based sport recreation and tourism and attracts both local and international paddlers and spectators. With a total distance of 120 kilometres, it includes paddling and running (portaging) with the ratio of paddling to running dependent on the water level of the river. The race was founded in 1951 and has become internationally popular and the largest canoeing event on the African continent attracting between 1500 and 2000 paddlers each year. It is characterized by a diverse range of participants, including

[29] See section 7.8.3 for a brief introduction to the uMsunduzi-uMngeni River system.

professional and non-competitive paddlers and local as well as international participants. The Dusi Canoe Marathon is considered the premier race of the canoeing season, and one that attracts many people to the sport.

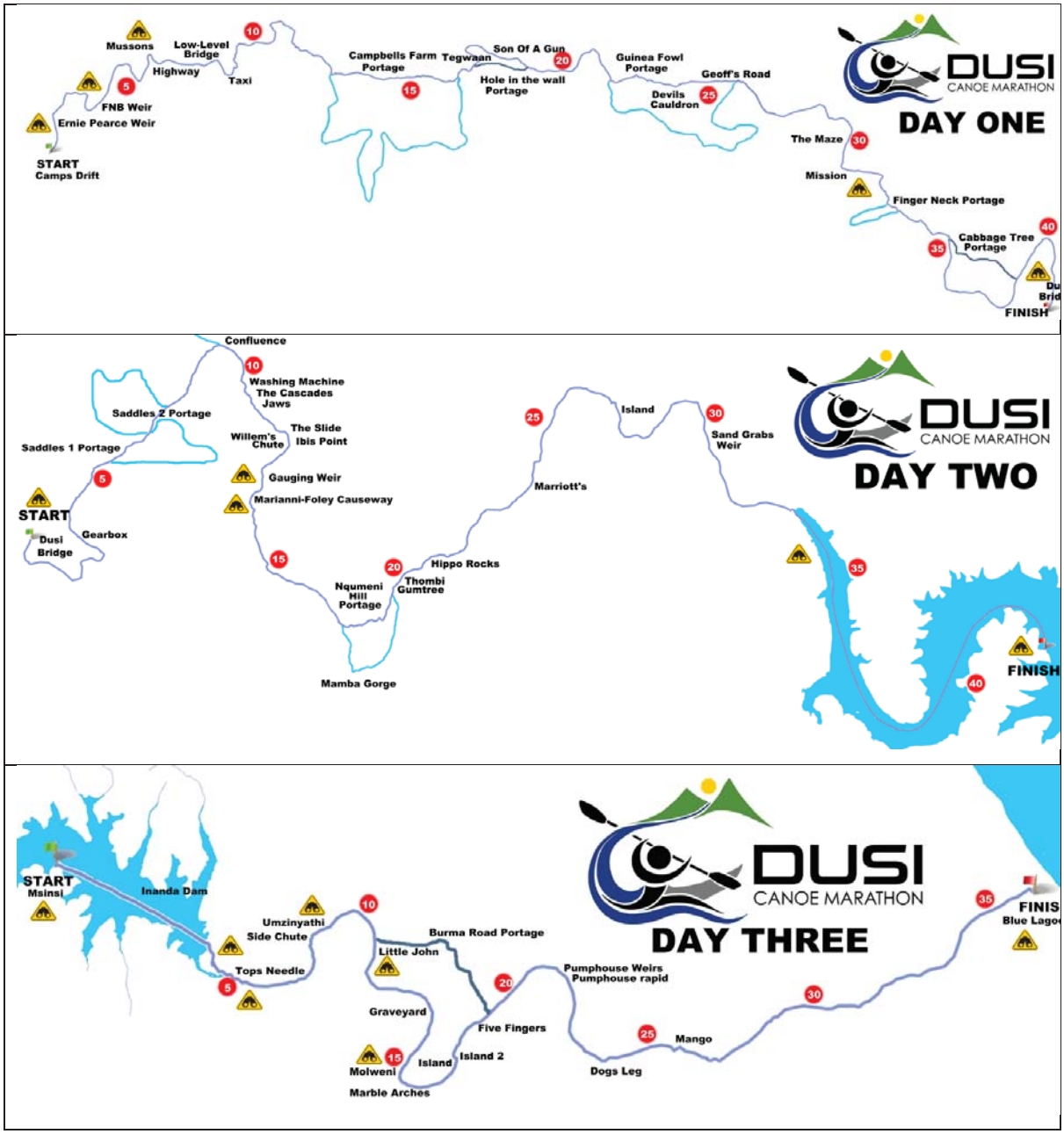


Figure 4-6: Dusi Canoe Marathon route showing the three-day segments (Dusi Canoe Marathon – URL: https://dusi.co.za/).

The event attracts local visitors as well as day and overnight visitors, generating spending on accommodation, transport, food and beverages, entertainment and souvenirs. The finish of the race (day 3) is followed by an official party event, offering entertainment, foods and beverages. In 2017, the Dusi Canoe Marathon event generated an estimated direct economic

impact in the region of R4 million and an indirect economic impact of between R6 to 9 million (Wyllie and Kohler, 2017).

The Dusi Canoe Marathon is a suitable case study for exploring the complex relationships between water pollution (a driver of change) and tourism for several reasons:

- The marathon is the largest canoeing event on the African continent and is internationally popular, attracting both local and foreign tourists and generating a regional economic impact;
- The marathon is directly dependent on the uMngeni-Msunduzi River system;
- There are existing (and increasing) concerns over the quality of the water in the uMngeni-Msunduzi River system;
- The marathon was founded in 1951 and therefore provides a relatively long time-frame for analysis;
- There is existing water quality data and a water quality monitoring programme for the uMngeni-Msunduzi River system;
- Growth of the event through innovation is recommended by Tourism Kwazulu-Natal (TKZN) to increase the attractiveness of the event and to encourage visitors to stay for longer periods;
- The Dusi Canoe Marathon constitutes a tourism destination, around which secondary tourist activities can be developed. This presents both an opportunity and a risk to tourism growth in the region.

4.2.1.1.3 An adaptive cycle model of the Dusi Canoe Marathon

Applying the theory of adaptive cycles (see section 7.7), several cycles of change can be identified for the Dusi Canoe Marathon event (Figure 4-7 and Table 4-21). Based on participant numbers, the Dusi Canoe Marathon appears to have experienced a cycle of organization and mobilization from 1951 to 1965, followed by a cycle of growth between 1966 and 1999. The race was founded in 1951 with eight participants. In 1956, 48 paddlers took part and by 1967 participant numbers exceeded 100. By 1990, participant numbers reached 1500. In 1987, Hansa (Pilsner) become the title sponsor of the event. Media coverage and participant numbers increased concomitantly. From 2000 onwards, the event seemed to have reached a consolidation and conservation phase, with the number of entrants having steadied at around 1500 to 2000 participants. Consolidation of the event is apparent with the appointment of a full time General Manager in 2013 and First National Bank taking over as title sponsor in 2016. However, in 2015, entries fell to below 1500 and have continued to decline with just over 1000 participants entering the 2017 event just short of a 1000 entering

the 2018 event (Figure 4-8). Wyllie and Kohler (2016) have suggested that the downward trend may be associated with the national drought and an unfavourable national economic situation.

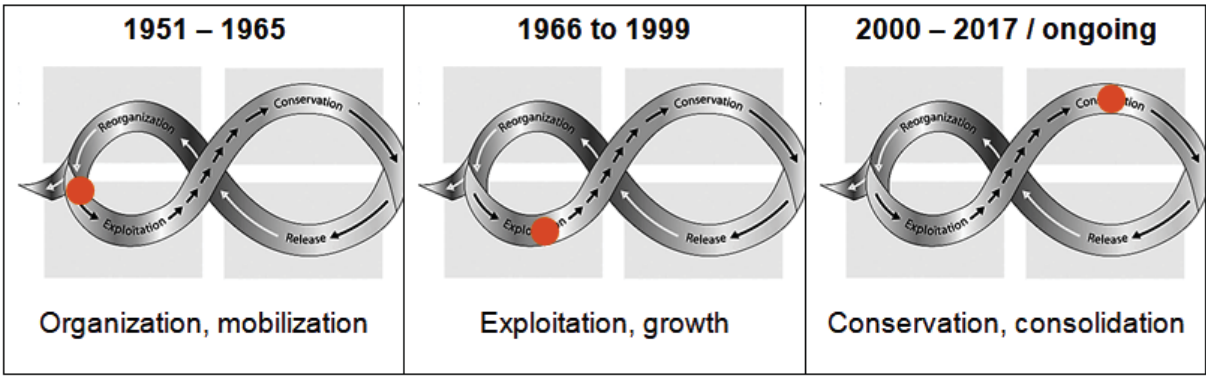


Figure 4-7: Proposed adaptive cycles of change for the Dusi Canoe Marathon event.

The completion of Inanda Dam (on the race route) in 1999 had a profound influence on the race as the dam impacts on water levels for the 3rd day of the race. Generally, water is released from the dam for the race. Drought conditions during 2017 meant that “low water rules” for day 3 had to be implemented, which increased the amount of portaging required. The 2017 race is regarded as the ‘toughest Dusi ever on record’. Rainfall and water levels also affect water quality. The date for the event was specifically chosen to coincide with the wet season and in 2010 the race date was moved to a date in mid-February (from mid-January) to deal with ongoing water quality challenges (i.e. to take advantage of summer rainfall).

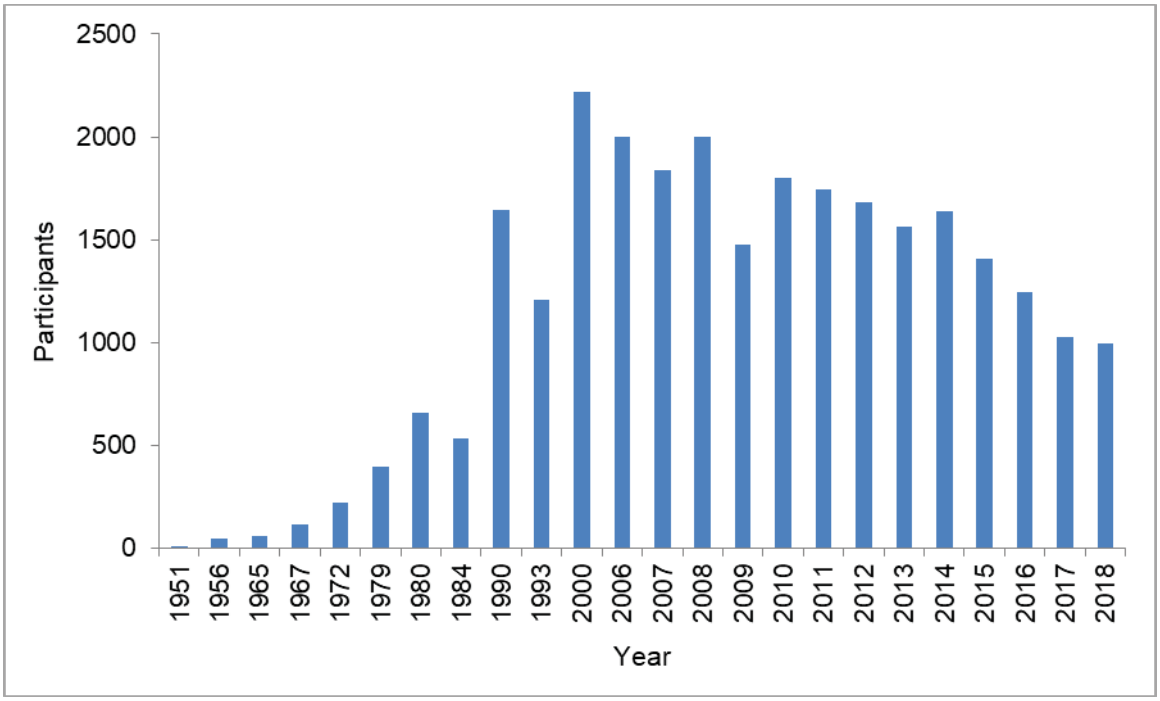


Figure 4-8: Number of participants in the Dusi Canoe Marathon over time.

Note: Data from FNB Dusi Canoe Marathon and Tourism KwaZulu-Natal.

In recent years, anecdotal evidences from the event point to increasing concerns related to water quality and water related illness. Poor water quality and illness appear, however, to have been associated with the event since its beginning. Before the first race in 1951, an exploratory expedition was undertaken in 1950 during which drinking water was taken from the river resulting in 'crippling stomach cramps and violent attacks of dysentery' (Mars and Farman, 2000). Several surveys over the life of the marathon indicate concerns and risks of poor water quality associated with the event from the late 1980s (Canoeing South Africa, 2017; Farman and Mars, 2002; Mars and Farman, 2000; Oliver, 2006).

Table 4-21: A history of the South African Dusi Canoe Marathon from an adaptive cycle perspective

	Timeframe / period			
	1951-1965		**1966-1999**	**2000-2017 / ongoing**
	Establishment		**Growth and commercialisation**	**Stabilization**
Key characteristics	Founding of event with a few participants, numbers increasing, but remain below 100 people	*Transition*	Growth in numbers, entrants exceeded 100 paddlers, commercialisation of event, first significant sponsor	Post 2000, entrant numbers appear to have steadied between 1500 and 2000. Consolidation of the event is apparent with the appointment of a full time General Manager in 2013 and First National Bank taking over as title sponsor in 2016
Adaptive cycle phase	**Organization, mobilization**		**Exploitation, growth**	**Conservation, consolidation**

A 2013 study profiled participants in the Dusi Canoe Marathon according to their motives for participating (Kruger and Saayman, 2013). The study found the main motives for paddling were enjoyment and adventure followed by intrinsic achievement. Event attractiveness was also cited as a key motivational factor. In other words, participants regard the Dusi Canoe Marathon as an event they want to participate in because of its characteristics and favourable reputation. Additionally, the study found that canoeists are influenced not by a single motive but rather by several reasons. A recent survey by the KwaZulu-Natal Canoe Union found that a vast majority of paddlers listed water quality as the main factor that influenced their decision to paddle (Canoeing South Africa, 2017). The Duzi-uMngeni Conservation Trust website features an annual *E.coli* concentration map specifically for the Dusi Canoe Marathon route.

The economic impact of the Dusi Canoe Marathon showed a significant decline in 2016, attributed to a decline in participant numbers, a significant decline in spectators (by 50%) and a reduction in average spending (Wyllie and Kohler, 2016). Results for the 2017 economic impact assessment of the event show that there has been an improvement in the total economic impact of the event that year (increased spend of the respondents and an increased number of visitors); though still not to the same level of impact experienced prior to 2016 (still a relatively low number of participants and associated visitors).

While the current economic situation in the country is considered to be having an effect on events such as the Dusi Canoe Marathon (Wyllie and Kohler, 2017), the key drivers influencing participation in the Dusi Canoe Marathon appear to be river levels and water quality. Changes in consumer tastes and preferences may also affect participation, particularly for new entrants. However, participation in the Dusi Canoe Marathon is dominated by return or repeat participation (80 to 90%); new entrants thus play a very limited role, indicating the potentially limited opportunity for event growth.

4.2.1.2 Ecosystem service supply, demand and stress modelling according to different water-related glocal change scenarios model within the greater uMngeni catchment

This section is focused on highlighting the relative risk indexes for ecosystem services supply and demand (section 4.2.1.2.1) and the relative risk indexes according to three 2030 scenarios (section 4.2.1.2.2). The full ecosystem services modelling is available in the annexure (section 7.8.4 and 7.8.5).

4.2.1.2.1 Assessing the relative risk indexes for ecosystem services in the greater uMngeni catchment

Following the assessment of the relative ecosystem service supply and demand, the relative stress or risk facing these ES was assessed. The process involved producing ES supply-demand ratios (i.e. a risk or stress index), which will highlight which ES are over-supplied (i.e. low risk or stress of critical shortage of ES) and under-supplied (i.e. high risk / stress of critical shortage of ES). The higher the ratio of relative ES supply over relative ES demand, the lower the risk or stress for the ES. The lower the ratio of relative ES supply over relative ES demand, the higher the risk or stress for the ES.

As shown in Table 4-22 and Figure 4-9, the relative risk indexes for water supply and quality are already very low (i.e. high risk of critical shortage of ES) for most quaternaries in the greater uMngeni catchment. However, there is low risk of critical shortage for habitat provision in a few quaternaries (e.g. U20L, U20M, V20A), while water supply and water quality appear not to be under significant stress yet in four quaternaries (i.e. U20A, V20A, V20B and V20C).

Table 4-22: Total relative ecosystem services risk indexes for the quaternaries of the greater uMngeni catchment

	Relative risk index (supply / demand)			
Quaternary	Water supply	Water quality	Tourism / recreation	Habitat provision
U20A	23,61	24,18	26,49	123,01
U20B	4,21	4,40	4,22	21,54
U20C	0,87	0,91	0,89	4,31
U20D	11,71	12,69	13,05	59,13
U20E	1,12	1,23	1,37	5,81
U20F	1,07	1,17	1,21	5,11
U20G	1,22	1,39	1,37	7,26
U20H	0,21	0,22	0,24	1,16
U20J	0,13	0,14	0,14	0,76
U20K	0,89	1,05	1,22	5,50
U20L	0,27	0,33	0,36	1,73
U20M	0,01	0,02	0,02	0,09
V20A	29,98	30,10	29,88	161,35
V20B	19,22	19,29	18,92	98,37
V20C	26,46	26,72	25,71	135,07
V20D	9,12	9,05	8,44	44,56

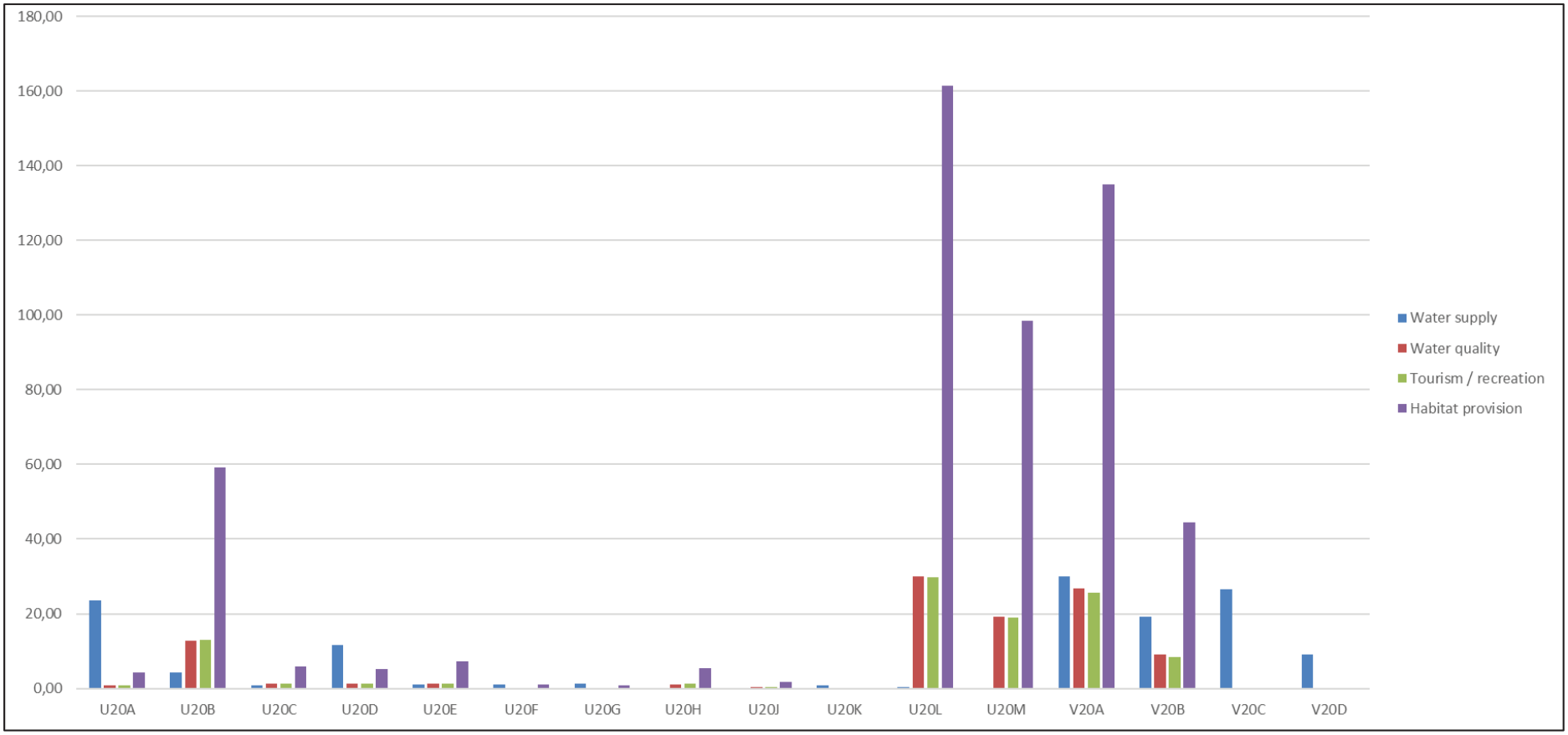


Figure 4-9: Relative ecosystem services risk indexes of the quaternaries of the greater uMngeni catchment.

Note: The higher the risk index (ratio of relative ES supply over relative ES demand), the lower the risk or stress for the ES.

4.2.1.2.2 Assessing the relative risk indexes for the ecosystem services in the greater uMngeni catchment according to three 2030 scenarios

To better understand potential changes in ES risk indexes for the greater uMngeni catchment, the following 2030 water scenarios were modelled:

- Scenario 1: No change;
- Scenario 2: Water quality declines significantly (-50% decline in water quality, no change in water supply);
- Scenario 3: Water levels remain at drought (below a 'normal' year) levels or decline further (-50% decline in water quality and water supply); and
- Scenario 4: Water levels and water quality improve (+50% increase in water quality and water supply).

Figure 4-10 and Figure 4-11 show the changes in water supply risk indexes for the greater uMngeni catchment according to the four scenarios.

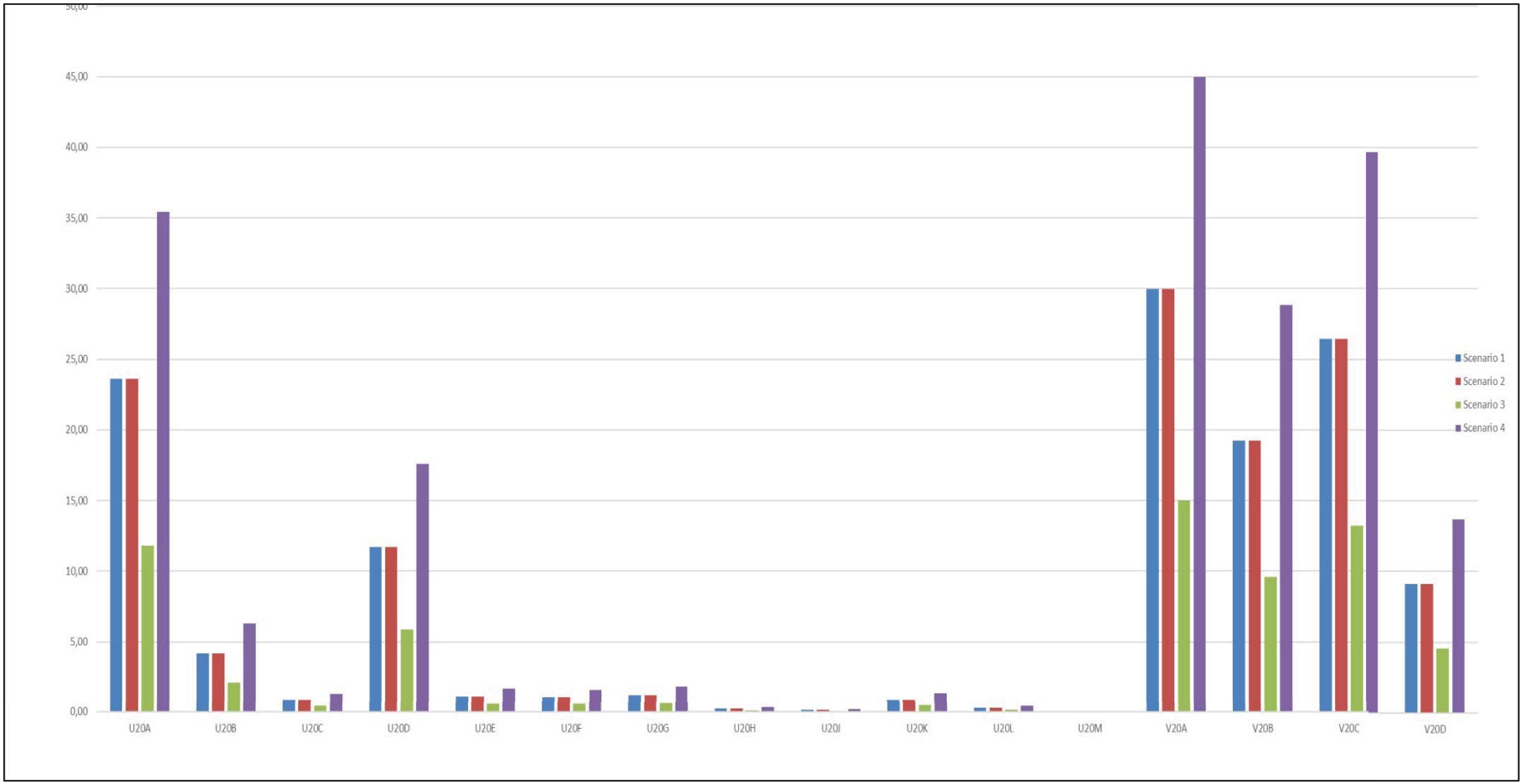


Figure 4-10: Relative **water supply** risk indexes of the quaternaries of the greater **uMngeni catchment** according to three 2030 scenarios.

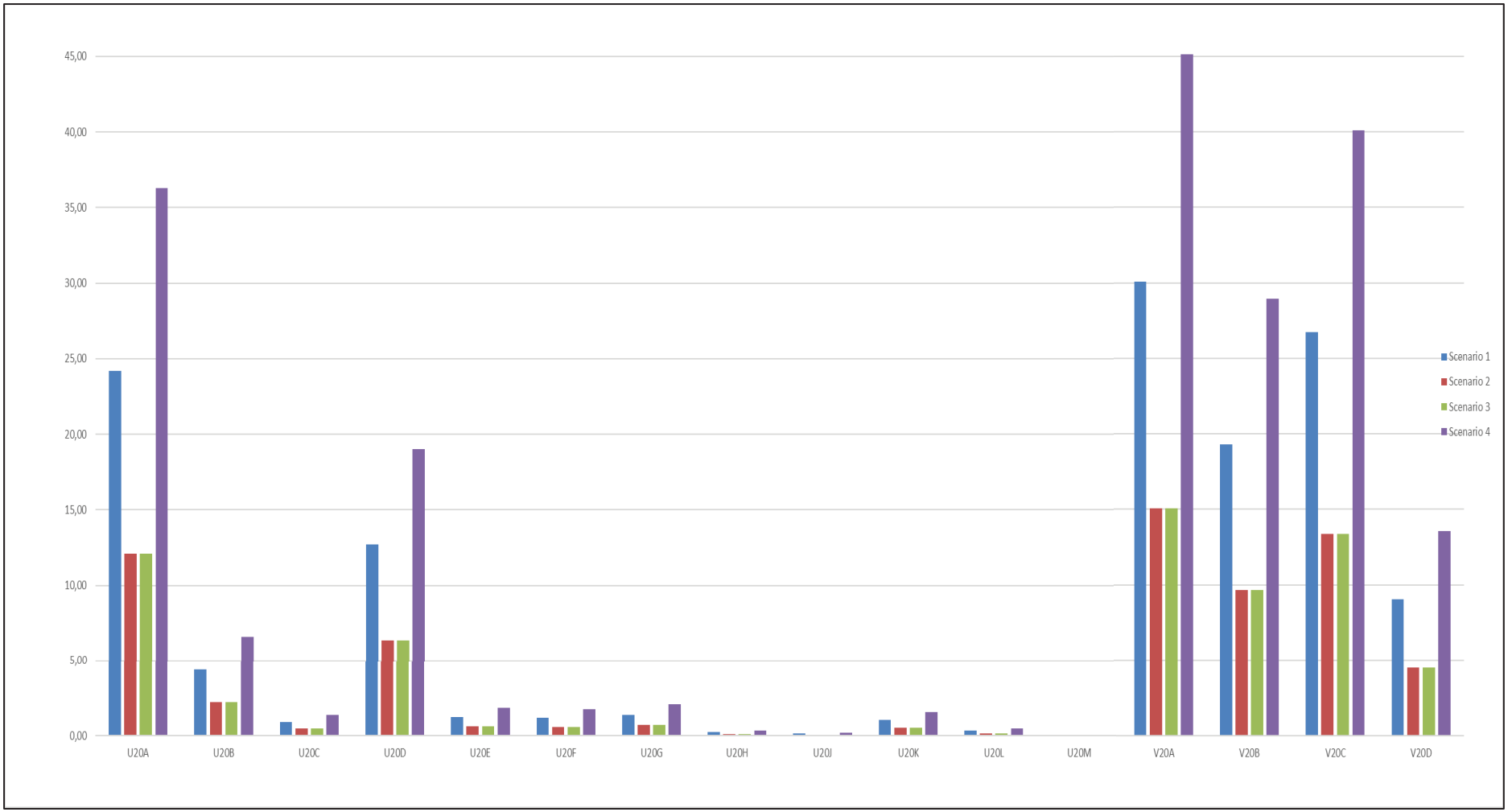


Figure 4-11: Relative **water quality** risk indexes of the quaternaries of the greater **uMngeni catchment** according to three 2030 scenarios.

4.2.1.3 Economic impacts of the Dusi Canoe Marathon

This section presents summarized results of the economic research undertaken for the Dusi Canoe Marathon and includes, namely:

- A summary of various primary and secondary data collection activities and analyses for the greater uMngeni catchment and the Dusi Canoe Marathon, including trends in event attendance, economic impacts and water-related impacts on the canoeing experience (sections 4.2.1.3.1 to 4.2.1.3.3);
- Modelling of the economic impacts of water-related climate change scenarios on the tourism system (section 4.2.1.3.4).

4.2.1.3.1 The Dusi Canoe Marathon: Participation trends and associated tourist perceptions

The Dusi Canoe Marathon attracts both local and international tourists. In this case, the 'tourists' consist of the race participants (paddlers) and the race spectators. Participant and spectator numbers and their origin (where available) were extracted from the Tourism KwaZulu-Natal Economic Impact Assessments for the Dusi Canoe Marathon[30] and are summarised in Table 4-23 for 2009 to 2018. Participant numbers were available regularly from the year 2006 onwards and show an overall decline over time (Figure 4-12). Participant numbers prior to 2000 (where available[31] Figure 4-8), show eight participants for the initial race (1951), climbing to 112 entrants by the year 1967, 1647 entrants by the year 1990 and 2217 in the year 2000.

From 2006, the number of participants slowly declined each year – barring a slight increase of participants in 2014. The total number of participants in 2018 was the lowest across the 18-year period. According to Tourism KwaZulu-Natal (2018): "*It is possible that the national drought has had a major impact on the numbers for 2016 and 2017, as well as on canoeing as a sport. As for the further decline in 2018, this was most likely due to various aspects relating to the canoeing discipline / fraternity – in terms of the costs and administration involved*".

The estimated number of event spectators also experienced a decline over the 2016-2017 period with a slight increase in 2018 (Table 4-23). However, spectator numbers and total attendance is estimated by multiplying the number of participants by the average group size

[30] Event Impact Assessments downloaded from URL: https://www.zulu.org.za/archive/impact-assessments-of-events-in-kwazulu-natal-F57990, accessed on September 12, 2019.
[31] Dusi Canoe Marathon, History – URL: http://dusi.co.za/history/, accessed on September 12, 2019.

which is obtained from the survey sample (Tourism KwaZulu-Natal, 2018). Average group size has fluctuated over the 9-year period considered.

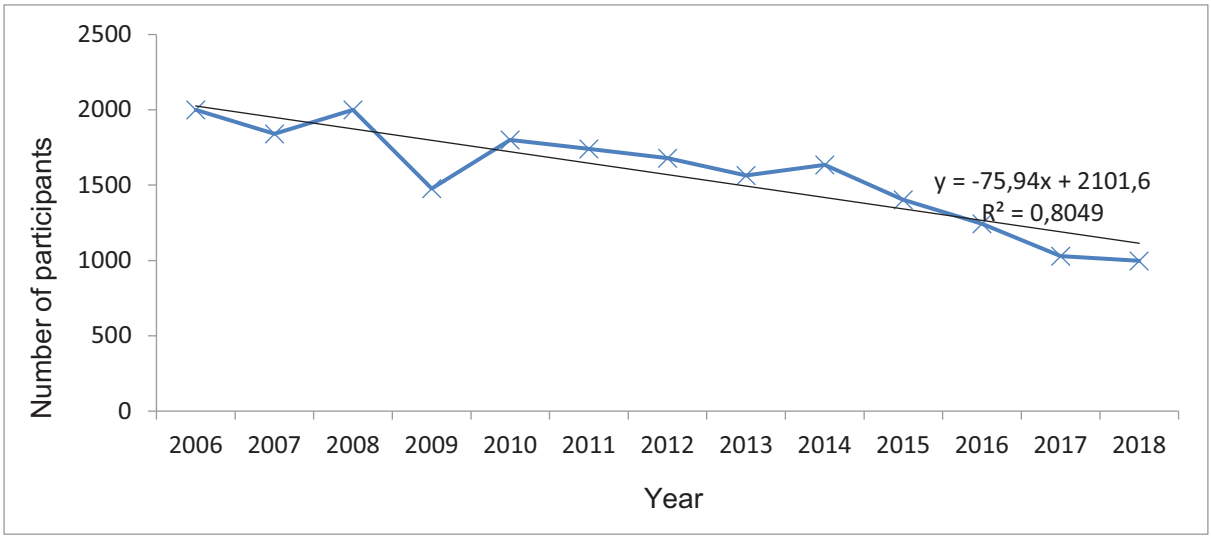


Figure 4-12: Race participants, Dusi Canoe Marathon, 2006 to 2018 (data from Tourism KwaZulu-Natal).

A representative of the organising committee for the event indicated that the preferred number of participants is between 1300 and 1500 and the aim of the committee is to ensure / improve the experience of the event rather than increasing the numbers significantly (which leads to traffic congestion issues).

A survey undertaken by the KwaZulu-Natal Canoe Union (KNCU) of KNCU members, in May 2016, aimed to investigate members' motivations for paddling and challenges to the future of the sport. The KNCU was formed in 1951 after the first Dusi Canoe Marathon and has more than 3800 paddlers registered as members. KNCU is a key organizer of the Dusi Canoe Marathon. Results from the survey with particular relevance to this study are summarised below (270 respondents).

Paddler income

An important determinant of participation in water-related tourism and sporting events is that of occupation and income (linked to availability and affordability; Charlton *et al*., 2010). According to the KNCU (2016) survey, 56% of the respondents fell within a monthly income band upwards of R40 000 (Figure 4-13).

Table 4-23: Race participants, spectators and total attendance, Dusi Canoe Marathon, 2009-2018 (data from Tourism KwaZulu-Natal)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Event participants										
TOTAL	**1477**	**1800**	**1741**	**1679**	**1564**	**1635**	**1404**	**1243**	**1029**	**998**
South Africa	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	1589	1376	1218	1011	970
KwaZulu-Natal	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	1204	1080	945	748	722
Gauteng	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	257	205	199	195	186
Western Cape	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	57	64	50	41	42
Central districts	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	19	10	12	7	7
Eastern Cape	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	52	17	12	20	13
International	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	46	28	25	18	28
Event spectators										
TOTAL	**5500**	**5500**	**3501**	**3750**	**6000**	**6060**	**4340**	**1616**	**1441**	**1896**
Local residents	3 685	3685	1313	1680	2520	3060	2647	1212	677	1024
Day visitors	1 485	1430	1750	1470	2640	2160	825	162	403	569
Overnight	330	385	438	600	840	840	868	242	361	303
Total attendance	6977	7300	5242	5429	7564	7695	5744	2859	2470	2894
Average group size[a]	3.7	3.0	2.0	2.2	3.8	3.7	3.1	2.3	2.4	2.9

[a] Average group size is based on the survey sample.

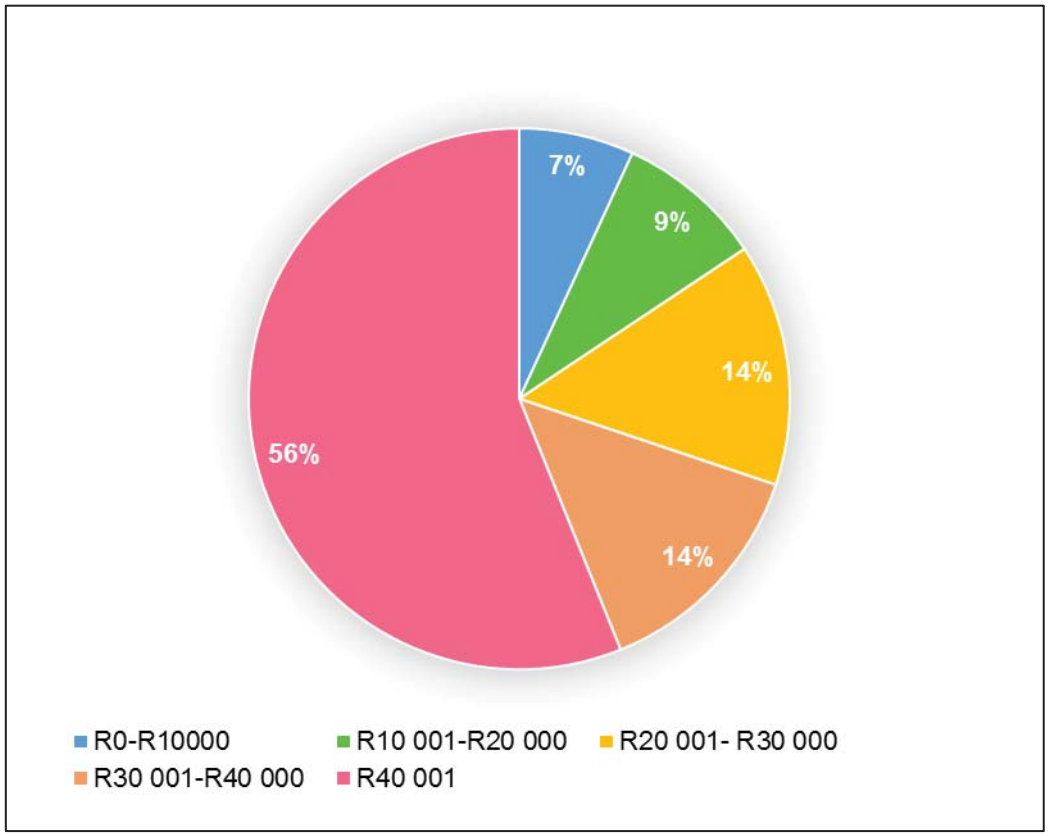


Figure 4-13: Monthly income band of respondents (KNCU Survey, 2016) (n=270).

Duration of union membership

KNCU membership duration and event participation were also investigated. 45% of the respondents have been registered with the KNCU for more than 11 years, while 15% have been registered with the KNCU for 1 to 3 years (Figure 4-14).

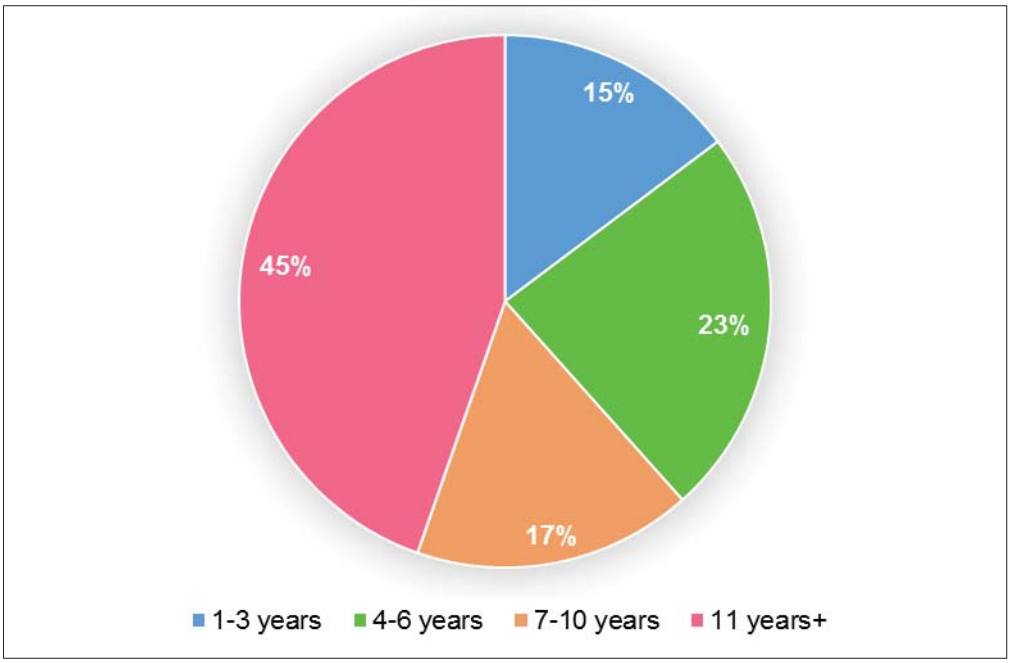


Figure 4-14: Number of years respondents have been registered with KNCU and participating in events (KNCU Survey, 2016) (n=270).

Additional (non-water) sports

The survey explored other types of sports in which members of the KNCU partake (Figure 4-15). Mountain biking and trail running were the most popular additional sports of KNCU members.

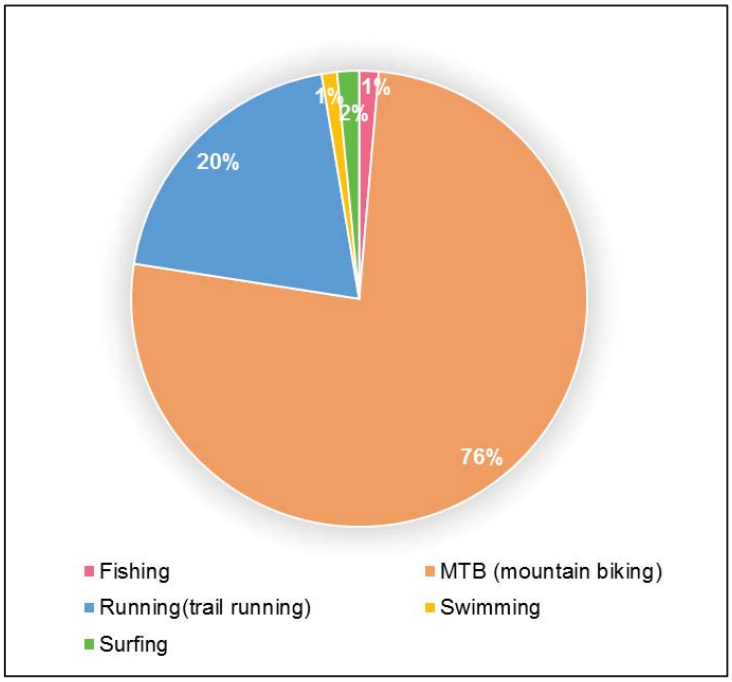


Figure 4-15: Non-water sporting disciplines in which the respondents are involved (KNCU Survey, 2016) (N=270).

4.2.1.3.2 The economic impacts of the Dusi Canoe Marathon

Tourism KwaZulu-Natal[32] produces an annual Economic Impact Assessment of the Dusi Canoe Marathon. Key findings for 2010 to 2018 are summarised in Table 4-24. Event participation and economic impact overtime are shown in Figure 4-16. Total attendance includes race participants and spectators. International standard practice suggests that only visitor spend and not local spend should be used to determine the economic impact of an event (Tourism KwaZulu-Natal, 2018), thus the economic impact estimates reported here exclude local spend. While 2018 shows an increase in total attendance from 2017, there was a decline in the total economic impact of the event attributed to a decrease in average spend and a decline in overnight visitor numbers.

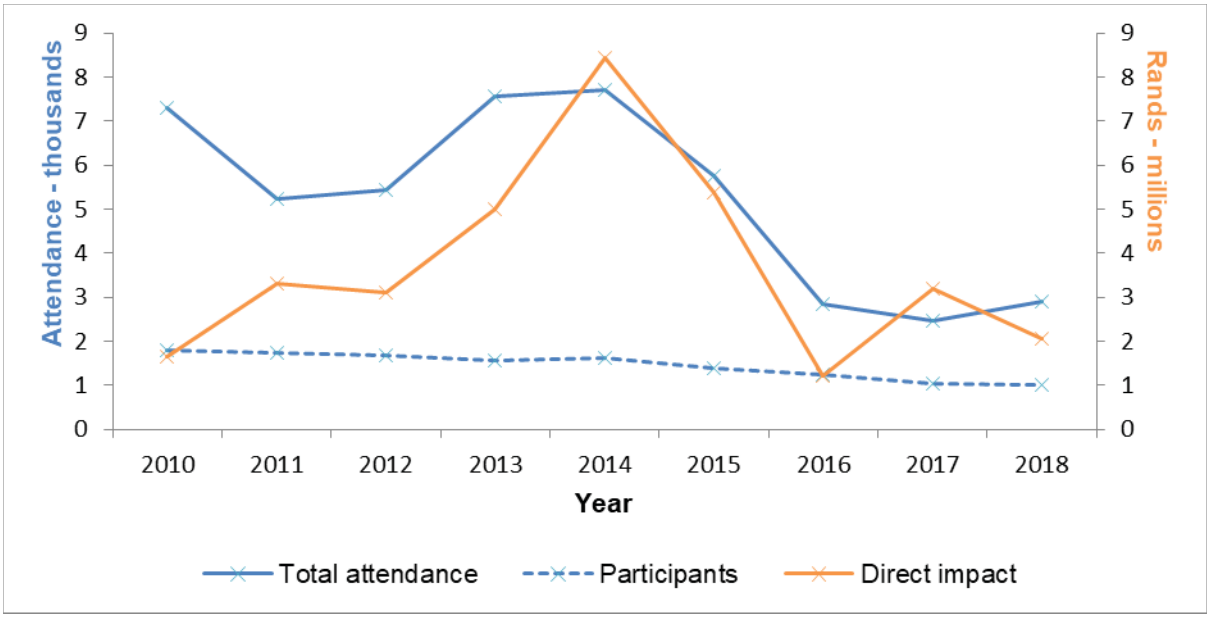


Figure 4-16: Estimated direct economic impact and event attendance, Dusi Canoe Marathon, 2010 to 2018 (data from Tourism KwaZulu-Natal).

[32] Event Impact Assessments – URL: https://www.zulu.org.za/archive/impact-assessments-of-events-in-kwazulu-natal-F57990, accessed on September 5, 2019.

Table 4-24: Estimated economic impact of spending of participants and spectators of the Dusi Canoe Marathon, 2010 to 2018

Note: Data from Tourism KwaZulu-Natal), arrows indicate an increase / decrease from 2017 to 2018

Category	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Average total spend	*n/a*	1 031	1 542	1 274	1 776	2 199	1 420	2 049	1 899	↓
Mean spend by category										
Accommodation [a]	*n/a*	1 642	2 843	1 983	1 729	3 566	2 455	4 339	1 864	↓
Transport	*n/a*	733	716	757	664	907	767	697	596	↓
Food & beverages	*n/a*	389	420	397	564	609	570	562	704	↑
Entertainment	*n/a*	346	244	492	730	557	540	74	196	↑
Souvenirs/Other	*n/a*	268	458	282	490	607	700	51	74	↑
Mean spend by group										
Participants	1 193	1 321	2 564	1 694	2 189	1 968	1 898	3 089	2 540	↓
Spectators: local	500	255	469	437	662	739	640	768	842	↑
Spectators: day visitors	790	524	1 184	718	1 323	988	620	1 349	774	↓
Spectators: overnight	2 964	3 035	4 916	4 874	6 453	4 407	2 967	3 567	4 580	↑
Estimated direct impact [b]										
Min	1 641 856	3 307 277	3 113 415	4 999 453	8 436 420	5 387 988	1 205 490	3 201 640	2 067 985	↓
Max	4 959 634	6 455 964	12 419 598	12 461 510	15 354 487	9 805 284	2 644 785	4 553 560	3 097 544	↓
Estimated total impact [c]										
Min	2 331 578	4 696 333	4 421 050	9 998 906	16 872 840	10 775 976	2 410 980	6 403 280	4 135 970	↓
Max	7 042 680	9 167 469	17 635 055	24 923 302	30 708 975	19 610 568	5 289 570	9 107 120	6 195 089	↓
Race participants	1 800	1 741	1 679	1 564	1 635	1 404	1 243	1 029	998	↓
Total attendance	7 300	5 242	5 429	7 564	7 695	5 744	2 859	2 470	2 894	↑

[a] Includes the amount for overnight visitors only; [b] Excludes local spend – international standard practice suggests that only visitor spend and not local spend should be used to determine the economic impact of an event, and local spend should be excluded; [c] A multiplier of 1.4 was applied for 2010-2012 and a multiplier of 2.0 for 2013-2018.

Tourism enterprises: uMsunduzi-uMngeni River system – Dusi Canoe Marathon (DCM)

To better understand the relationship between the Dusi Canoe Marathon event and its suppliers / service providers, businesses associated with the Dusi Canoe Marathon were identified and classified by tourism value chain category (Table 4-25). Several businesses were surveyed through a questionnaire (via email). Seven of the 11 businesses responded. In general, enterprises associated with the Dusi Canoe Marathon provide support services to the event such as event infrastructure (fencing, tents, toilets), media support (printing and helicopter coverage) and catering. For the majority of the respondents, the Dusi Canoe Marathon event contributes less than five percent to annual turnover, though one business indicated a five to 10 percent contribution. Advertising was identified as an additional benefit. On average, these businesses have been providing services to the Dusi Canoe Marathon event for eight years (with a maximum of 17 and minimum of 2 years). The average number of staff employed by the responding businesses is 12 – excluding one business which employs over 150 people in the Durban area. Five of the seven responding businesses employ additional staff for the Dusi Canoe Marathon event: on average, 27% additional staff are employed – excluding one business which employs five times its permanent staff for the Dusi Canoe Marathon event.

Table 4-25: Tourism enterprises associated with the Dusi Canoe Marathon classified by tourism value chain category

DUSI CANOE MARATHON (DCM) ENTERPRISES		
Value chain category	**Enterprise**	**Description**
Travel organisation & booking		
Direct	Natal Canoe Club / DCM organizing committee	Organizer of the DCM.
(Indirect) Promotional activities	FNB HANSA EUROSTEEL JONNSON WORKWEAR THIRSTI GAME CMH	Sponsors of the DCM (2017)
Accommodation	Multiple (13 associated with the DCM)	Provide overnight accommodation to participants and spectators.
Food & Beverage	Dickson Catering – outdoor catering	Providers of catering at the DCM stage finishes.

DUSI CANOE MARATHON (DCM) ENTERPRISES		
Value chain category	**Enterprise**	**Description**
	Hops Riverside – Durban	Official venue of the DCM 'after party'.
Transportation	Local service provider	A service to drive paddler's cars to each stage finish.
Support services		
Event infrastructure	Bedouin Tents	Supplier of marquees for the stage finishes.
	Event World	Provide and co-ordinate the infrastructure for the finish of the DCM at Blue Lagoon; includes marquees, furniture, power, staging and AV.
	M Rent	Event infrastructure.
	Inkunzi Fencing	Providers of crowd control fencing and picket fencing.
Toilets	Sanitech	Supplier of sanitation.
Media	Big Shot Media	Production and broadcasting of the DCM.
Media / Safety	BAC Helicopters	Helicopter charter services, including aerial photography.
Canoe repairs	Kayak Centre	Provides canoe repair services during the race.
Medical	Kings Park Sport Medicine Centre	Sports massage therapists on-site at Dusi Bridge and Inanda Dam stage finishes.
Printing	Pastel Printers	Promotion and communication materials.
Location	Inanda Dam (Msinsi Holdings)	Provide (for hire) the location of the stage 2 finish.
	Blue Lagoon (eThekwini Municipality)	Provide (for hire) the location of the DCM finish.

Figure 4-17 shows the number of enterprises per tourism value chain category and provides a sense of the different types of services and products associated with the Dusi Canoe Marathon tourism system.

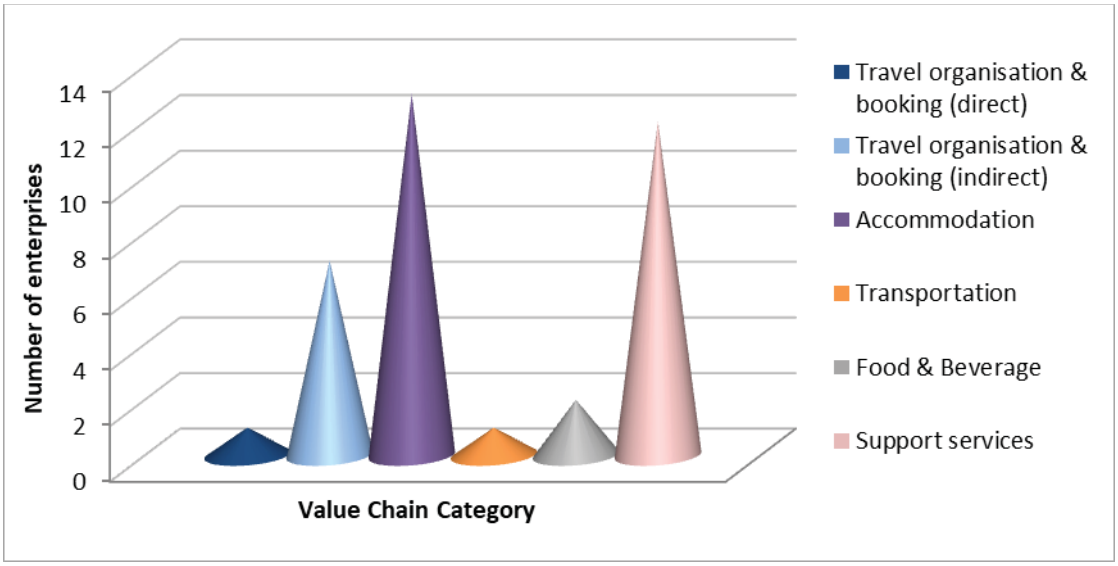


Figure 4-17: The number of tourism enterprises associated with the Dusi Canoe Marathon classified by tourism value chain category.

4.2.1.3.3 The impacts of deteriorating water quality on the Dusi Canoe Marathon

The KNCU survey also sought to explore general areas of concern with regards to (a) retaining existing participants and (b) attracting new participants to the sport of canoeing. Issues pertaining to water levels and water quality featured frequently among the responses (Table 4-26).

Table 4-26: Key issues, identified by respondents, to retaining existing, and attracting new, participants to the sport of canoeing (KNCU Survey, 2016) (n=270).

Issue	Respondents (%)
Poor water quality leading to health issues	**25**
Fluctuating water levels	**21**
High registration costs	11
Becoming an elite sport as equipment is too expensive	10
Travelling costs are too high	7
Safety	7
Drought	**6**
Lack of information for new paddlers regarding skills and technique	5
Poor mainstream / media coverage	4
Not enough diversity of disciplines within the sport	3

As part of this research project, additional interviews were undertaken with individuals involved in canoeing in KZN to gain a better understanding of canoeists' perceptions of the water quality of the uMsunduzi-uMngeni River. Several responses are quoted in Table 4-27 (Sithole, 2018).

Table 4-27: Canoeists' perceptions of the water quality of the uMsunduzi-uMngeni River

Paddler interviews
Age: 29 Number of years involved in the Dusi Canoe Marathon: 0-3 years "*The water quality of the Msunduzi River is extremely poor, and I've been aware of its poor water quality for the last 10 years. Participation in the marathon has been discouraged by low water levels and poor water quality, which could potentially make us sick*" (08-11-2018).
Age: 48 Number of years involved in the Dusi Canoe Marathon: 6-10 years "*The water quality is very poor, and has made me nervous about participating in the Marathon in case I fall in. The river also smells really bad*" (08-11-2018).
Age:45 Number of years involved in the Dusi Canoe Marathon: 11-15 years "*The water quality is dangerously bad, and I've been aware of its poor state since the 1980s. The water can make you fall sick and it stinks*" (08-11-2018).
Age: 49 Number of years involved in the Dusi Canoe Marathon: 16-20 years "*The water quality is extremely poor and how sick I can get discourages me from returning to participate in the Marathon next year. When you get sick the enjoyment factor reduces exponentially*" (08-11-2018).
Age: 40 Number of years involved in the Dusi Canoe Marathon: 3-4 years "*The water quality is extremely bad and full of sewage waste. This is because of the poor management of sewage plants by the local municipality*" (08-11-2018).
Additional stakeholder interviews
Respondent: "*water quality is a big problem for the Dusi Canoe Marathon, and is the biggest threat to its continuation. The poor water quality is also a threat to the health of the paddlers as they can fall sick. This has resulted in a decrease in the number of paddlers who partake in the Marathon*" (08-11-2018).

Respondent [discussing canoeing trails at the Blue Lagoon Estuary]: "*The more the water quality and level of the dam deceases the less fun the experience is for tourists. Drought also impacted negatively on the water levels, this is evident because four years ago water levels were higher, so canoeists had to walk shorter distances to the river, now because of the drought, and water levels are much lower, so canoeists walk three times the distance to get to the estuary to launch their canoe. This has a negative impact on the tourist experience and tourism activities*" (2018-09-11).

These perceptions are corroborated with the monitoring of the water quality of the uMsunduzi-uMngeni River system. The Duzi uMngeni Conservation Trust (DUCT) – with support from Umgeni Water, Msunduzi Municipality and Talbot Laboratories – provides an overview of the water quality of the system in the specific context of the Dusi Canoe Marathon. A morbidity survey of the number of paddlers suffering from 'Dusi Guts' (an upset stomach associated with poor water quality) is undertaken after each Dusi Canoe Marathon. Summaries of the water quality and morbidity results are reproduced in Figure 4-18, Table 4-28, and Figure 4-19 (DUCT, 2018[33]). The years 2008 and 2016 show a spike in *E.coli* levels and a corresponding spike in the number of race participants affected by 'Dusi Guts'.

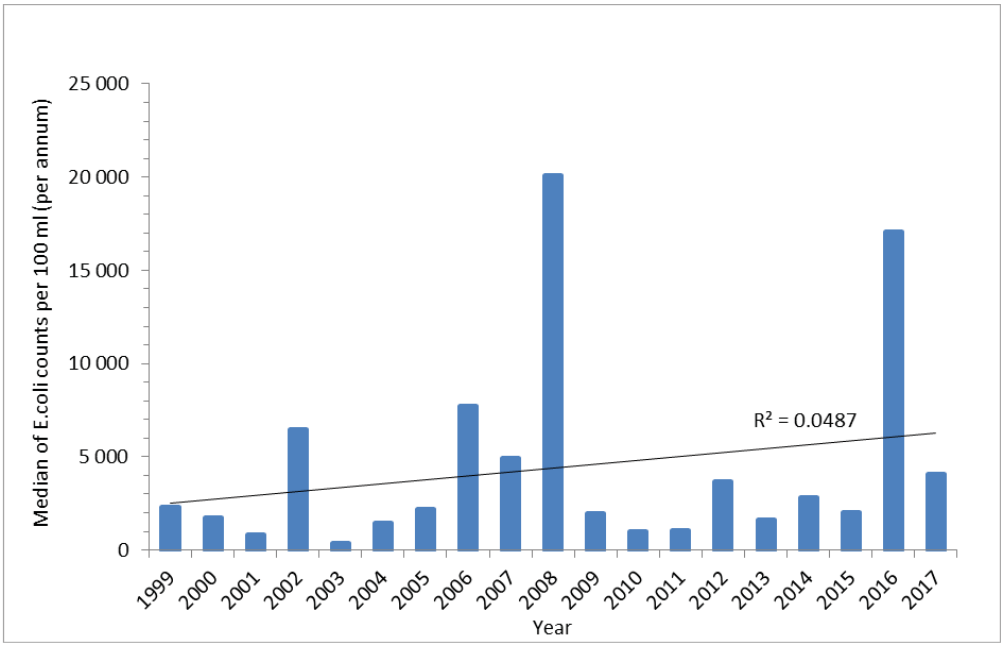


Figure 4-18: *E. coli* based water quality indicator for the Dusi Canoe Marathon Route.

Note: E.coli counts (an indicator of the presence of pathogens) above 10 000 per 100 ml reflect a moderate risk to canoeists and some likelihood of illness (1 in 5 canoeists may become ill); a count greater than 25 000 per 100 ml is considered high risk (approximately 1 in 3 may become ill) and canoeists are advised to consider not canoeing, or to only paddle on flat water with no risk of falling out (DUCT, 2018).

[33] Available from https://www.duct.org.za/duzi-paddlers-information.html.

Table 4-28: Dusi Canoe Marathon morbidity survey

Year	Surveys sent out	Response rate (%)	Suffered from 'Dusi Guts'	Did not suffer from 'Dusi Guts'	Morbidity as % of respondents	Median water quality over race
2008	188	94	83	94	46.9	20 100
2009	277	65	17	163	9.4	2 000
2010	na	na	10		14.9	1 000
2011	na	na	na		10.0	1 035
2012	167	79	9	123	6.8	3 700
2013	149	85	11	115	8.7	1 630
2014	160	49	15	64	19.0	2 844
2015	63	62	11	28	28.2	2 005
2016	148	55	34	47	42.0	17 075
2017	93	66	12	49	19.7	2 328

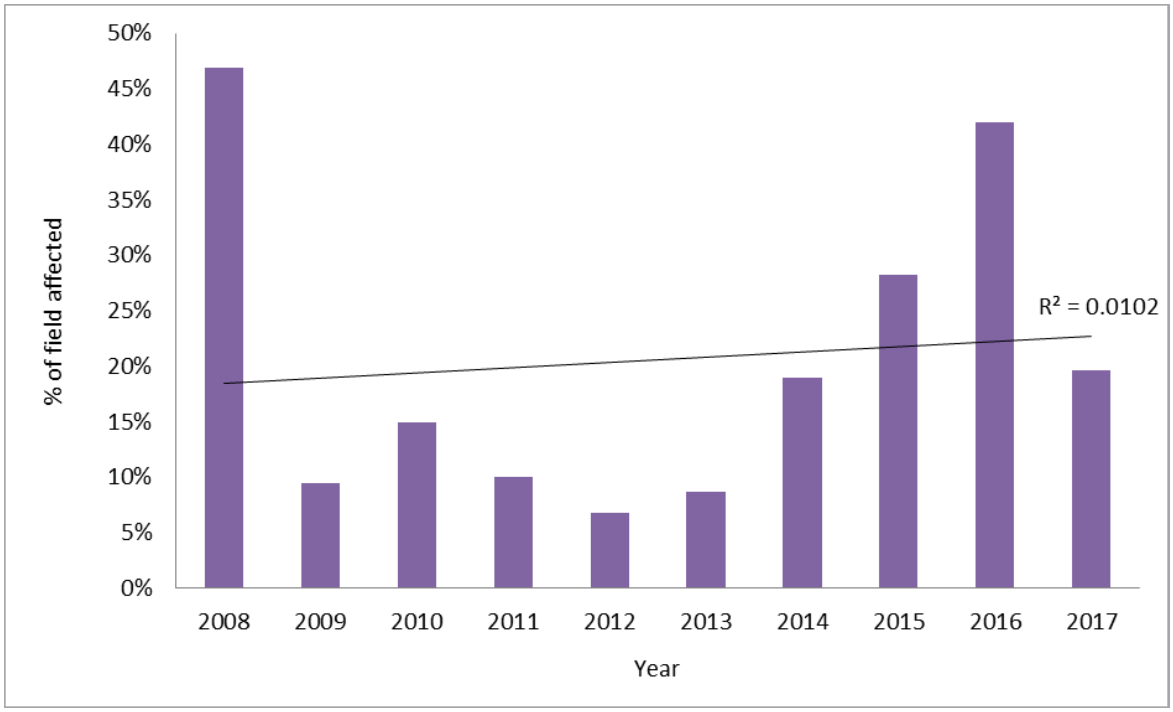


Figure 4-19: Dusi Canoe Marathon water quality and morbidity history.

Note: Based on responses from 5% to 10% of the field, 39 < n < 177 (DUCT, 2018).

Media coverage also illustrates the negative perceptions of water quality particularly of the Msunduzi River (see Boxes 4-2 and 4-3).

Box 4-2: Media coverage – perceptions of water quality of the uMsunduzi-uMngeni River system (Pieterse, 2018)

The Witness

'Paddling in a sewer'

Blocked drain discharges sewage into Duzi at paddling and picnic area

The Witness, 8 Nov 2018, CHELSEA PIETERSE - chelsea.pieterse@witness.co.za

Local paddler Gavin Dundas-Starr crouches next to the overflowing manhole that has been leaking thousands of litres of sewage into the Duzi at Camps Drift for the past three months (Ian Carbutt).

A BROKEN sewer at the edge of Camps Drift has been discharging thousands of litres of sewage into the river for over three months despite multiple complaints from local paddlers. Positioned just a few metres from the water's edge on the grassy banks of the river, the broken manhole is estimated to leak around 1 000 litres of sewage per minute by some local paddlers.

The Witness visited the blocked manhole yesterday afternoon and found it overflowing with disintegrated toilet paper, and human waste.
The sewage has formed a rivulet running from the manhole straight into the Duzi River at Camps Drift.

Although the leaking manhole can be heard and smelt from metres away, there were still several people fishing a little way away from it.
There were also several people who were sitting on the river bank, eating their lunch less than 20 metres away.

Pietermaritzburg resident and paddler Gavin Dundas-Starr said he and "about 30 local canoeists" had been reporting the leaking sewer for the past three months.

He said, however, that the reports have "fallen on deaf ears of the municipality".

"A lot of the paddlers feel that this issue has not been taken seriously," said Dundas-Starr.

"This is the home of Pietermaritzburg paddling.

"When you get out on to the water, it feels like you are paddling in a sewer pit. It is disgusting."

Dundas-Starr said for regular paddlers and professional paddlers, "hepatitis vaccines and daily pro-biotics are the norm".

He said the Camps Drift to Bishopstowe Canoe Race, which is one of the Duzi seeding races, was two weeks ago.

"Some of the paddlers who took part are still sick," he said.

"My children like to paddle but I don't really want them to be in the water because of the sewage, but in the afternoons we have about 50 kids paddling out on the Duzi.
"My children only paddle about three times a week."

He added that people who participate in the park runs on Saturdays also run past the blocked manhole.

He said it had become a health and safety hazard for those using the Duzi to fish or paddle.

Duzi-uMngeni Conservation Trust's (Duct) David Still said yesterday that in following the terms of their contract with the municipality, Duct locates and reports leaking sewers to the municipality to fix.

Still said Duct could not comment further as Duct is not allowed to communicate directly with the media.

The Msunduzi Municipality had not responded to media queries at the time of going to print yesterday.

Box 4-3: Media coverage – perceptions of water quality of the uMsunduzi-uMngeni River system (Kocott & Mngadi, 2018)

8 NEWS
SUNDAY TRIBUNE FEBRUARY 04 2018

A water pollution time bomb

Alarmed specialists say Durban's water security is not so much threatened by scarcity as by upstream pollution – much of it emanating from Pietermartizburg's Msundusi River. **Fred Kocott and Siboniso Mngadi** report

DURBAN might not face a Day Zero water crisis in the foreseeable future but a more insidious and pervasive threat: upstream pollution of the city's major water source.

Already Inanda Dam, Durban's primary water supply, is blooming with harmful blue-green algae (cyanobacteria).

If not addressed, this will lead to premature ageing and serious deterioration of this body of water through a phenomenon called eutrophication, says a leading aquatic scientist and GroundTruth director, Dr Mark Graham.

Graham said eutrophication can produce cyanotoxins. The World Health Organisation has warned that exposure to these toxins through drinking the polluted water can cause liver damage, skin irritation and rashes, stomach cramps, nausea and vomiting, diarrhoea, fever, muscle and joint pain, mouth blisters, drowsiness, slurred speech and increased salivation.

Graham said while the cyanotoxin levels in Inanda Dam were not yet considered unsafe to swim or canoe in, it was certainly not safe to drink, and would require additional and costly purification treatment before it enters Durban's water supply.

"It requires an advanced treatment process which becomes hugely expensive. This will exponentially increase the costs of water to domestic and business consumers," said Graham.

He said this could have major economic implications, particularly for a developing country like South Africa, where most people cannot afford to pay for water supply.

Graham has 30 years of experience in terrestrial and aquatic "ecosystem management and has worked on numerous national and international projects investigating solutions to ecological problems.

He warned that if the levels of Inanda Dam become exceptionally low because of prolonged drought as in Cape Town, the toxic algal blooms could turn the water into a "great big biological soup".

Ironically, KwaZulu-Natal enjoys the cleanest and highest rainfall water catchment area in South Africa – the Drakensberg, from which flows crystal clear water into mountain streams and ultimately into rivers which supply most of the province's water.

But as the rivers flow through agricultural, industrial and urban areas toward the sea, the once crystal clear water becomes increasingly polluted.

Graham said sewage-contaminated water flowing out of Pietermaritzburg and into the Msundusi and Umgeni rivers, along with nutrients from agricultural activity, were primary causes of algal blooms in Inanda Dam.

Many believe that problem lies in failure of the Pietermaritzburg municipality to rehabilitate the city's ageing 1450km sewer network.

While Pietermaritzburg's city manager, Sizwe Hadebe, argues that sufficient resources are allocated to maintaining the city's sewer network, the latest river testing results from Umgeni Water tell a different story.

These results show that high levels of E. coli have increased dramatically over the last 10 years, with nearly 50% of sites now recording E. coli counts of 10000 units per 100ml of water. This is 10 times the permissible limit (1000 units) determined by South Africa's national water quality standards.

Graham said Pietermaritzburg's original sewer network was built at the turn of the last century to cater for under 100000 people.

It has since been extended to serve up to between three million and four million people, but was not coping nor being properly maintained, said Graham.

This is despite the faecal pollution making headlines each year – always in the run-up to the iconic Duzi Canoe Marathon.

Two years ago a leading development consultant in Pietermaritzburg and acting CEO of Duzi Umngeni Conservation Trust, Richard Clacey, warned that not enough money was being allocated to rehabilitate the city's sewer network.

In an article in The Witness in early 2016 Clacey revealed that the municipality's own studies had revealed that R94 million was required to urgently rehabilitate Pietermatizburg's sewer network, but only R6 milion was allocated to address the crisis in the 2016/17 financial year.

How much has since been spent, Hadebe was unable to say this week.

Back in 2016, Clacey also cited river testing figures showing the dramatic escalation in E.coli levels in the Pietermaritzburg catchment area over a period of 10 years.

He said the continued decline in the river's water quality posed a risk to the city's reputation as a tourism destination and host of the Dusi Canoe Marathon, which brings R35 million annually into the local and regional economy.

Of greater concern, said Clacey at the time, was the eutrophication (toxic algal bloom) beginning to happen on Inanda Dam and the impact this would ultimately have on Durban.

"This threatens Durban's water security and will lead to a sharp increase in the cost of water treatment, affecting the competitiveness and long-term sustainability of the region's most important local economy," wrote Clacey.

That was two years ago.

This week Graham and other water specialists said the situation had since worsened, and echoed Clacey's concerns that purification of water from Inanda Dam could become prohibitively costly.

If this happens, large industrial consumers of water will face increased production costs, as has happened with electricity.

This in turn will make final product costs uncompetitive or result in sharply lower profit margins.

"And the more we have to pay for water, the less is there to spend on maintenance, which is already not happening as it should," said Graham.

Umgeni Water, the largest supplier of bulk potable water in KZN, was unable to disclose on Friday the amount it currently spends on water purification or advise whether it had budgeted for increased spending as a result of increased pollution in catchment areas.

In the meantime, pollution of Pietermaritzburg catchment continues to be monitored on a weekly basis.

In a recent e-mail accompanying the test results which get sent weekly to various stakeholders, including senior municipal staff and Department of Water and Sanitation officials, Umgeni Water pollution scientist Steve Terry said: "It is still nasty everywhere."

Terry said that throughout 2017 the highest pollution levels were consistently recorded at Bayne's Spruit, a small tributary of the Msundusi River that has historically served as a valuable resource to the nearby Sobantu community for fishing, swimming and irrigation purposes.

The latest Bayne's Spruit sampling results reveal E coli counts in excess of 830000 units per 100ml. This is practically slightly diluted raw sewage.

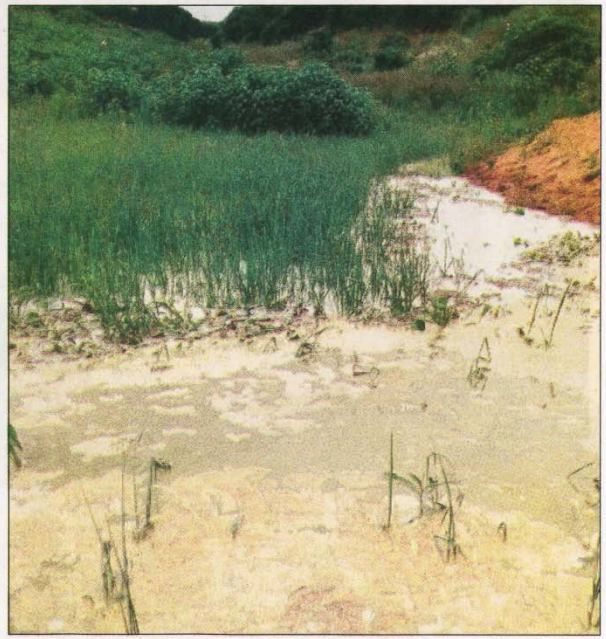
Several people have raised concerns that young children in Sobantu and other areas surrounding Pietermaritzburg continue to play in the city's tributaries, including Bayne's Spruit, particularly in the hot summer months.

"That is really dangerous. They are getting exposed to serious health risks," said one stakeholder involved in the monitoring of water quality.

"People undertaking market gardening on banks of the river, using the water for irrigation, are also increasingly at risk. This undermines their livelihood opportunities," added Graham.

FACT BOX

South Africa's national water quality standards allow 1 000 units of E. coli per 100 ml of water in treated sewage water. An E. coli count below 300 is considered "good" quality for recreational sports in South Africa but drinking water should not contain any E. coli.



Inanda Dam, Durban's primary water supply, is blooming with blue-green algae which can kill off fish and generate cyanotoxins harmful to animal and human life.

To further illustrate water-related risks for the Dusi Canoe Marathon, Pope's Canoe Centre's closure can be highlighted. Pope's Canoe Centre was a family run business located in Pietermaritzburg. The business sponsored more than 23 Dusi Canoe races and was highly regarded as a canoe supplier. The business also provided sponsorships for young and upcoming paddlers. After the 2016 Dusi Canoe Marathon, the business closed due to a continuing decline in the demand for canoes. As a result of the shutdown, 19 jobs were lost. In an interview (Sithole, 2018), the owner of Pope's Canoe Centre attributed the declining demand for canoes to a decrease in the numbers of paddlers participating in the Dusi Canoe Marathon, specifically as a result of worsening water quality in the Msunduzi River: "*The water quality of the Msunduzi River is so bad and full of sewage. This poor water quality has caused the number of paddlers who partake in the Dusi Canoe Marathon to decrease significantly over the years…This resulted in the demand for boats going down, and the business shutting down in 2016*" (08-11-2018).

4.2.1.3.4 Modelling the economic impacts of water-related scenarios: What future(s) for the Dusi Canoe Marathon?

Two natural capital dependency pathways relevant to participants in the Dusi Canoe Marathon were identified as material:

- **River water levels** (risk of decrease) → affect the quality of experience to the participant, influencing future participation → participant numbers impact the product (organizer financial impact, jobs, etc.) and have a regional economic impact (e.g. accommodation, other spending categories); with three key change drivers / factors of water levels – rainfall, dam releases, exotic vegetation density.
- **River water quality** (risk of decline) → affects the quality of experience to the participant (health, satisfaction), influencing future participation → participant numbers impact on the product (organizer financial impact, jobs, etc.) and have a regional economic impact (e.g. accommodation, other spending categories); with three key change drivers / factors of water quality – point & non-point source pollution, water quantity (dilution).

Based on secondary data collected (i.e. significant changes in event attendance over the years due to a combination of factors, including water quantity and quality), 5 scenarios were defined:

- Scenario 1: No significant change in water levels and water quality (based on a 'normal' year): 2% change in attendance;
- Scenario 2: Water quality declines slightly: -5% change in attendance;

- Scenario 3: Water quality declines significantly: -25% change in attendance;
- Scenario 4: Water levels remain at drought levels or decline further: -50% change in attendance;
- Scenario 5: Water levels and water quality improve: 25% change in attendance.

Table 4-29 shows the results of the modelling of the impacts of water-related scenarios on attendance of the Dusi Canoe Marathon event up to 2030 while Table 4-30 and Table 4-31 show, respectively, the impacts of these scenarios on the expected direct and total economic impacts. While the results for scenario 5 are improbable, as participant numbers greater than 1 500, along with the attendant spectators, begin to compromise the quality of the experience, scenarios 3 and 4 suggest a collapse of the event. Building on the ample evidence of water-related impacts on the canoeing experience (section 4.2.1.3.3), collapse scenarios may be further supported by a combination of key factors such as an aging client base and few new participants. While no staff member is dedicated full time to only the Dusi Canoe Marathon and the event represents a small, but predictable, proportion of the turnover of interviewed businesses, the results of these scenarios would have significant implications for water-related tourism businesses and jobs throughout the uMngeni-Msunduzi River, as water quality decline and low water levels would be experienced in several places across and period of time and impacts would not be limited to the Dusi Canoe Marathon event.

Table 4-29: The impacts of water-related scenarios on the attendance of the Dusi Canoe Marathon to 2030

Note: Baseline 2018 data from Tourism Kwazulu-Natal; in red, scenarios with a complete collapse of the tourism system and in grey those that are improbable given the limited capacity of the Dusi Cane Marathon to manage participants without compromising the experience)

Water-related scenarios	Adaptive cycle phase (tourism)		Tourism growth	Change in attendance due to scenario	Race participants			Spectators			% change (2018-30)
					2018	2019	2030	2018	2019	2030	
1	Status quo	Conservation / consolidation	1%	2%	998	1028	1423	876	902	1249	43%
2				-5%		958	611		841	537	-39%
3				-25%		758	37		666	33	-96%
4				-50%		509	0		447	0	-100%
5				25%		1257	15980		1104	14027	1501%
1	Growth	Exploitation phase	5%	2%	998	1068	2248	876	937	1973	125%
2				-5%		998	998		876	876	0%
3				-25%		798	69		701	60	-93%
4				-50%		549	1		482	1	-100%
5				25%		1297	23251		1139	20409	2230%
1	Crisis	Release / collapse	-5%	2%	998	968	692	876	850	608	-31%
2				-5%		898	282		788	247	-72%
3				-25%		699	14		613	12	-99%
4				-50%		449	0		394	0	-100%
5				25%		1198	8898		1051	7811	792%

Table 4-30: The impacts of water-related scenarios on the direct economic impacts (R) of Dusi Canoe Marathon to 2030

Note: Baseline 2018 data from Tourism Kwazulu-Natal; in red, scenarios with a complete collapse of the tourism system and in grey those that are improbable given the limited capacity of the Dusi Cane Marathon to manage participants without compromising the experience

Water-related scenarios	Adaptive cycle phase (tourism)		Tourism growth	Change in attendance due to scenario	Total economic impact (R) 2018		2019		2030		% change (2018-30)
					Min	Max	Min	Max	Min	Max	
1	Status quo	Conservation / consolidation	1%	2%	2067985	3097544	2130025	3190470	2948452	4416357	43%
2				-5%			1985266	2973642	1267075	1897895	-39%
3				-25%			1571669	2354133	76791	115022	-96%
4				-50%			1054672	1579747	640	959	-100%
5				25%			2605661	3902905	33112649	49597984	1501%
1	Growth	Exploitation phase	5%	2%	2067985	3097544	2212744	3314372	4657498	6976263	125%
2				-5%			2067985	3097544	2067985	3097544	0%
3				-25%			1654388	2478035	142111	212862	-93%
4				-50%			1137392	1703649	1585	2373	-100%
5				25%			2688381	4026807	48180091	72166844	2230%
1	Crisis	Release / collapse	-5%	2%	2067985	3097544	2005945	3004618	1434856	2149207	-31%
2				-5%			1861187	2787790	584060	874838	-72%
3				-25%			1447590	2168281	28624	42874	-99%
4				-50%			930593	1393895	143	214	-100%
5				25%			2481582	3717053	18438362	27618013	792%

Table 4-31: The impacts of water-related scenarios on the total economic impacts (R) of Dusi Canoe Marathon to 2030

Note: baseline 2018 data from Tourism Kwazulu-Natal; in red, scenarios with a complete collapse of the tourism system and in grey those that are improbable given the limited capacity of the Dusi Cane Marathon to manage participants without compromising the experience

Water-related scenarios	Adaptive cycle phase (tourism)		Tourism growth	Change in attendance due to scenario	Total economic impact (R) 2018		2019		2030		% Change (2018-2030)
					Min	Max	Min	Max	Min	Max	
1	Status quo	Conservation / consolidation	1%	2%	4135970	6195089	4260049	6380942	5896904	8832716	43%
2				-5%			3970531	5947285	2534149	3795791	-39%
3				-25%			3143337	4708268	153582	230044	-96%
4				-50%			2109345	3159495	1281	1918	-100%
5				25%			5211322	7805812	66225298	99195984	1501%
1	Growth	Exploitation phase	5%	2%	4135970	6195089	4425488	6628745	9314997	13952527	125%
2				-5%			4135970	6195089	4135970	6195089	0%
3				-25%			3308776	4956071	284222	425723	-93%
4				-50%			2274784	3407299	3169	4747	-100%
5				25%			5376761	8053616	96360181	144333711	2230%
1	Crisis	Release / collapse	-5%	2%	4135970	6195089	4011891	6009236	2869711	4298415	-31%
2				-5%			3722373	5575580	1168120	1749676	-72%
3				-25%			2895179	4336562	57247	85748	-99%
4				-50%			1861187	2787790	285	427	-100%
5				25%			4963164	7434107	36876724	55236036	792%

4.2.2 Olifants River Catchment – Recreational fishing, Loskop Dam

The results of the Loskop Dam case study are organised as follows:

- Characterisation of the case study in the context of the Panarchy model (section 4.2.2.1);
- Ecosystem service supply, demand and stress modelling according to different water-related glocal change scenarios model (section 4.2.2.2);
- Economic impact modelling of tourism according to the different water-related glocal change scenarios model (section 4.2.2.3).

4.2.2.1 Characterisation of the case study in the context of the Panarchy model

This section is organised as follows:

- Introduction to tourism in the study area (section 4.2.1.1.1);
- Trends in tourist numbers linked to the fishing competitions (section 4.2.2.1.2);
- An adaptive cycle model of the Loskop Dam fishing competitions (section 4.2.1.1.3).

4.2.2.1.1 Introduction to the study area

Loskop Dam (25˚ 26' 57. 05" S 29˚ 19' 44. 36" E) is located about 32 km south of the town of Groblersdal in the Mpumalanga Province, in the upper catchment of the Olifants River (Figure 4-20 and Figure 4-21). The impoundment was initially built to provide water for agriculture and it is one of the largest in South Africa. While irrigation remains the dam's primary function, Loskop Dam has become a freshwater angling hot spot and popular tourist attraction (Driescher, 2008) and draws both international and local tourists every year (La Grange, 2015). The dam is surrounded by the approximately 25 000 ha Loskop Dam Nature Reserve managed by the Mpumalanga Tourism and Parks Agency (MTPA). Loskop Dam and associated activities in the area (fishing competitions, game viewing on boats, water sports, lodges, etc.) play an essential role in tourism and the economy of the area.

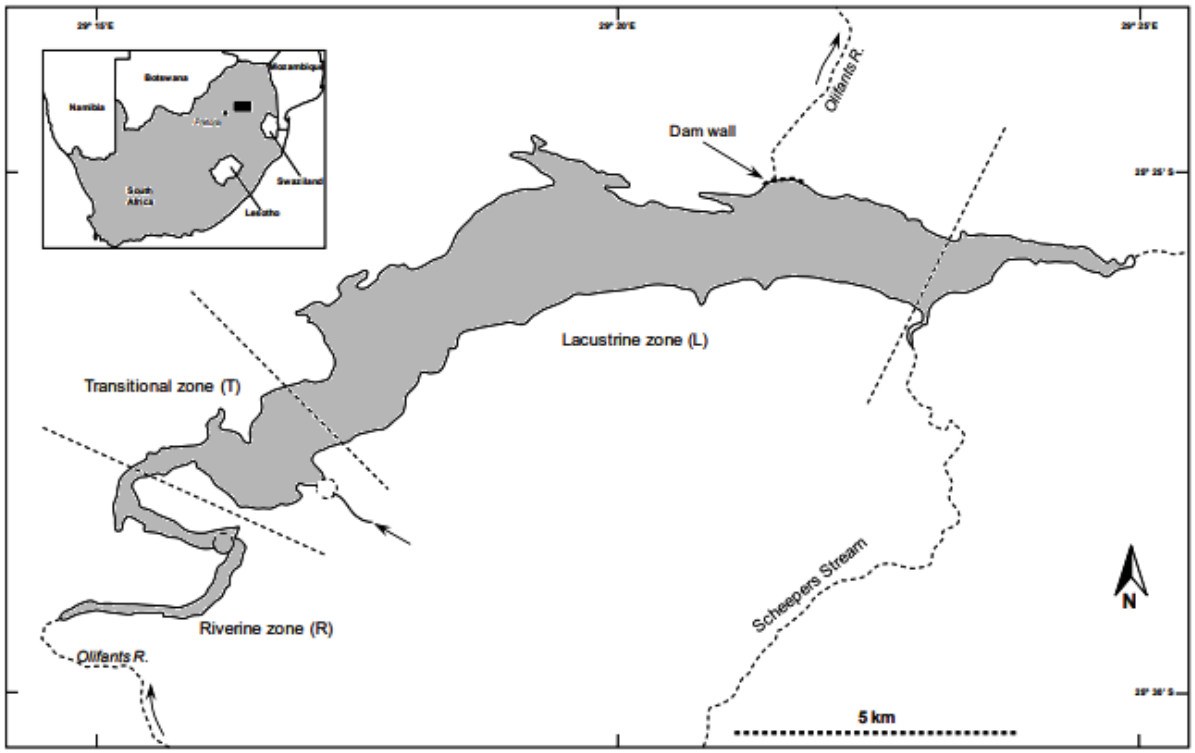


Figure 4-20: Map of Loskop Dam (25˚ 25‘1"S 29˚ 21’30"E) in the upper Olifants River Catchment (Shakwane, 2018).

LOSKOP DAM

Figure 4-21: Loskop Dam, Fishing competition, October 2018.

4.2.2.1.2 Trends in tourist numbers related to fishing competitions

In this case study, ‘tourists’ are defined as the competitors / participants and the associated family and friends who attend fishing competitions held at Loskop Dam. There are six main annual fishing competitions held at Loskop Dam. Competitor numbers were sourced from the organizers of the fishing competitions (Table 4-32). Organizers identified the value of prizes, the weather, and the prevailing economic climate as key factors influencing participation in the

fishing competitions. One organizer noted that there appeared to be a shift toward day attendance as accommodation (predominantly at the Forever Resorts establishment) rates have increased. The value of the prizes, entrances fees and competitor numbers for the main competitions are reported in Table 4-33 for 2018.

Table 4-32: Loskop Dam fishing competitor numbers from 2014 to 2018

Competitors	2014	2015	2016	2017	2018
Maximum	1000	730	804	712	820
Average (per event)	441	369	376	362	393
Total per year (all events)	2203	1846	1880	1808	1963

Table 4-33: Loskop Dam fishing competitions, entrance fees and value of prizes, 2018

Fishing competition	Entrance fee	Value of prizes	No. entries
Karp & Barber Bonanza	350	350 000	820
Kurper Bonanza	300	>300 000	585
Baber	300	>80 000	363
Sterling Moddervis	150	23 500	120
Sterling Plastic Bass	200	17 000	75
3 Species	380	> 164 000	n/a

Survey of fishing competition participants

A survey of competitors taking part in the 2018 Karp and Barber Fishing Bonanza was undertaken[34]. The survey investigated motivations for fishing at Loskop Dam and competitors' perceptions of water quality and its role in tourism at Loskop Dam. The competition received 820 entries for 2018, and 46 questionnaires were completed during the competition (6-7 October 2018). Key results from the survey are summarised in Table 4-34.

[34] As part of this research project and in collaboration with the University of Limpopo.

Table 4-34: Selected results from the survey of fishing competition participants, Karp and Barber Fishing Bonanza, Loskop Dam, October 2018 (n = 46)

PARTICIPATION
• 41% of respondents have been fishing for more than 25 years. • 46% undertake more than 10 fishing trips per year (non-competitions). • 85% spend 7 or more days on fishing trips per year. • 48% enter at least 2 competitions per year; 20% enter more than 5 per year.
DISTANCE
• On average, distance travelled by participants to Loskop Dam is 151 km.
SPEND
• Average total spend per participant per fishing competition at Loskop Dam is R9 458. • On average, 34% of the total spend is spent locally. • The highest spending is on accommodation, followed by food, transportation and fishing equipment.
MOTIVATION
• 76% of respondents cited 'enjoyment of nature and the outdoors' and 'rest and relaxation' as benefits derived from the fishing competitions; 46% cited 'catching big fish' and 35% cited 'catching many fish' as benefits.
WATER QUALITY PERSPECTIVES
• 76% feel that the water quality of Loskop Dam has changed in the last 10 years of which 52% feel it has improved (mainly due to better management and improved water levels). • Declining water quality was largely attributed to pollution. • 86% indicated that the water quality of Loskop Dam affects their fishing activities; the main reason being that water quality affects the size and quantity of fish. • 85% indicated that a decrease in water quality in future would affect their willingness to fish at Loskop Dam citing reduced fish populations (53%), reduced attraction to visit (28%) and human health risk (17%) as reasons.
NON-FISHING TOURISM ACTIVITIES
• Camping and game viewing were identified as popular non-fishing activities in the Loskop Dam area; bird watching, visiting game reserves and going to restaurants were also highlighted.
• Kids' entertainment / activities were suggested by many respondents to increase the attractiveness of the area to visitors.

4.2.2.1.3 An adaptive cycle model of the Loskop Dam tourism system

Due to the very limited knowledge of the fishing competition over time, it is harder to apply the adaptive cycle model to the Loskop Dam tourism system than for the Dusi Canoe Marathon. Available statistics, however, do suggest that the activities have peaked and that without

investments into new tourism assets and the associated activities (e.g. development of tourism facilities and accommodation in the nature reserve) there will not be any significant increase in tourist numbers in the near future. Given the current conditions, one could describe the Loskop Dam tourism system as being in the conservation phase (Table 4-33), with a risk of collapse due to water quality issues.

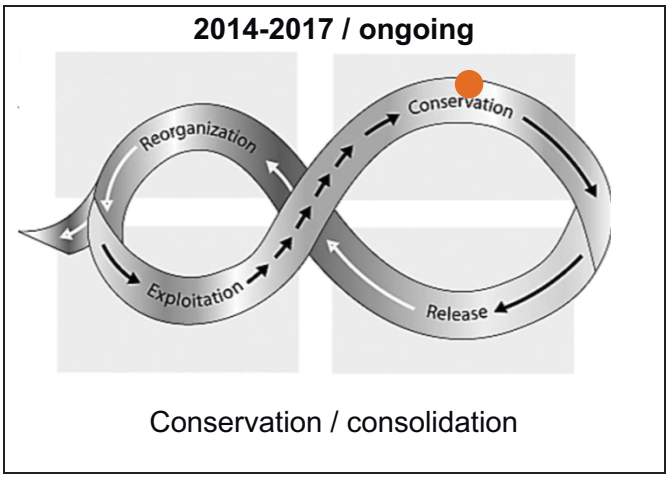


Figure 4-22: Proposed adaptive cycle stage for the Loskop Dam recreational fishing system.

4.2.2.2 Ecosystem service supply, demand and stress modelling according to different water-related glocal change scenarios model

This section is focused on highlighting the relative risk indexes for ecosystem services supply and demand (section 4.2.2.2.1) and the relative risk indexes according to three 2030 scenarios (section 4.2.2.2.2). The full ecosystem services modelling is available in the annexure (section 7.8.6 and 7.8.7).

4.2.2.2.1 Assessing the relative risk index for the ecosystem services in the Loskop Dam catchment

As shown in Table 4-35 and Figure 4-23, the relative risk indexes for water supply and quality are already very low for many quaternaries in the Loskop Dam catchment. However, habitat provision is “over-supplied” in a few quaternaries (e.g. B11L and B32A) while water supply and water quality appear to be “over-supplied” in four quaternaries (i.e. B11A, B11C, B11L and B32A).

Table 4-35: Relative ecosystem services risk indexes for the quaternaries of the Loskop Dam catchment

Quaternary	Relative risk index (supply / demand)			
	Water supply	Water quality	Tourism / recreation	Habitat provision
B11A	25,93	25,47	30,05	132,55
B11B	5,56	5,49	5,79	28,32
B11C	30,93	30,54	37,09	159,11
B11D	1,47	1,47	1,69	7,69
B11E	5,38	5,33	6,43	27,44
B11F	8,68	8,52	9,36	43,85
B11G	0,56	0,56	0,54	2,95
B11H	7,01	6,98	7,01	36,60
B11J	0,92	0,94	0,92	4,99
B11K	0,16	0,16	0,15	0,85
B11L	70,41	79,17	71,63	422,72
B12A	2,27	2,24	2,49	11,65
B12B	7,28	7,13	7,86	36,92
B12C	9,75	9,51	10,59	48,57
B12D	0,32	0,32	0,30	1,65
B12E	0,89	0,91	0,85	4,73
B20A	0,97	0,96	0,94	4,80
B20B	1,04	1,03	0,95	5,14
B20C	10,58	10,55	9,22	53,49
B20D	1,00	1,01	0,93	5,15
B20E	10,38	10,29	10,34	51,92
B20F	8,22	8,15	7,99	40,72
B20G	1,49	1,52	1,39	7,84
B20H	0,97	1,06	1,00	5,32
B20J	6,24	7,59	7,38	40,02
B32A	31,41	38,23	35,66	202,31

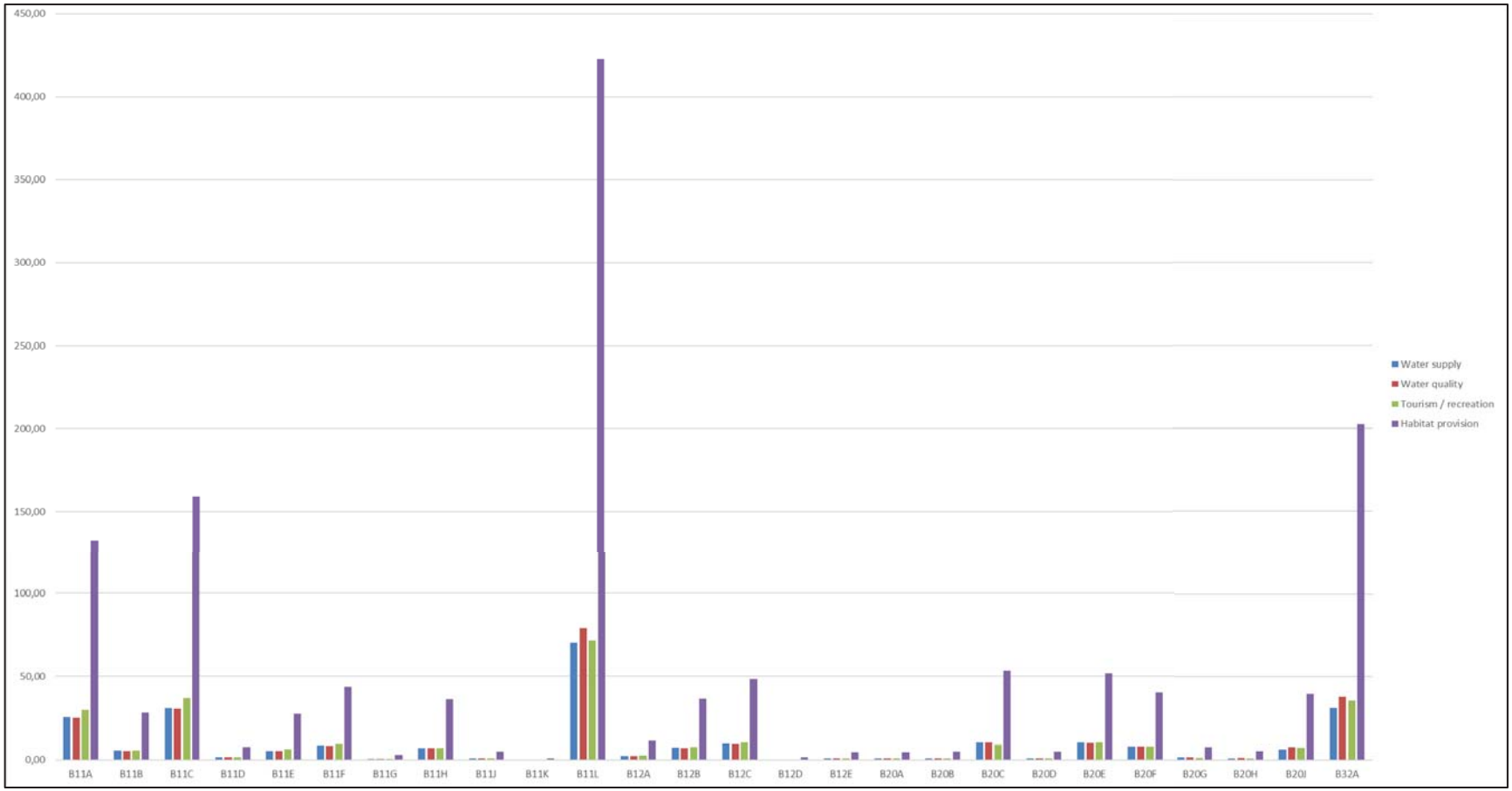


Figure 4-23: Relative ecosystem services risk indexes of the quaternaries of the Loskop Dam catchment.

4.2.2.2.2 Assessing the relative risk indexes for the ecosystem services in the Loskop Dam catchment according to three 2030 scenarios

Finally, to better understand potential changes in ES risk indexes for the Loskop Dam catchments, the following 2030 water scenarios were modelled for both catchments:

- Scenario 1: No change;
- Scenario 2: Water quality declines significantly (-50% decline in water quality, no change in water supply);
- Scenario 3: Water levels remain at drought (below a 'normal' year) levels or decline further (-50% decline in water quality and water supply); and
- Scenario 4: Water levels and water quality improve (+50% increase in water quality and water supply).

Figure 4-24 shows the changes in water supply risk indexes according to the four scenarios while Figure 4-25 shows the same for water quality risk indexes.

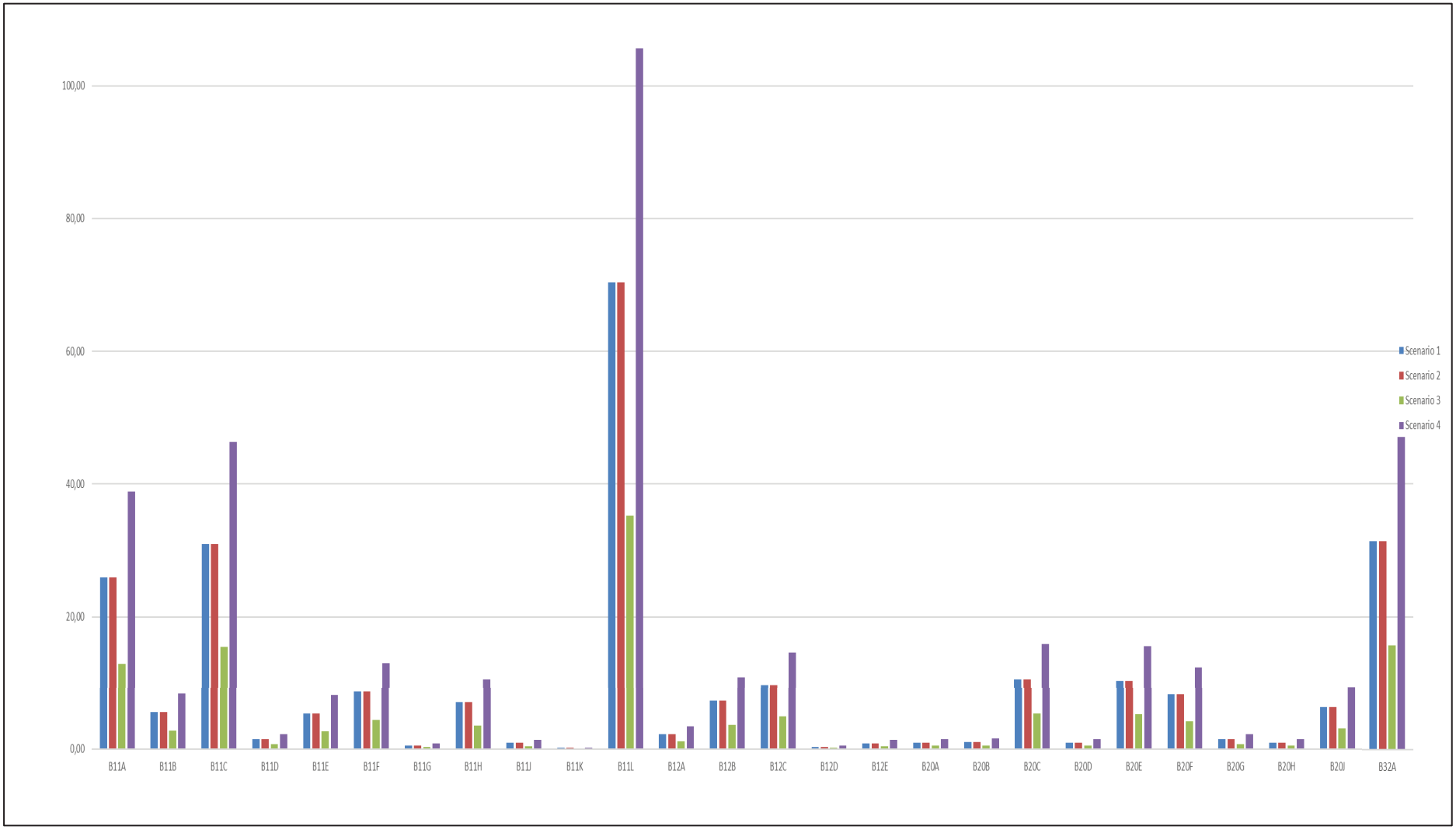


Figure 4-24: Relative **water supply** risk indexes of the quaternaries of the **Loskop Dam** catchment according to three 2030 scenarios.

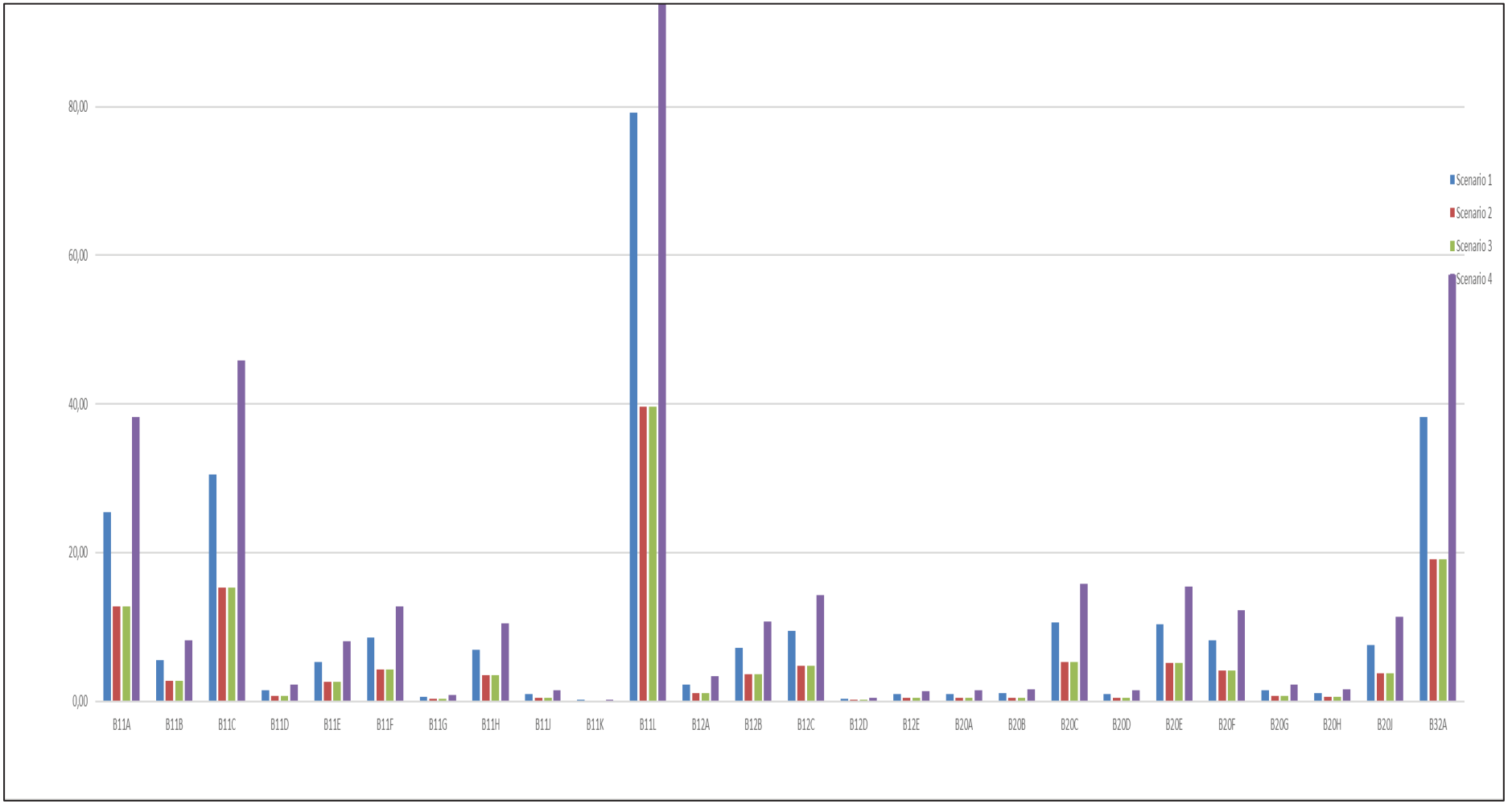


Figure 4-25: Relative **water quality** risk indexes of the quaternaries of the **Loskop Dam** catchment according to three 2030 scenarios.

4.2.2.3 Economic impacts of tourism in the Loskop Dam area

This section presents summarized results of the economic and ecological (water quality) research undertaken for the Loskop Dam recreational fishing tourism system and includes, namely:

- Business survey and perceptions (section 4.2.2.3.1);
- Trends in water quality (section 4.2.2.3.2);
- Modelling of the economic impacts of water-related climate change scenarios on the tourism system (section 4.2.2.3.3).

4.2.2.3.1 Business survey and perceptions

Tourism related enterprises based in the Loskop Dam area were identified (Table 4-36). Seven enterprises were interviewed during October 2018 (Table 4-37).

Table 4-36: Tourism enterprises associated with the Loskop Dam classified by tourism value chain category

LOSKOP DAM TOURISM ENTERPRISES		
Value chain category	**Enterprise**	**Description**
Leisure, excursions and tours	Forever Resorts	Provides the location and facilities for recreational fishing.
Travel organisation & booking	Fishing competition organizers (7 different organizers identified)	Generally there are 7 major fishing competitions held annually at Loskop Dam, attracting 500 to 800 entries.
Accommodation	Forever Resorts	Host the fishing competitions and provide accommodation (log cabins, chalets, camping) – located on the edge of Loskop Dam.
	Loskop Dam Nature Reserve	Provide accommodation in 3 chalets – located next to Loskop Dam.
	Multiple options in the area	Offer accommodation along the Olifants River, within 10 km of Forever Resorts.
Food & Beverage	Forever Resorts Restaurant	Restaurant located at the Forever Resort.
	Several options in the area	Restaurant s within 10 km of Forever Resorts.
Support services		

LOSKOP DAM TOURISM ENTERPRISES		
Value chain category	**Enterprise**	**Description**
Retail – grocery	Forever Resorts Convenience Store	Convenience store located at the Forever Resort.
	Rietvallei General Store	Convenience store.
Retail – angling equipment	Go Fish Angling	Supply angling equipment to Aventura Loskop Dam (Forever Resorts).

Table 4-37: Location and services supplied by tourism enterprises interviewed, Loskop Dam

Enterprise	Location	Services (value chain category)
1	5 km from Forever Resorts, Loskop Dam	Accommodation; Food & Beverage; Retail
2	Loskop Dam	Food & Beverage – restaurant
3	Loskop Dam	Retail – convenience store
4	Witbank – have an outlet at Loskop Dam during fishing competitions	Retail – fishing equipment
5	20 km from Loskop Dam	Accommodation; Food & Beverage; Recreation (small)
6	7 km from Loskop Dam	Accommodation; Food & Beverage; Recreation
7	Loskop Dam	Retail; Food & Beverage – kiosk

Employment

The average number of permanent staff employed by the responding businesses is 16 (minimum of 1, maximum of 44). All the responding businesses indicated that they hire additional temporary staff seasonally or specifically during Loskop Dam fishing competition times. On average, five additional staff are employed during peak times.

Tourism

In general, the respondents felt that tourism in the Loskop area is good. Respondents highlighted that the recently completed roadworks had a significant negative impact on tourism, but that tourism is improving since the completion of the roadworks. The popularity of the area to tourists was linked to the presence of the Loskop Dam – all the responding businesses indicated that Loskop Dam was 'very' (2 businesses) or 'extremely' (5 businesses) important to local tourism. All the businesses identified fishing as an important tourist activity

in the area; camping and boat rides were also regarded as popular as well as game viewing by boat, and bird watching to a lesser extent.

All the businesses felt that tourism associated with Loskop Dam is important for their own business. All of the establishments indicated that their business activities increase during Loskop Dam fishing competitions (by 10-30% more for 3 businesses, and by more than 50% for 3 of the businesses). Several businesses also indicated that they benefit from the fishing competitions in the form of 'advertising'.

Water quality and tourism

71% of the businesses interview indicated that the water quality in Loskop Dam has declined in the last 10 years, but several indicated it has improved again in the last few years. The declining water quality was attributed to mine pollution, litter, invasive aquatic plants and low water levels. All the responding businesses felt that declines in water quality in future would affect their business because tourism in the area depends on 'nature and clean water'. In other words, poor water quality would make the area less attractive (e.g. for bird watching, fishing) and there would be fewer visitors / tourists and less sales.

4.2.2.3.2 Trends in water quality and fish pansteatitis

The Olifants River in the Mpumalanga Province originates from the Highveld Plateau. The catchment of the river is heavily impacted by human activities which include mining, agriculture, coal fired electricity generating, industrial effluents, surface discharge and waste water treatment works. Over time, these activities have had progressively greater detrimental effects on water quality, as well as a notable adverse impact on the aquatic environment of Loskop Dam (DWAF, 2004; Driescher, 2008). Due to the above-mentioned activities, the Olifants River is considered one of the most highly threatened aquatic ecosystems in South Africa (Ashton and Dabrowski, 2011).

Pansteatitis (yellow fat disease) has become an increasing concern in South African freshwater ecosystems, because it affects and causes mortality of freshwater organisms such as fish and crocodiles (Huchzermeyer, 2012). Pansteatitis is a nutritional disorder characterised by degenerative, necrotic and inflammatory changes of adipose tissue. It causes hardening of the fat tissue which affects normal metabolism resulting in the animal becoming lethargic and later leads to death. Fish mortalities due to pansteatitis have been reported from Loskop Dam (Lane et al., 2013; Dabrowski et al., 2017). One of the fishing

competitions held regularly at Loskop Dam was cancelled in 2013 because of the unexplained death of a large number of fish. Fish mortalities and declining fish health may have a negative impact on tourism and associated small scale enterprises.

As part of the fish health survey (Shakwane, 2018), eight fish species were examined for the presence of pansteatitis while health was evaluated in four of these namely; *Oreochromis mossambicus*, *Labeo rosae*, *Clarias gariepinus* and *Schilbe intermedius* during summer (March) and winter (July) 2018. Fish were euthanised, measured and dissected: Fish health was determined using the Health Assessment Index (HAI), Inverted Parasite Index (IPI) and Condition Factor (K). Parasites were preserved according to standard methods. The level of pansteatitis was determined by using a vet score of 1-5 lesions observed on organs, muscle and fat tissue. Water physio-chemical properties were also measured.

Water quality parameters, metalloids and metals that were analysed were within the Target Water Quality Range (TWQR), except for the high pH, nitrate and sulphate levels, at the inflow. Four of the eight fish species examined showed signs of steatitis with an addition of *Labeobarbus marequensis* which is a new record for the site. Pansteatitis was more prevalent in the liver, eyes, brain and mostly in fat tissue of the larger fish specimens. It was also noted that all the fish collected from the inflow indicated high score levels of pansteatitis. The HAI and IPI results, in parallel with water quality results, indicate that Loskop Dam is moderately impacted. Previous studies suggest that the Dam is highly polluted and the result obtained in this survey (moderate impact) could be due to the fact that only two seasons were sampled, and sampling was done at specific time of the day.

The study findings suggest that there is a potential risk to tourism at Loskop Dam given that much of the tourism is dependent on recreational fishing and fishing competitions (as indicated through the various surveys and interviews conducted during the fishing competitions). Although it has not yet been reported that pansteatitis can affect human health, consumption of affected fish could hold a potential risk to human health if consumed frequently and in large quantity (Shakwane, 2018).

4.2.2.3.3 Modelling the economic impacts of water-related scenarios: What future(s) for the Loskop Dam fishing competitions?

One natural capital dependency pathway relevant to participants of the Loskop Dam fishing competitions was identified as material:

- **River water quality** (risk of decline) → quality of experience to the fishing competition participants (recreational fishing as final ecosystem service, with fish mortalities and declining fish health as the key risks) → impact to the products and services (financial impacts, jobs, etc.) and regional economic impacts (e.g. accommodation, other spending categories); with three key change drivers / factors of water quality: point & non-point source pollution, water quantity (dilution).

Based on primary and secondary data collected (i.e. fishing competition participants, water quality and fish health surveys), 5 scenarios were selected:

- Scenario 1: No significant change in water levels and water quality (based on a 'normal' year): 2% change in competition participation;
- Scenario 2: Water quality declines further slightly: -5% change in participation;
- Scenario 3: Water quality declines significantly: -25% change in participation;
- Scenario 4: Water quality declines further: -50% change in participation;
- Scenario 5: Water levels and water quality improve: 25% change in participation.

Table 4-38 shows the results of the modelling of the impacts of water-related scenarios on competition participation and estimated total spending at the Loskop Dam fishing competitions up to 2030. While the results for scenario 5 in 2030 are improbable due to the limited capacity of the area to cater for such high numbers of participants without compromising the experience; scenarios 3 and 4 suggest a collapse of the recreational fishing-based tourism system. While declining water quality has been confirmed in the catchment due to several factors (see section 4.2.2.3.2), the likelihood of collapse scenarios may not be as high as for the Dusi Canoe Marathon. While much of the tourism in the area is linked to the Loskop Dam, there is a greater diversity of activities and products available (which don't require direct contact with the water) increasing the resilience of the tourism system.

Table 4-38: The impacts of water-related scenarios on participation in the Loskop Dam fishing competitions and estimated total spend to 2030

Note: Baseline 2018 data[35]; in red, scenarios with a complete collapse of the tourism system and in grey those that are improbable given capacity constraints

Water-related scenarios	Adaptive cycle phase (tourism)		Tourism growth	Change in attendance due to scenario	Fishing competition participants				Estimated total spend (R)		
					2018	2019	2030	% change (2018-30)	2018	2019	2030
1	Status quo	Conservation / consolidation	1%	2%	1963	2022	2799	43%	18566054	19123036	26470754
2				-5%		1884	1203	-39%		17823412	11375602
3				-25%		1492	73	-96%		14110201	689418
4				-50%		1001	1	-100%		9468688	5749
5				25%		2473	31432	1501%		23393228	297280314
1	Growth	Exploitation phase	5%	2%	1963	2100	4421	125%	18566054	19865678	41814311
2				-5%		1963	1963	0%		18566054	18566054
3				-25%		1570	135	-93%		14852843	1275850
4				-50%		1080	2	-100%		10211330	14226
5				25%		2552	45734	2230%		24135870	432553506
1	Crisis	Release / collapse	-5%	2%	1963	1904	1362	-31%	18566054	18009072	12881915
2				-5%		1767	554	-72%		16709449	5243602
3				-25%		1374	27	-99%		12996238	256978
4				-50%		883	0	-100%		8354724	1280
5				25%		2356	17502	792%		22279265	165536802

[35] Baseline data drawn from the survey of fishing competition participants.

4.3 Case study analysis: Opportunities and challenges for community-based tourism development

The tourism sector is regarded as a modern-day engine of growth, and a key strategic sector for economic transformation for South Africans as emphasised in the 2019 State of the Nation Address (SONA). It is a labour-intensive industry, and holds the potential to drive increases in export earnings and the market is generally less volatile than commodity exports. The World Travel and Tourism Council estimated that travel and tourism directly employ more people than the mining, communication services, automotive manufacturing and chemicals manufacturing sectors in South Africa. The combination of well-developed infrastructure, scenic beauty, rich biodiversity, sunny climate, cultural diversity and a reputation for value for money experiences, are believed to be what makes South Africa one of the world's fastest growing tourism destinations. The 2019 SONA by President Cyril Ramaphosa (7 February 2019) reflected on SONA 2018 which highlighted the significant potential that exists for the expansion of the tourism sector in South Africa. President Ramaphosa (2019) reported that there has subsequently been a significant growth in the number of foreign visitors as the result of efforts to market South Africa as a prime destination for tourists. This growth creates the conditions for growth in employment and SMME opportunities. In particular, tourism and associated job creation opportunities linked to South Africa's coastline was highlighted.

In the pro-poor tourism model, tourism is seen as a tool for development and poverty alleviation. Defined as "tourism that generates net benefits for the poor", pro-poor tourism is regarded as an approach to tourism development and management, rather than a niche sector or product of tourism (Ashley et al., 2001: 2; UNWTO, 2010). Tourism benefits may be economic, social, environmental, cultural or a combination of these. A key assumption underlying the pro-poor model of tourism, drawing from pro-poor growth theory, is that "economic growth is beneficial for development and should be encouraged as long as the 'poor' benefit over-proportionally" (Meyer, 2007: 558). The pro-poor tourism framework thus aims to modify growth towards pro-poor objectives (Chok *et al*., 2007). Tourism is regarded as having better prospects for promoting pro-poor growth than many other sectors. Several characteristics inherent in tourism contribute to its pro-poor potential (Rogerson, 2006):

- It is a diverse industry. This increases the scope for wide participation, including the participation of the informal sector.
- The customer comes to the product, providing considerable opportunities for linkages (e.g. souvenir selling).
- Tourism is highly dependent upon natural capital and culture. These are assets that some of the poor have, even if they have no financial resources.

- Tourism can be more labour intensive than manufacturing (though less labour intensive than agriculture).
- Compared to other modern sectors, a higher proportion of tourism benefits (jobs, petty trade opportunities) go to women (though it is not known whether these are necessarily the poorest women).

Tourism, like all economic sectors, is heavily dependent on ecosystem services to develop its activity. The Economics of Ecosystems and Biodiversity (TEEB) proposes that most tourism businesses are either partially or entirely dependent on biodiversity and ecosystem services, for example provisioning and regulating ecosystem services, and not only cultural ecosystem services. The dependence of tourism on ecosystem services can therefore be described as material rather, than nonmaterial, and tourism can be defined as a beneficiary of ecosystem services (Pueyo-Ros, 2018). There is however growing concern that ongoing degradation of natural capital, due to various global and local drivers of change, will compromise the delivery of the ecosystem services on which the Tourism Sector in South Africa relies. Biodiversity loss and ecosystem collapse, water crises, failure of climate-change mitigation and adaptation and extreme weather events are some of the primary global risks identified in the 'Global Risks Report 2019' (WEF, 2019).

Furthermore, there is also an understanding that, drawing on the 'sustainable development spectrum' – from the very weak (a traditionally resource exploitative perspective) to the very strong (an extreme preservationist perspective), that the pro-poor tourism approach risks falling into a weak sustainability position. The focus on (financially) poor people drives a strong anthropocentric dimension, with the focus on environmental benefits as secondary to maximising the benefits to poor people (Chok *et al*., 2007). Placing environmental concerns as secondary to pro-poor tourism development creates a risk of exacerbating existing vulnerabilities of the poor as well as potentially creating new vulnerabilities (Chok *et al*. 2007). However, what is less clear, are the perceptions of communities themselves, who are potential beneficiaries of pro-poor tourism, of the links between the condition of ecosystems and their capacity to support tourism and SMME development. An understanding of this connection creates the potential for pro-poor tourism to unlock incentives for environmental management and restoration that will support tourism and thereby its capacity to drive economic transformation for South Africans.

Communities' perceptions about tourism potential and its capacity to contribute to SMME development and economic transformation, as well as perceptions of the connections between

ecosystem condition and tourism potential were explored through the two case studies, namely uMngeni River system (Inanda Dam) and the Olifants River system (Loskop Dam). The key results from these applied research methodologies and the capacity development activities at the case studies are summarised in Tables 4-44 to 4-49.

4.3.1 uMngeni River Catchment case study – Inanda Dam

The results from the qualitative analysis of the survey of local tourism entrepreneurs in proximity to Inanda Dam, to explore the perceptions of local tourism entrepreneurs about tourism development potential and the influence of environmental conditions, are summarised in Table 4-39. The key insights from the analysis of secondary data from Durban Green Corridors is summarised in Table 4-40. The outcomes of the youth group capacity development workshops are summarised in Table 4-41.

Table 4-39: Summary of results of Inanda survey exploring perceptions of local tourism entrepreneurs about tourism development potential and the influence of environmental conditions, Inanda Dam area, June 2019

Challenges and Issues	Description
Environmental conditions	• Perceptions are that more tourists used to visit the area when the Dam level was fuller, but less seem to come now with lower Dam levels as they think it is less enjoyable. • Uncontrolled development and activities such as sand mining also key challenges. • Control of solid waste pollution has improved slightly but there are still challenges. • Water quality was not highlighted as an issue although it was not deemed fit for drinking. Respondents did recognise that “everything depends on water” and that clean water and a clean environment would help to attract more tourists, which would give the community an incentive to clean up pollution around the Dam.
Capacity to develop tourism opportunities	• Awareness about tourism potential among the local community is low and there is a need to develop capacity among the youth in particular. • Capacity needed to develop existing tourism opportunities around Inanda Dam such as wedding venues, local trained guides for fishing, cycling, and quad bikes. • Capacity development needed to raise awareness about opportunities to provide support services to existing tourism operations.

Challenges and Issues	Description
Marketing and finance	• Current marketing initiatives are ineffective and enterprises are struggling to market and advertise effectively. • Access to finance and start-up capital is a challenge and limits the start-up or expansion of tourism enterprises in the Inanda area.
Constraints to tourism enterprise development	• Community attitudes towards entrepreneurship are negative as the perception is that entrepreneurship / self-employment is not a real or meaningful opportunity, but rather inferior to employment. Most people want formal jobs rather than to start their own enterprises. • Lack of or degraded state of services and infrastructure is a constraint to developing the tourism sector in the Inanda area. • Perceptions of crime in the area are a deterrent for tourists
Community collaboration	• Tourism in Inanda can't work without community support. • Need to ensure positive impact of tourism on community in general e.g. local business opportunities, local shops, financial benefits to other entrepreneurs.

Table 4-40: Summary of insights from interviews with, and secondary data from, Durban Green Corridors, September 2018, March 2019, June 2019

Key Issue	Description
Trends in tourism	• Tourism within the uMngeni and Inanda Dam Valley is increasing, but slowly; though tourist numbers remain relatively low. • Perceptions about crime – particularly within the Inanda Dam Valley area and for local tourists – are a limiting factor to the growth of tourism in the area.
New tourism opportunities	• There are additional community-based tourism opportunities, particularly around adventure activities. • Poor infrastructure (dirt roads and limited services), affordability and the complexity of community negotiations are key challenges to implementation.
Capacity constraints	• Tourism related to Inanda Dam creates enterprise opportunities, but the local communities are not yet familiar with tourists coming into the area and the opportunities this may present.
Conflicting development	• Local development (people moving into the valley, new housing) is resulting in additional pollution to the Inanda Dam / uMngeni River system (water pollution and litter dumping in the riparian area) – which reduces the attractiveness of the area to tourists and tourism investors.

Key Issue	Description
Environmental conditions and influence on tourism	• The DGC canoe tours and nature tours haven't been affected by pollution to date. Signs of water pollution are not immediately visible to tourists and generally tourists don't request to swim. • Low water levels reduce the attractiveness of the canoe trails as tourists have to walk further. • Litter is a widely faced problem at the Inanda Dam as solid waste is dumped illegally at the banks of the Dam.

Table 4-41: Outcomes of youth group capacity development workshop at Inanda Dam, April 2019

Inanda Dam Youth Group
Familiarity with concepts of tourism • Tourism appeared to be a fairly vague concept. • Ideas of tourism focused largely on catering, accommodation and cultural activities (likely influenced by the tourist excursion activity and their participation in the X-factor 101 group). • Examples of tourism activities (e.g. canoeing, sports and cultural events, tour guide) and the concept of a tourism value chain (where even support services such as transport and waste management are part of tourism) appeared to be new and unfamiliar to most of the group.
Understanding of nature-tourism interlinkages • Participants generally recognized the threats to tourism business of various ecosystem degradation scenarios and discerned that the different business types would experience different risks / impacts (e.g. water-based sports activities vs. catering). • During the capacity development activities the groups began to realise how business were connected (e.g. catering supports art and culture events, water-based activities attract tourists who then explore other attractions and need services such as food and transport).
Capacity for tourism business planning • The group were able to recognise 'tourists' as potential customers of a tourism business, but they weren't able to expand on who these 'tourists' would be. • The group found it challenging to link their tourism business idea with a local opportunity – why the 'idea' would work in the local context.

4.3.2 Olifants River Catchment case study – Loskop Dam

The qualitative and quantitative results from the survey of local community members from Dennilton currently employed in the tourism sector are summarised in Table 4-42. These explain perceptions of their tourism development potential and connections to water quality in the Dam area. The qualitative and quantitative results from the engagement and survey of members of Dindela and Rampolodi, who are the land claim beneficiaries on Loskop Dam Nature Reserve, are summarised in Table 4-43. These present their perceptions of tourism

development potential and connections to changes in environmental condition. The outcomes of the youth group capacity development workshops are summarised in Table 4-44.

Table 4-42: Summary of results from the survey of Dennilton community members, Loskop Dam, October 2018 (n = 40)

Local Tourism
• Average household size of the respondents was six, with an average of two household members earning income, one of which was typically in the tourism sector. Average monthly income from tourism was R3 727 per household. • 63% of respondents felt that tourism in the area has changed in the last decade; opinions of whether tourism had improved or declined were split with slightly more than half feeling that it has improved. • Of those who indicated tourism had changed, roughly half felt that this had affected their household. The main effect was related to employment – more tourists were associated with more jobs, while declining tourist numbers were considered a risk to both current jobs and future job opportunities. • Job opportunities, employment and income were the main benefits from tourism identified by the respondents. Some respondents also indicated benefits related to engaging with new people and learning new things. Five respondents felt that there were no benefits for them from the Loskop Dam tourism sector. • In terms of tourism impact for the whole community, 63% of respondents indicated job creation is an impact; 10% indicated access to tourism activities for community members; 2 respondents felt that the tourism sector had no impact on the community. No negative impacts were noted.
Community SMME Opportunities
Respondents were asked for their ideas on new opportunities for small-scale tourism enterprises in the Loskop Dam area to benefit the local communities. • Almost half (48%) felt that there were no enterprise opportunities; the main opportunity identified was ‘more jobs’. One respondent suggested ‘community shops’ and another suggested ‘youth learnerships’. • 64% of respondents indicated ‘lack of capital’ as a barrier / challenge to local community enterprise development; ‘lack of skills’, ‘education’ and ‘policies ’were also noted. Several respondents suggested that community members were not allowed to set-up businesses or sell anything in the Loskop Dam area (because of the surrounding Nature Reserve and privately owned land areas).
Water Quality Perspectives
• Slightly less than half (43%) the respondents indicated that there had been a change in the water quality of the dam over the last 10 years. Of those who indicated there had been a change, most felt that the water quality had improved. • In response to ‘how tourism in the area is affected by the water quality of the dam’, 67% indicated that water quality affects tourist numbers; 22% indicated health implications / concerns.

Conservation Activities
• 33% of the respondents indicated that community members were involved in activities to conserve natural areas in the region; the dominant activity was 'cleaning up' (removing litter), other activities included 'reporting pollution', 'recycling', 'removing unwanted trees' and 'putting out fires'.

Table 4-43: Perceptions of Dindela and Rampolodi communities relating to tourism development at Loskop Dam, October 2018

Local Tourism Based SMME Development Opportunities
• Craft work and baking were identified as existing community run tourism enterprises although they are currently extremely limited, and the crafts are not sold in the Loskop area. Both groups suggested that the tourism sector in the Loskop Dam area makes little contribution overall to jobs and income of local people. • The Dindela representatives felt that the level of the Olifants River is lower than it was in the past and that increasing business development around Loskop Dam and waste from mines in the upper catchment affects the water quality of the Olifants River and Loskop Dam. They felt, however, that tourism in the area hasn't changed much as a result.
New Opportunities for Small-Scale Tourism Enterprises in The Loskop Dam Area to Benefit Local Communities
The representatives suggested: • Loskop Nature Reserve – picnic sites and activities (e.g. mountain biking, hiking trails, horse riding) and game viewing ('bring the big five'); and • Outside the Reserve – agriculture and natural resource-based opportunities and culture-based activities (e.g. dancing groups, traditional food restaurants, indigenous games).
Barriers To Local Tourism Enterprise Development
• Lack of capital, information and skills among local communities and potential entrepreneurs. • Declines in water quality (of the dam / river) would negatively affect the potential for new tourism opportunities. Reasons given were: o Tourists want to be near clean water; o Animals depend on clean water and tourists come to see animals; and o Tourists will be discouraged if animals are sick or numbers decline.
Suggestions For Encouraging Community Participation in Environmental Management and Restoration Activities
• Allowing people to access the Reserve – to see what it's like and its importance. • Control and enforcement of laws to discourage tree cutting and poaching. • Encouraging the community and the Nature Reserve management group to meet and agree to work together. • Raising awareness with the youth.

Table 4-44: Outcomes of youth group capacity development workshops at Loskop Dam, March 2019

Loskop Dam Youth Group
Familiarity with concepts of tourism • The participants grasped the concept of the tourism value chain and recognized how different tourism businesses are connected and identified services such as transport, maintenance and equipment hire as supporting tourism and being part of the value chain. • Participants were less familiar with tourism opportunities not directly related to accommodation and food, such as water-based activities; sport, music and cultural events and activities related to the Nature Reserve.
Understanding of nature-tourism interlinkages • Participants recognized the threats to tourism businesses from various ecosystem degradation scenarios and discerned that the different business types would experience different risks / impacts (e.g. water-based activities vs. art and culture events). • The groups grasped the connection between the different businesses and the need to collaborate to address particular challenges (e.g. water pollution) and debated energetically on the best course of action to take.
Capacity for tourism business planning • The groups were able to develop a business concept, with several providing specific detail on their customers (e.g. fishing tourists and cultural tourists). • Although challenging, the groups linked their 'business idea' with the local landscape and made suggestions on 'why the customer needed the product / service.

4.3.3 Challenges to effective economic and environmental transformation

The case studies clearly highlight that the need for development and economic transformation in these communities is significant. Aquatic ecosystems may hold significant potential to support tourism SMME development, particularly pro-poor tourism. In addition, there are indications from the surveys that there is a perception among communities that tourism development linked to ecosystems will provide incentives for improved environmental management and restoration. The existence of this potential is, however, not in itself a catalyst for transformation. There are several constraints that hinder the harnessing of this potential:

a) Awareness of alternative development pathways;
b) Knowledge and capacity to harness potential for tourism enterprises;
c) Access to finance and business support.

a) *Awareness of alternative development pathways*

The widely held view among the surveyed communities is that formal employment in one of the mainstream economic sectors (e.g. mining, retail, and manufacturing) is the best way to achieve financial security and prosperity. Self-employment and entrepreneurship in alternative

sectors such as tourism are seen as less desirable and inferior in terms of securing prosperity (in its currently held definition). There is little understanding or motivation in these communities, particularly among the youth, to explore alternative development pathways and opportunities such as those in tourism and the blue-green economy. Readily available opportunities in the tourism sector are, therefore, not recognised nor their potential to contribute to alternative development concepts and issues, such as empowerment, self-reliance, and sustainable livelihoods. Alternative development pathways also tend to be more resource-efficient and low-pollution while still offering social, economic and environmental benefits in the short- and long-term. One of the pillars of the alternative development paradigm is local empowerment and how this can be driven through tourism development. However, there appears to be little local awareness of alternative development pathways suggesting limited provincial or national level practical progress towards empowering communities to stimulate socio-economic innovation in alternative development pathways, such as the blue-green economy and the tourism sector.

b) Knowledge and capacity to harness potential for tourism enterprises

The level of awareness and information on the tourism sector among the surveyed communities was extremely limited, including among the youth. Even those employed in the tourism sector had very little understanding of the sector and the types of development opportunities it can stimulate. Without this awareness and understanding, it is almost impossible for people to harness enterprises opportunities that may be readily available in the tourism sector.

In general, environmental awareness and / or literacy was limited, notably in terms of the lack of understanding of the links between environmental condition and the delivery of critical ecosystem services that are crucial for tourism businesses and the associated supporting socio-economic activities (e.g. food production for tourists). However, some community members recognised that environmental degradation, such as pollution and poor water quality and quantity, was a deterrent to tourists. This is a positive indicator of the potential for tourism development to broadly incentivise environmental management and restoration.

For tourism to become a catalyst for improving the condition of critical ecosystems, such as our freshwater aquatic ecosystems, a fundamental level of capacity development will be required: not only directly regarding the tourism sector, but also on the issues needed to provide an enabling environment for tourism such as water and waste management, pollution reduction and crime control. Awareness about opportunities along the tourism value chain

need to be raised to expand the scale and extent of impacts and ‘spin offs’ (or multipliers) from tourism to further increase the incentives for environmental management and restoration.

c) Access to finance business support

Access to finance and start-up capital was widely highlighted by survey respondents as a constraint to the start-up of SMMEs in any sector. The lack of access to start-up capital severely constrains entrepreneurship in disadvantaged communities. These entrepreneurs seldom have the collateral needed to secure loans, and if they do, they can seldom afford the commercial interest rates for repayment of loans.

The survey results also highlight that, even where start-up capital was secured, the sustainability and growth of the enterprises were severely constrained by lack of capacity or resources for adequate business support such as marketing, advertising and business development. As a result, the enterprises were floundering and their sustainability compromised, or they were just able to survive but were nowhere near fulfilling their potential in terms of growth and capacity to employ more people to support the start-up of complementary enterprises along the tourism value chain. This contributes to the perpetuation of the perception that the potential contribution of these tourism enterprises and self-employment opportunities cannot contribute meaningfully to prosperity and are inferior to employment in the mainstream economic sectors. Access to both financial and business management support are critical to unlocking the potential of pro-poor tourism to deliver economic transformation and development that incentivises environmental management and restoration of critical ecosystems.

5 CONCLUSIONS

The evidence gathered through this research project led us to the following key findings:

- The tourism sector in SA relies on both the domestic and international tourism markets and generates significant socio-economic benefits to the nation, with spatial differences / inequalities at the local level. The sector is based on a complex value chain with significant contributions of SMMEs, which explains why almost 10% of the SA workforce can be linked to tourism. Its success and future are subject to numerous local and international factors and trends that influence how tourists make decisions.
- Tourism systems are complex adaptive systems akin to socio-ecological systems. These systems are characterized by multiple, interacting components; cause and effect relationships that are often non-linear and unclear; system dynamism; 'butterfly effects' (being disproportionally affected by external events); and vulnerability to multiple shocks, from health and security related events to severe climate-related changes (e.g. droughts).
- All tourism activity categories have impacts and dependencies on natural capital, not only tourism assets and destinations. While cultural ecosystem services are drivers of tourism activities, either directly or indirectly by attracting other activities, provisioning services provide inputs to many tourism businesses and are often imported from elsewhere. Regulation and maintenance of ecosystem services are critical for site-specific activities and the associated tourism assets which rely on them.
- As is well known by tourism stakeholders, growth trajectories of the sector can vary considerably over time, depending on a number of socio-economic and political drivers of change. The impacts of tourism on the national economy and job creation will vary accordingly. Through the review of case study evidence (e.g. drought impact on tourism in Cape Town), the modelling of different climate change scenarios on the national tourism industry and the local tourism systems of two case studies (Dusi Canoe Marathon and Loskop Dam tourism), our research underlines the fact that freshwater-related extreme events can have significant impacts on the tourism industry and stakeholders, especially in rural areas, with weak institutional support and limited community skills / know-how, and / or where tourism systems are small or weak due to a combination of factors (e.g. a single event or attraction).
- Water-related drivers of change and variables hold non-linear relationships with the various components / structures and processes of tourism systems. The adaptive capacity of tourism systems will vary significantly across SA. For instance, under different climate change scenarios, some SA hydrological zones will suffer much more

than others due to significant climate variability across the country, with direct consequences for the behaviour of tourists and hence tourism activity / businesses. In this context, it is critical to understand (a) which phase of the adaptive cycle various nested tourism systems may lie and / or transition towards and (b) what are the potential traps for each nested system (e.g. lack of water resources for tourism expansion).

- There are three primary links between tourism and hydrologic services: water supply (quality and quantity), water damage avoidance / mitigation and water-based tourism. While tourism is increasingly recognized as one of the key sectors with the potential to support the transition to a Green Economy, the mainstreaming of natural capital considerations into the tourism sector should be tackled in a number of complementary ways: that is, the sustainable use of hydrological services requires a freshwater ecosystem "source-to-sea" management approach, from the stewardship of water source areas and watercourses (and associated ecological infrastructure) to that of tourism assets / destinations.
- A pathways approach to sustainability acknowledges that there are alternative, competing pathways towards multiple sustainable tourism futures, which emphasises the role of power relationships between stakeholders in the framing of sustainability discourses / policies and the adoption / implementation of the associated strategies and activities. While there is a diversity of perceptions / values regarding the meaning of sustainability in the context of tourism systems, which range from weak sustainability principles to the conservation of critical natural capital and / or the prioritisation of pro-poor outcomes, we argue that investing in freshwater-related ecological infrastructure to enable tourism growth, SMME development and pro-poor opportunities should drive the agenda of all tourism actors in SA.
- Finally, the need for economic and environmental transformation in the case study communities needs to be emphasised. While aquatic ecosystems may hold significant potential to support increased tourism SMME development, particularly pro-poor tourism; several constraints currently hinder the harnessing of this potential, notably the lack of: (a) awareness of alternative development pathways, (b) knowledge and capacity to harness potential for tourism enterprises and (c) access to finance and business support.

6 RECOMMENDATIONS

The degradation of natural ecosystems (capital and ecological infrastructure) caused by many anthropogenic factors, including tourism, is threatening the future of the tourism economy in South Africa. This is affecting all tourism stakeholders, including tourism businesses, local communities, employees and tourists themselves. Trends must be reversed leading to the 2030 NDP and SDG goals.

While the SA government has recognised the importance of the tourism sector for the economy, especially for transformation and pro-poor growth, notably through the support and development of SMMEs throughout urban and rural areas, we have highlighted a number of policy gaps and shortcomings. First and foremost, there is a lack of clear recognition of the importance of water source areas and ecological infrastructure linked to freshwater ecosystems (rivers, wetlands) as key enablers of tourism activities and the associated businesses and jobs. Currently, environmental activities in the tourism sector focus on improving environmental management of selected tourism sites (e.g. national parks) and businesses (e.g. hotels), which is not sufficient to sustain the natural capital (NC) and associated ecological infrastructure (EI) on which tourism relies.

Working towards 2030 to mainstream NC and EI in the tourism economy may involve identifying, designing and implementing various mainstreaming interventions at one or more pilot sites, including potential NC impact avoidance (e.g. through strategic planning) and minimisation (e.g. innovation infrastructure design based on green infrastructure principles), NC restoration / rehabilitation (e.g. as part of tourism product development) and / or offset measures (e.g. through stewardship site declaration). However, restoration of degraded freshwater ecosystems and natural capital cannot be adequately addressed solely through local restoration in the proximity of tourism operations. Ecological degradation is widely driven by land use and pollution upstream or at catchment level, which localised restoration activities alone will not resolve. Given the importance of tourism to the South African economy and its potential to contribute to achieving the 2030 Sustainable Development Goals, the sector has an opportunity to strategically influence decision making, financing and investment in ecological restoration at a meaningful and effective scale. The tourism sector must act collectively to effectively lobby for, and support, ecological restoration as a key component of the Green Economy to safeguard South Africa’s tourism sector and its growth potential.

Therefore, a comprehensive, integrated tourism socio-economic and ecological strategy and action plan is warranted:

- From an ecological perspective, this calls for strategically investing in freshwater ecosystems following a "source-to-sea" approach: that is, water source area stewardship, sustainable water infrastructure design and management, sustainable water use / management practices in various tourism businesses (accommodation, catering, recreation, etc.) and ecological infrastructure stewardship at tourism asset / destinations.
- From a socio-economic perspective, an extensive programme of capacity building is required to empower rural and marginalised communities, and particularly the youth, to recognize and harness tourism opportunities and to embed an understanding of the linkages and interdependencies between tourism and natural capital. Such a programme needs to focus not only on aspects directly regarding tourism and its value chains, but also on the issues needed to provide an enabling environment for tourism such as water and waste management, pollution reduction and crime control.

A multi-stakeholder private-public sector forum (building on the 2030 Tourism and Natural Capital Working Group; see Annexure 7.9) is needed to drive this agenda on three main fronts:

- Lobbying for policy change, notably in the education, tourism, mining, water management and local government space, with an emphasis on policy integration / alignment across both the public and private sectors;
- Through the support of relevant tertiary education institutions and research organisations (e.g. SANBI, Tourism SA), funding for continuous research / evidence gathering to make / support the business case with respect to freshwater ecosystems conservation / restoration planning and prioritisation for pro-poor tourism growth (e.g. freshwater ecosystem trends; tourism value chain statistics, especially in rural areas);
- Unlocking financial and institutional support to harness tourism potential in critical "source-to-sea" pilot areas (e.g. for the iSimangaliso WHS); ideally through establishing financially independent (e.g. non-sinking, endowment / trust fund), multi-stakeholder, accountable / transparent Water Funds with broad mandates to ensure alignment in public-private sector policy-making and implementation throughout the pilot sites.

7 ANNEXURE

7.1 WRC project K5/2620 overview

This study has been conducted over a period of three years through primary (questionnaires and interviews) and secondary data collection, desktop level analysis and in-field capacity development activities. During the project the following dissemination materials were produced:

- Six project deliverable reports
- Two book chapters
    - Environmental Impacts of Tourism in Developing Nations – A volume in the Advances in Hospitality, Tourism, and the Services Industry Book Series (IGI Global)
    - Mutual dependencies between tourism and natural capital. What risks of increasingly stressed water resources for our economy? (The Responsible and Sustainable Tourism Handbook of South Africa: Volume 6)
- An oral and a poster presentation at the 8th World Conference on Ecological Restoration (Cape Town, South Africa, September 24-28, 2019)
- Two project synthesis products
    - "Empowering communities to harness sustainable tourism opportunities for the benefit of people and natural capital"
    - "Investing in freshwater ecological infrastructure for tourism growth and SMME development in the face of climate change"
- A popular article based on the capacity development component of the project (see section 7.10).

The project contributed to capacity building through:

- Supporting four university students in project-related research studies;
- The participation of interns in data collection and analysis and community workshop activities;
- Capacity development workshops with community youth groups at each of the case study sites, with a focus on introducing concepts related to natural capital, freshwater systems, tourism and nature-tourism linkages.

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7.2 Photos of the Dusi Canoe Marathon[36] and Inanda Valley

UMSUNDUZI-UMNGENI RIVER

Dusi Canoe Marathon

Dusi Canoe Marathon

Dusi Canoe Marathon

Ezweni Lodge – Inanda Dam

uMngeni River – Inanda Dam Valley

Inanda Dam Valley

[36] Source: https://dusi.co.za/ .

7.3 Photos of the Loskop Dam case study site

LOSKOP DAM

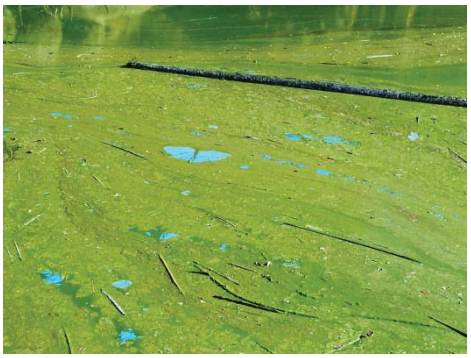
Forever Resorts

Forever Resorts

Fish survey field work

Fish survey field work

Near the inflow



Near the inflow

7.4 Natural capital valuation for improved decision-making: Diversity of values and the call for integrated valuation

Governments, companies and citizens are often not aware of the benefits they receive from ecosystem services. Mainstream gross domestic product calculations and corporate decision-making and accounting systems are silent regarding the full value of ecosystem services, thereby giving the impression that reliable flows from well-functioning ecosystems have no value at all (TEEB 2010; 2012). Because a lack of knowledge can lead to wrong decisions and even conflicts or catastrophes, a good understanding of ecosystem services, their benefits and trade-offs in development pathways has been advocated to be prerequisite for win-win-win situations for people, business and nature. This is where valuation plays a role: It refers to the process of expressing the worth or importance of something and may be defined as "the act of assessing, appraising or measuring value, as value attribution, or as framing valuation" (Dendoncker *et al*., 2013:3).

The valuation of ecosystem services aims to generate information regarding the links between ecosystem services and the benefits economic agents derive from them and could potentially be used in various public and private sector decision-making processes and applications. Valuation is thus increasingly being marketed as a key vehicle to integrate ecological understanding and economic considerations to redress the traditional neglect of business dependencies and impacts on ecosystem services in both private and public policy decision-making and operations (TEEB 2012; Waage, 2014; Natural Capital Coalition, 2014). Yet, while economic valuation has gained significant ground in both the public and private sectors, one cannot ignore the diversity of values and associated valuation approaches / methods (Figure A-1).

Key value perspectives include:

- Anthropocentric values: These are 'human-centred'. An anthropocentric value is a value that something has for human beings and human purposes.
- Intrinsic value: This concept refers to inherent value, that is the value something has independent of any human experience or evaluation. Such a value is viewed as an inherent property of the entity (e.g. an organism) and not ascribed or generated by external valuing agents (such as human beings).
- Biophysical / ecological values: A biophysical value is a measure of the importance of components of nature (living being or non-living element), of the processes that are

derived from the interactions among these components, or those of particular properties of those components and processes.

- Instrumental value: An instrumental value is the value attributed to something as a means to achieve a particular end.
- Economic values: Economists group values in terms of 'use' or 'non-use' value categories, each of which is associated with a selection of valuation methods. Use values can be both direct and indirect, and relate to the current or future (option) uses. Direct use values may be 'consumptive' (e.g. wood, foods) or 'non-consumptive' (e.g. nature-based tourism). Indirect use values capture the ways that people benefit from something without necessarily directly seeking it out (e.g. erosion control). Non-use values are based on the preference for components of nature's existence without the valuer using or experiencing it, and are of three types: existence value, altruistic value, and bequest value.

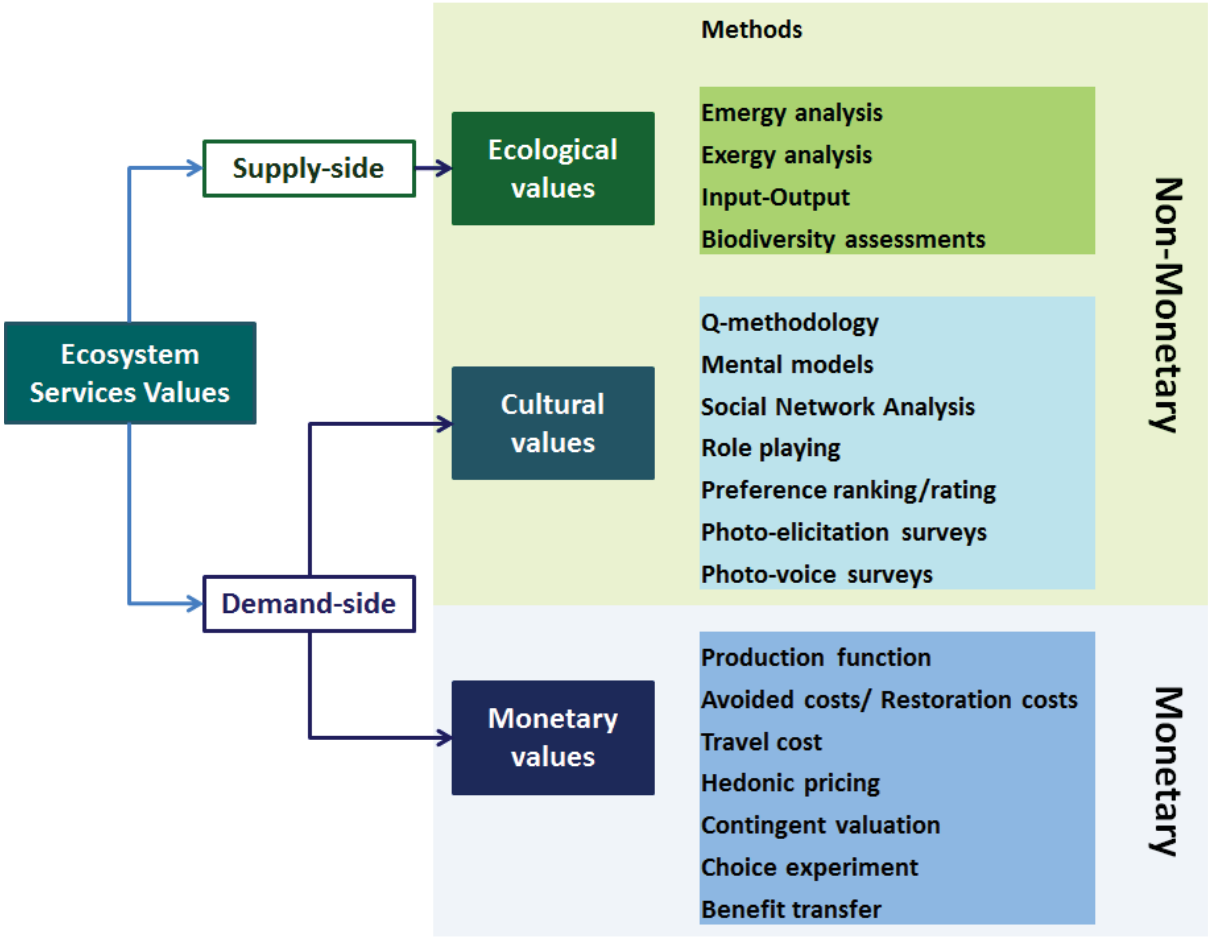


Figure A-1: Methodological toolbox for an integrated valuation of ecosystem services which considers non-monetary and monetary valuation methods and the value-pluralism (Gómez-Baggethun *et al*., 2014).

This diversity of values and valuation approaches can be explained by the conceptual framework of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES), which identifies three inclusive elements in the interaction between human societies and the non-human world: Nature[37], nature's benefits to people, and a good quality of life (Diaz *et al*., 2015). More specifically, the second element, nature's contributions to people, refers to all the positive contributions or benefits, and occasionally negative contributions, losses or detriments that people obtain from nature. It resonates with the use of the term ecosystem services, and goes further by explicitly embracing concepts associated with other worldviews on human-nature relations and knowledge systems (e.g. 'nature's gifts' in many indigenous cultures).

In other words, contributions of nature to people and its contributions to a good quality of life are often perceived and valued by people in starkly different and often conflicting ways (Daily *et al*., 2000; Martinez-Alier, 2003). Different values are associated with different cultural and institutional contexts and can be difficult to reconcile and compare for decision-making (Pascual *et al*., 2017). For instance, the importance of fynbos can be expressed from multiple perspectives. From an ecological viewpoint, a biophysical measure of how much habitat fynbos provides to birds, invertebrates and mammals is one proxy for its importance in terms of its potential for habitat creation. From an economic perspective, individuals' demand (e.g. willingness to pay) for the survival of fynbos-related wildlife is just one way to capture people's preference where protecting wildlife yields benefits that can be associated with inspiration and cultural identity connections, often related to non-use (existence and bequest) values. This can also be illustrated when undertaking corporate valuation assessments, where one can focus on the business value perspective (i.e. financial benefits), the societal value and / or both value perspective(s) (Table A-1).

[37] For IPBES, Nature refers to the non-human world, including co-produced features. Within the context of science, it includes categories such as biodiversity, ecosystems, ecosystem functioning, evolution, the biosphere, humankind's shared evolutionary heritage, and biocultural diversity. Within the context of other knowledge systems, it includes categories such as Mother Earth and systems of life.

Table A-1: Different value perspectives in business natural capital valuation (Natural Capital Coalition, 2016)

Value perspective	Typically used to
Business value	• Assess how natural capital impacts and / or dependencies affect, positively or negatively, the financial performance of the company (i.e. the bottom line) and thus the value at risk. • Assess company exposure to risks arising from its impacts and / or dependencies. • Minimise company expenses or liabilities and maximise company revenues / receivables. • Communicate to shareholders, budget control staff, management and creditors.
Societal value	• Understand the significance of your natural capital impacts and dependencies to other / external stakeholders. • Determine outcomes for society, assess which stakeholders are affected and how much, and assess net impacts to society. • Investigate the potential nature and extent of future risks and opportunities, including license to operate, and reputational issues. • Assess risks and opportunities associated with environmental externalities, either positive or negative. • Communicate to employees and external stakeholders (e.g. regulators, local communities, consumers, non-governmental organisations, suppliers, contractors and clients).
Both value perspectives	• Undertake a comprehensive natural capital assessment. Assessing societal values, in particular your future impacts on society, enables all potential business values to be considered as well.

Yet, while IPBES argues that different types of values need to be promoted in decision making, including the intrinsic values of nature, it also acknowledges that decision making relies to a great extent on the instrumental values of nature's values to people (Pascual *et al*., 2017). Recognisant of the diversity of values of nature and associated valuation approaches, academics have recently called for integrating social, ecological, and monetary aspects of the values of ecosystem services and biodiversity in environmental decision making. As argued by Gómez-Baggethun *et al*. (2014), for more than a decade, the literature on ecosystem services valuation has stressed the importance of integrating social, ecological, and monetary aspects of the values of ecosystem services and biodiversity in decision-making, rather than relying only on monistic approaches dominated by a single worldview (Figure A-2). Integrated

valuation[38] typically involves an interdisciplinary effort comprising multiple expert domains from both the social and the natural sciences. Interdisciplinarity, transdisciplinarity, and methodological pluralism are key elements in integrated ecosystem services valuation: "*The process of synthesizing relevant sources of knowledge and information to elicit the various ways in which people conceptualize and appraise ecosystems services values, resulting in different valuation frames that are the basis for informed deliberation, agreement and decision*" (Gómez-Baggethun *et al*., 2014: 20).

In other words, an integrative valuation framework for nature should:

- Support decisions on the basis of a consistent integration of multiple types of value (e.g. ecological, cultural and monetary) and associated valuation methods to inform decision making processes;
- Feed on different knowledge systems (e.g. scientific, traditional, professional);
- Rely on both qualitative and quantitative information;
- Cover values emerging at different levels of societal organization, from individuals, to communities, to nations;
- Be able to accommodate different valuation rationalities[39];
- Be useful in different public, private and community-based decision or policy making processes and applications, which requires such values to be expressed in a manner that adheres to or respects the rules or principles governing those processes or applications (Houdet and Chikozho, 2015).

[38] Integrated valuation: The process of collecting, synthesizing, and communicating knowledge about the ways in which people ascribe importance and meaning to nature's contributions to people, to facilitate deliberation and agreement for decision making and planning.

[39] Social processes of valuation, either monetary or non-monetary, are value articulating institutions, i.e. a constructed set of rules that not only reveal values, but also contribute to shape and construct them in the valuation process itself. Valuation methods and associated rationalities are frames invoked in the process of expressing values that regulate and influence which values come forward, which are excluded, and what sort of conclusions can be reached (Gómez-Baggethun *et al*., 2014).

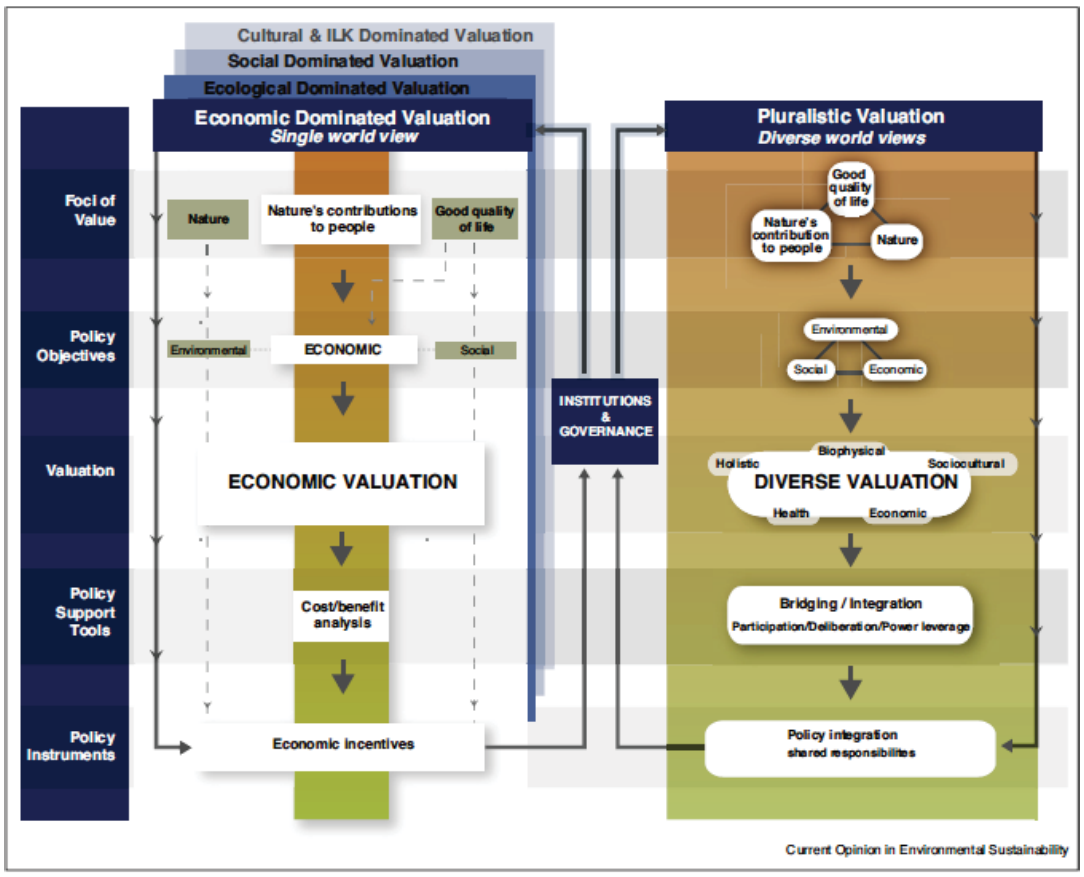


Figure A-2: From single world views in valuation towards pluralistic valuations (Pascual *et al.*, 2017:10).

7.5 Natural capital and ecosystem services: Definitions and classification systems

According to the Natural Capital Protocol (Natural Capital Coalition, 2016: 2), "*natural capital can be defined as the stock of renewable and non-renewable natural resources (e.g. plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people*" (adapted from Atkinson & Pearce, 1995 and Jansson *et al.*, 1994). These benefits relate to the concept of ecosystem services, which was popularised by the 2005 Millennium Ecosystem Assessment (MA).

The MA offered four general types of ecosystem services (Figure A-3):

- Supporting services: The natural processes that underlie and maintain other ecosystem services (e.g. nutrient cycling, primary production);
- Provisioning services: The goods or products from ecosystems used by people (e.g. water, timber, food);

- Regulating services: The benefits people receive from an ecosystem functioning to regulate natural processes (e.g. erosion control, temperance of flooding);
- Cultural services: The non-material human benefits from ecosystems (e.g. recreation, inspiration).

Figure A-3: Linkages between ecosystem services and human well-being (MA, 2005).

These categories of ecosystem services quickly gained world-wide recognition, and have been explicitly mentioned in (or adopted by) various corporate valuation guidance documents, such as the Corporate Ecosystem Services Review (Hanson *et al*., 2008), The Guide to Corporate Ecosystem Valuation (WBCSD, 2011), the International Finance Corporation Performance Standards (IFC, 2012), and the IUCN French Committee's Corporate Biodiversity Reporting and Indicators (IUCN French Committee, 2014).

Building on the MA (2005), several efforts were made to further detail and classify different types of "ecosystem services" for improved valuation, accounting and / or decision-making

(Liquete *et al*., 2013)[40], including (but not limited to) The Economics of Ecosystems and Biodiversity (a 22-ecosystem-service "typology"; TEEB 2012) and The Common International Classification of Ecosystem Services (CICES; a five-level hierarchical structure) (Haines-Young and Potschin, 2013). However, as these were being developed, economists and natural scientists led efforts to advocate for further differentiation of the broad notion of "ecosystem services" (ES) into ecosystem processes and functions (sometimes referred to as "intermediate ecosystem services") and "final ecosystem services" (FES) (e.g. Boyd and Banzhaf, 2007).

According to Landers and Nahlik (2013), an effective ecosystem services classification system needs to have rules that are based at least on the following principles:

- Exhaustive and mutually exclusive: The classification uniquely identifies all endpoints, and products of natural systems (separate from human-driven systems) that humans use or appreciate;
- Non-duplicative: The classification focuses attention and measurement on those ecosystem services that humans use or appreciate directly (final services versus ecological structures processes and functions), to avoid double-counting;
- Practical for users: The classification groups or separates candidate elements in a way easy to conceive and use, with clear definitions, and rules for classifying that appeal across disciplines and users; and
- Helpful for selecting appropriate metrics: The classification uniquely identifies the environment, the precise flows of ecosystem services, the users, and how they use the ecosystem services, which help to determine what ecologists and economists should measure.

The "final ecosystem services" (FES) approach or perspective has been developed to address these issues. Specifically, the FES perspective focuses on the ES transaction point, ecological endpoint, and beneficiary concepts (Figure A-4). By doing so, it moves away from the general "ecosystem to human well-being" approach (MA 2005) which implies that there is an environmental-human continuum and generates risks of double-counting in valuation, accounting and decision-making processes. As put by Landers and Nahlik (2013: 4), "*unless both environmental and economic (i.e. labor, and capital goods) inputs are well-specified in*

[40] Most of these efforts discarded the MA "supporting services" category (i.e. no direct link to beneficiaries or users to be classified as an ecosystem service) and have excluded abiotic services from their classification.

the general production function, it is difficult (or impossible) to explicitly separate the goods and services provided by (or predominantly by) the environment from the investment humans make to realize the total economic value of those goods and services. For example, agricultural commodities (e.g. corn, cotton, etc.) have both an important ecological component and an important economic component that results in the overall production and availability of these goods." This means that we need to distinguish between ecosystem services and benefits to humans. Given that FES are the final (i.e. end) product produced by the environment with which the beneficiary interacts, the benefit of FES cannot be realized without some varying amount of input of labour and capital goods (i.e. conventional goods and services) (Boyd and Banzhaf, 2007).

Two ES classification systems have been developed explicitly following the FES perspective: The Final Ecosystem Goods and Services Classification System (FEGS-CS; Landers and Nahlik, 2013) and The National Ecosystem Services Classification System (NESCS; US EPA, 2015). FEGS-CS divides any environment of the earth into Classes and Sub-Classes, knowing that each type is a complex reservoir of natural capital from which final ecosystem services may be derived (Landers and Nahlik, 2013). The FEGS-CS then combines a hierarchical designation for Environment type with types of beneficiaries, which are combinations of FES uses and users. The NESCS uses the same Environmental Classes and Sub-Classes as FEGS-CS, but has a core structure of four groups: Environment, Ecological End-Products, Uses and Users.

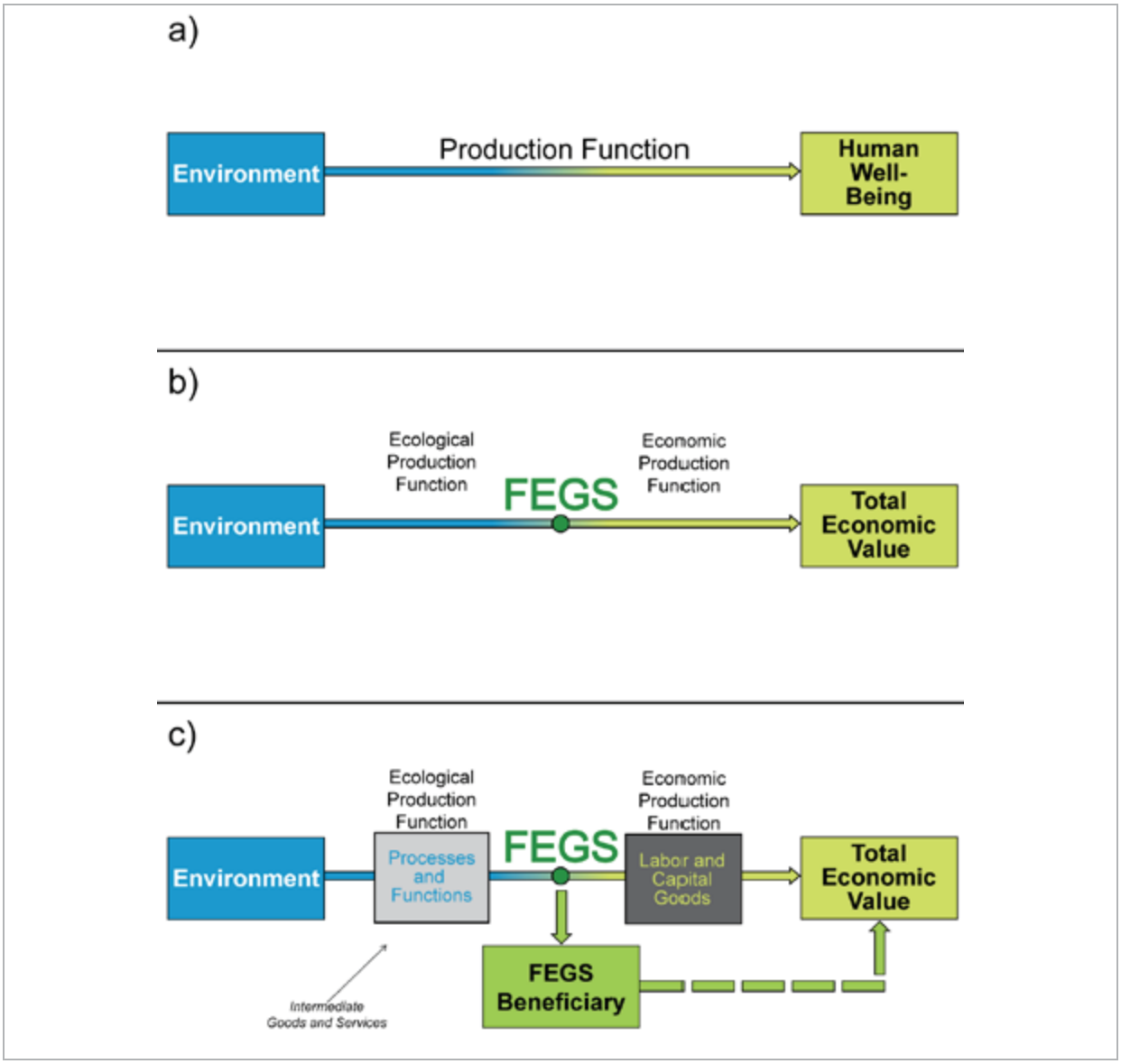


Figure A-4: Final Ecosystem Goods and Services (FEGS) approach (Landers and Nahlik, 2013:5)

Illustration of a) a production function between the environment and human well-being, b) how Final Ecosystem Goods and Services (FEGS) can be used to delineate the ecological production function from the economic production function, and c) examples of inputs for both production functions. The beneficiary is specific and inherent to the FEGS in the production function.

7.6 Critical review of normative models

7.6.1 The traditional model

The traditional model of the tourism system assumes considerable stability in the tourism system and takes linearity as the appropriate model for tourism impacts and changes (Russel and Faulkner, 2004). The surroundings within which the tourism system is positioned are viewed as separate and interactions with other systems (social, cultural, ecological) are generally not considered or made explicit.

From a review of existing tourism models, McKercher (1999: 426) identifies several assumptions of traditional tourism models:

- "*tourism can be controlled;*
- *disparate tourism players function in a formally, coordinated manner to form a unified whole;*
- *tourism is organised and that the organisation can be controlled by a top down management approach;*
- *individual tourism businesses function to achieve a set of common, mutually agreed upon goals;*
- *tourism is the sum of its constituent parts; and*
- *by understanding how each part works, an understanding of how tourism works as a whole will emerge*".

Emerging thinking regards traditional models of tourism as deficient in several ways (McKercher, 1999):

- They are selective in which elements of tourism they include;
- They fail to reflect fully the dynamic nature of tourism;
- The models tend to focus on the stability of systems, or orderly linear change in systems, diverting attention from the periphery of systems, where change is most likely to be initiated; and
- They fail to recognize the power dynamics that influence the tourism system.

McKercher (1999) further argued that, implicit in traditional tourism models, is the assumption that tourism is a linear, deterministic activity. More recent thinking has shifted away from this view, recognizing the complex relationships between and among the elements of a tourism system, and arguing that such complexity cannot be fully explained or captured within linear, deterministic models (Farrell and Twining-Ward, 2004).

While traditional models of tourism are capable of explaining system behaviour in times of stability, they cannot adequately deal with unexpected processes and events (Farrell and Twining-Ward, 2004; Strickland-Munro *et al*., 2010). These models fail to recognize that slowly changing (social and ecological) drivers and variables can effect a sudden change in a system that may lead to a functionally different and possibly irreversible state(s) (Strickland-Munro *et al*., 2010). Models and indicators developed for current system conditions are unlikely to be applicable when system conditions change (Strickland-Munro *et al*., 2010).

Indeed, both linear and non-linear change can exist within a tourism system, with one or the other dominant depending on the process or stage (McKercher, 1999). In this way, "*tourism can appear to evolve in a stable, predictable and linear manner over long periods of time, until a trigger initiates a period of chaotic upheaval where non-linear relationships dominate*" (McKercher, 1999: 429 citing Faulkner, pers comm).

Viewed as an "unpredictable and interconnected system, tourism is vulnerable to outside disturbances" (Strickland-Munro *et al*., 2010: 504). It is an open system, influenced as much by external stimuli as internal events: "*while the internal tourism community is clearly at the heart of any successful tourism system, its survival is dependent on those elements that flow into it and the impacts of its outputs on its surrounding environment…one cannot analyse tourism without also being aware of how other elements shape the community and how the tourism community shapes these elements*" (McKercher, 1999:431). Given the non-linear, non-deterministic and open nature of the tourism system, and the array of interactions between various elements of the system, it is particularly challenging to show direct cause and effect relationships between actions and to accurately predict the future position of the system over time (McKercher, 1999).

Recognition of the complex nature of tourism, changing conditions and the resulting uncertainty, has given impetus to the need for new conceptualisations of the tourism system and new assessment methodologies. Non-linear approaches have been called for, and attention has shifted to new ways of thinking such as resilience, adaptive management, systems modelling and scenario planning, as well as an integrated approach drawing together social science and ecology (Farrell and Twining-Ward, 2005). A greater integration of systems thinking into tourism models and planning frameworks has been advocated (Farrell and Twining-Ward, 2004).

Established ways of thinking about tourism planning, development and policy and the traditional tourism model are increasingly criticized (Dwyer, 2017). Several alternative approaches to tourism have been proposed, for example, slow tourism, transformative tourism and socially responsible tourism among others. In other words, Dwyer (2017) contrasts the established approach to tourism with a 'sustainable futures' view, an approach that "*sees economic and financial health as inseparable from human, societal and environmental health responsibilities to others, environmental and sociocultural stewardship, inspiring experiences, and developing a sense of place*" (Dwyer, 2017:3).

Dwyer (2017) further argues that to effect a transition away from unsustainable tourism development, through the development of principles and good practices, it is first necessary to expose the different perspectives that underpin the established view and proposed alternative approaches. Characteristic elements of the established view of tourism are identified and compared to those of a proposed 'sustainable futures' view (Table A-2). Dwyer (2017) suggests that within the established / traditional tourism model, natural capital (environmental resources) is generally undervalued in decisions regarding tourism development.

To summarise, application of the traditional model of tourism is associated with multiple drawbacks, as summarized in Mullis *et al*. (2011: 6), it:

- *"Frequently lacks stakeholder involvement;*
- *Suffers from an absence of any long-term planning;*
- *Has no enforced regulatory framework;*
- *Applies direct pressure to the earth's ecosystems, exerts stress on host communities, competes for the use of scarce resources, pollutes;*
- *Is commonly an unstable income source; and*
- *Often fosters community frustration"*.

Table A-2: Alternative paradigms driving tourism development (Dwyer, 2017: 4)

Established paradigm	**Sustainable futures paradigm**
Neo-liberalism	Political economy
Anthropocentric ethic	Environmental ethic
Shareholder orientation	Stakeholder orientation
Growth orientation	Stewardship orientation
Price	Value
Space	Place
Promotion by push	Promotion by pull

7.6.2 Sustainable tourism models

International tourism has experienced rapid and continuing growth since the 1950s. It is to this 'remarkable growth', and particularly to its economic contribution, that Sharpley (2010) attributes the widespread adoption of tourism as an agent of development. However, tourism has also been progressively associated with environmental, social and economic costs. Tourism development, particularly mass tourism, is increasingly considered to be unsustainable and is progressively being questioned.

Sustainable tourism relates to a model or form of tourism "*characterized by a level of intensity and technology that generates sustainable net social, economic, and environmental benefits*" (Mullis *et al*., 2011: 5; see Box A-1. There are multiple interpretations of sustainable tourism and no widely accepted definition of sustainable tourism, its theoretical foundations, or the extent to which it can be translated into a set of practical policies and measures (e.g. Meyer, 2007; Sharpley, 2010). Additional confusion relates to "*whether the focus should be on making the development of tourism itself more sustainable or on achieving sustainable development through tourism*" (Sharpley, 2010).

Contemporary definitions of sustainable tourism, for example by the United Nations World Tourism Organization (UNWTO), align it closely with the broader principles of sustainable development, specifically the three pillars, or 'triple bottom line', of sustainable development, namely economic, environmental and social sustainability. In this way, tourism is seen as sustainable when it generates the 'triple bottom line' profits of environmental protection, socio-cultural improvement, and economic health (Mullis *et al*., 2011). Sustainable tourism is then a "*'condition' relevant to all forms of tourism and refers simply to tourism that is developed in accordance with the principles of sustainable development*"

(Sharpley, 2010: 4). Ecotourism and community-based tourism are related concepts (see Box 2-1), with more narrow or specific focus areas.

In general, these alternative tourism models can be seen as contributing in some way to a tourism that "*generates net benefits for both human and non-human communities found at destinations and throughout the value chain*" (Mullis *et al*., 2011: 5). Importantly, 'net benefits' indicate that positive impacts outweigh negative impacts and does not imply the absence of losses or damages (Mullis *et al*., 2011).

Box A-1: Defining sustainable tourism (after Mullis *et al*., 2011)
Tourism comprises activities of people traveling to and staying in places outside their usual environment for at least one night and no more than one consecutive year for leisure, business, and other purposes.
Sustainable development is broadly defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987).
Sustainable tourism is a form of tourism characterized by a level of intensity and technology that generates sustainable net social, economic, and environmental benefits. Sustainable tourism refers to tourism that develops in a fair and equitable manner for host communities, both human and natural. Sustainable tourism is economically viable in the long-term and avoids damage to the physical and cultural environment. In other words, it is tourism that participates in the management of all resources that fulfils economic, social, and aesthetic needs while it maintains cultural integrity and biological diversity, and environmental quality. Sustainable tourism applies the sustainable development principle, but to travellers, businesses involved in the travel trade, and destinations impacted by tourism development.
Ecotourism typically involves responsible travel to fragile, pristine, and / or protected natural areas, and which strives to be low impact and small scale. Like sustainable tourism, ecotourism focuses on environmental conservation and the improvement of the wellbeing of local people
Community-based tourism is sustainable tourism conducted in such a way that the local communities not only benefit economically and socially, but also take a leadership role by initiating and operating the tourism activities.

Three focus areas within sustainable tourism have been identified (Meyer, 2007):

- Economic sustainability: Through the creation and maintenance of a viable tourism industry;
- Responsible tourism: A form of tourism, which recognises the finite limits to tourism development, and generally advocates small-scale tourism that is sensitive to cultural

and environmental conditions, with an emphasis on ecotourism and community-based tourism; and

- Tourism as a tool for development: Tourism is seen as a way to enhance opportunities for local people by integrating tourism into broader economic and social developments. This approach places emphasis on the needs and development aspirations of local people rather than on protecting resources for the value of the tourism industry and seeks to harness the industry as a whole to contribute to development aims. Pro-poor tourism falls within this perspective.

In addition, a systems thinking / approach is advocated as a useful tool for understanding the components of sustainable tourism, how they interact and how the system changes over time. A system is "*a set of interrelated elements that changes over time. A systems approach presents the big picture, helps manage for the long term, identifies multiple entry points, weighs trade-offs and choices, and identifies stakeholders and partners*" (Mullis *et al*., 2011:14). For example, a systems map illustrating the interactions between natural resources, cross-cutting social issues, governance and economic growth has been used to identify potential issues within the tourism system (Figure A-5).

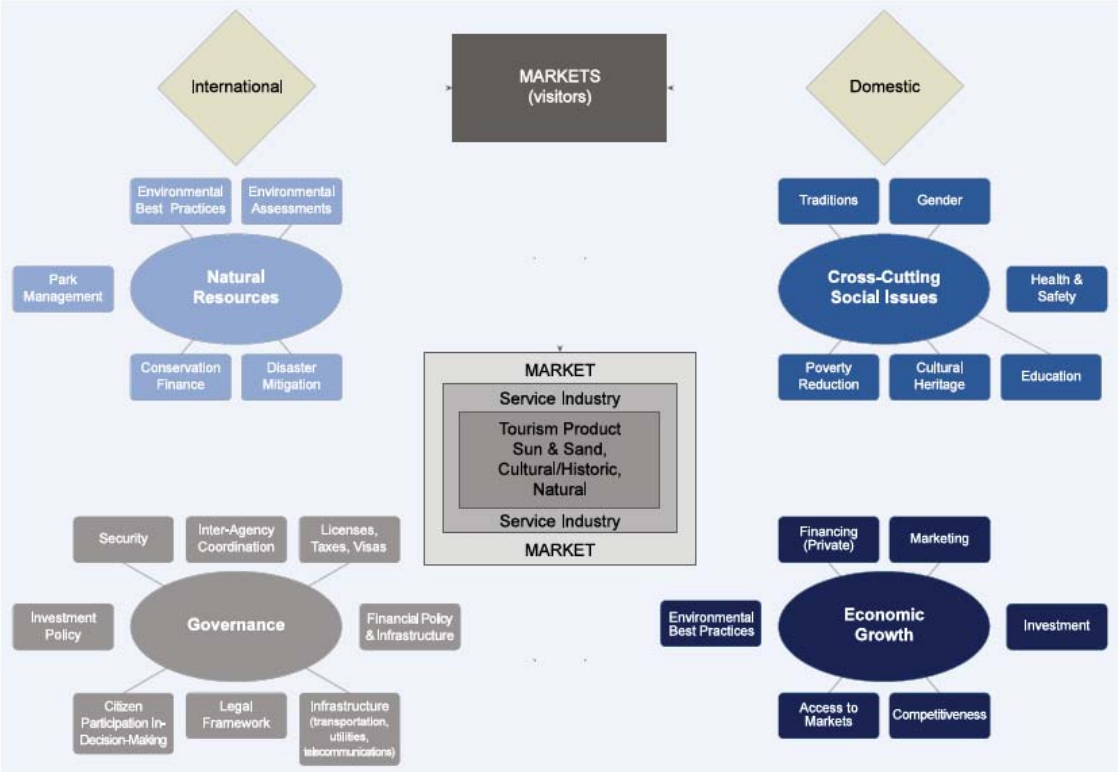


Figure A-5: Tourism systems map (Mullis *et al*., 2011: 14).

Similarly, Camus *et al*. (2014) describe sustainable tourism as interconnected sub-systems acting together to preserve present and future generations (Figure A-6) specifically:

- The transport subsystem;
- The infrastructure subsystem;
- The governance subsystem – the system uniting the actors of the tourism activity; and
- The natural subsystem – natural capital – which is subject to the pressures of the other subsystems.

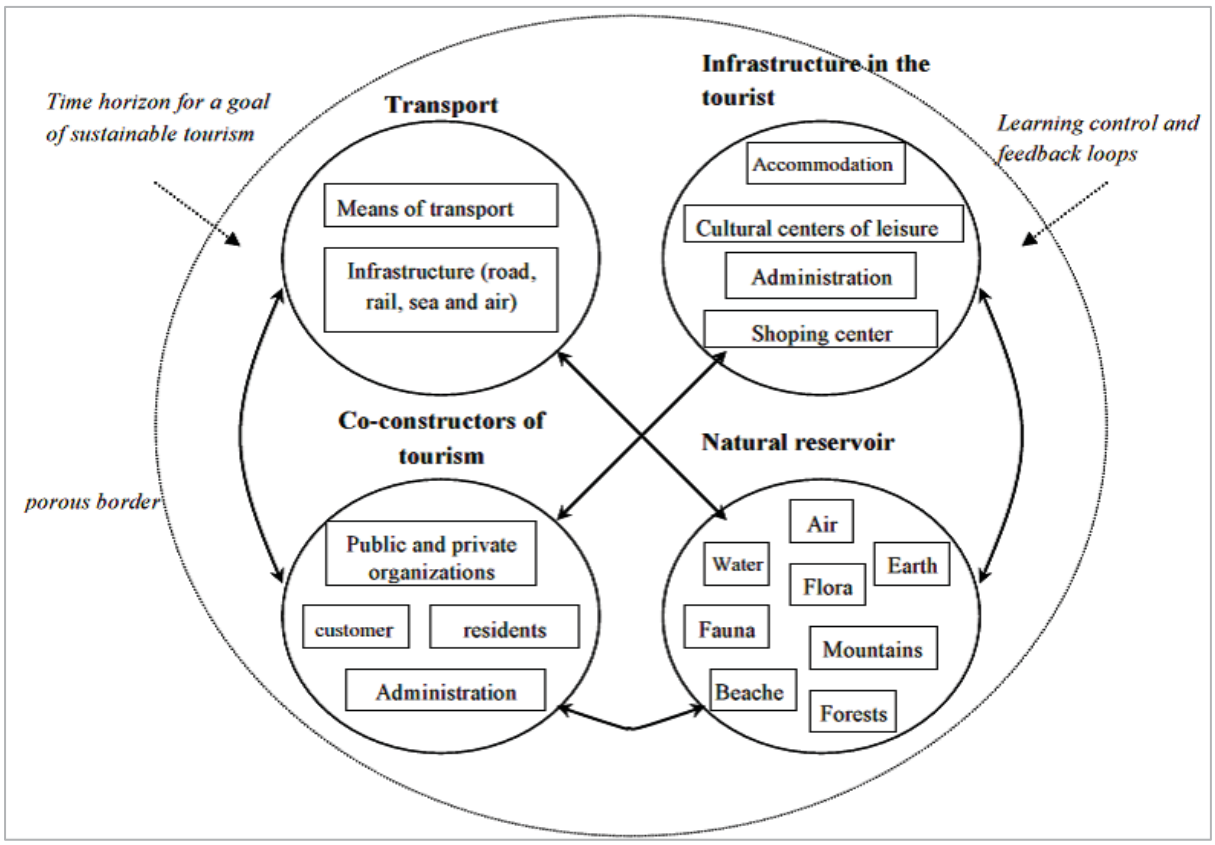


Figure A-6: System presentation of sustainable tourism (Camus *et al*., 2014:7).

From this perspective, a useful systems model for analysing the tourism system is the industry value chain approach. The value chain approach can be used to illustrate linkages between key tourism businesses and components within the tourism system (Figure A-7) or within the visitor experience (Figure A-8).

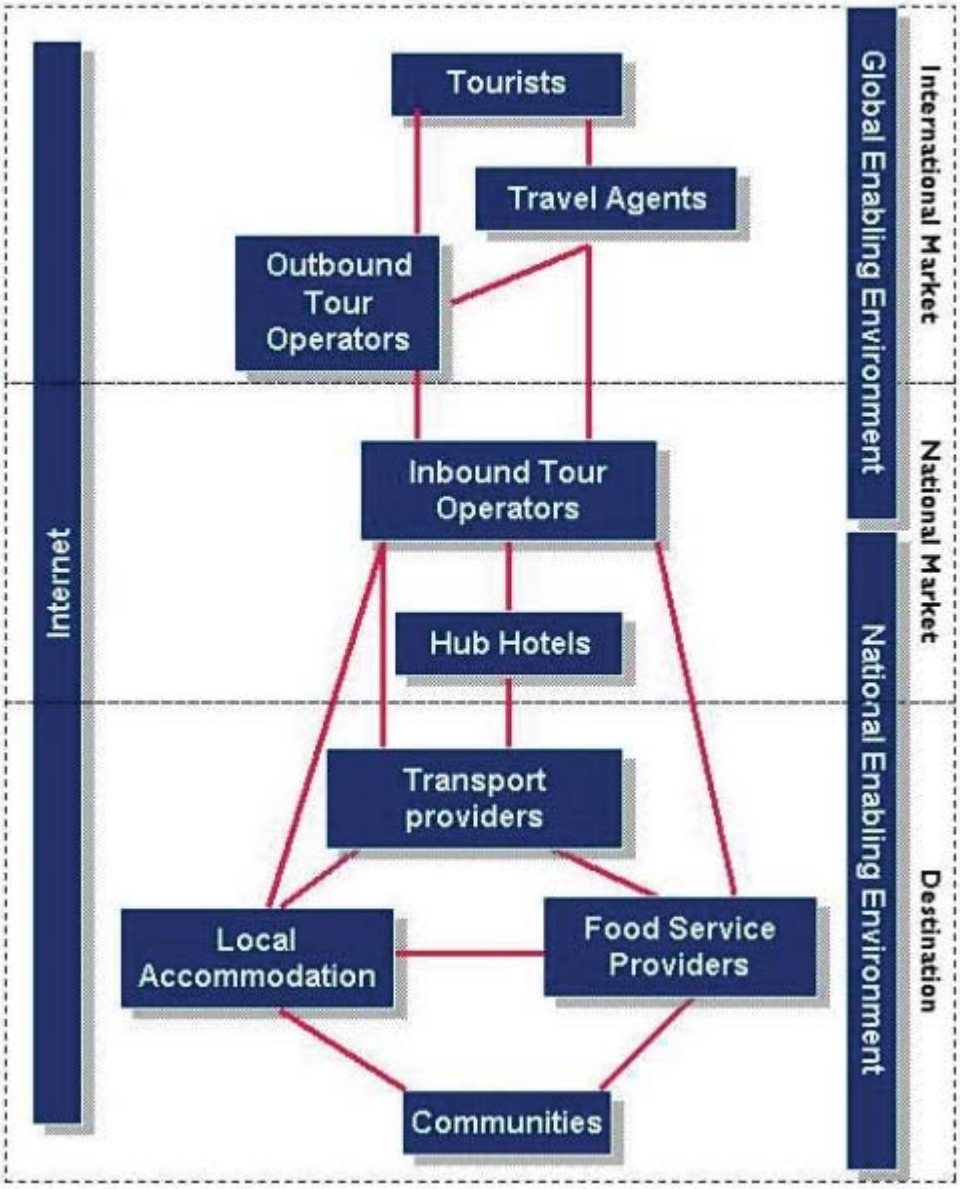


Figure A-7: Tourism industry value chain (Mullis *et al*., 2011:15, citing Volunteers for Economic Growth, 2011).

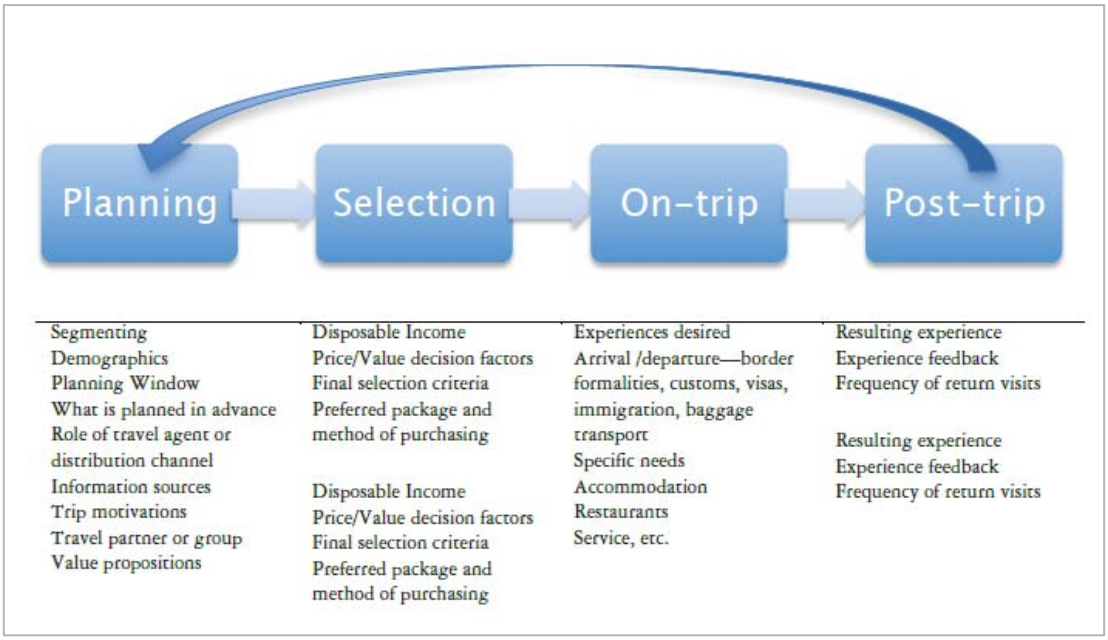


Figure A-8: The visitor experience value chain (Mullis *et al*., 2011:13).

A growing body of research offers formal, mathematical models of tourism sustainability. For example, Johnston and Tyrrell (2005: 2) propose a dynamic model of sustainable tourism "*illustrating the interrelated behaviour of tourism-related economic and environmental conditions throughout time*", specifically relating environmental quality and visitor numbers Figure A-9). The simplified model "*provides a sustainable path of visitor levels that maximizes an objective (profits or utility) throughout time while accounting for indirect changes in environmental quality*". The application of the model appears to be focused more toward the impacts of tourism (visitor numbers) on environmental quality rather than the impact of environmental quality on visitor numbers, although the relationship is implied.

A few points are noteworthy:

- Sustainable tourism is defined on the basis of environmental sustainability – the authors highlight a trade-off between sustainability goals, for example "*one may seek to sustain…the size or growth of industry profits, the quality of some or all environmental resources… the number of tourist jobs…it is unlikely that all may be sustained simultaneously*";
- A composite index variable, environmental quality, is used to represent the multi-attribute bundle of environmental resources on which tourism depends, all resources are assumed to be renewable to some degree;

- In this example, local permanent residents and tourism industry planners are the groups considered to have a primary interest in the existence and outcomes of tourism (a model in which more groups are considered could be developed);
- Tourist visitors are assumed to be attracted by higher levels of environmental quality, while also causing environmental quality to degrade.

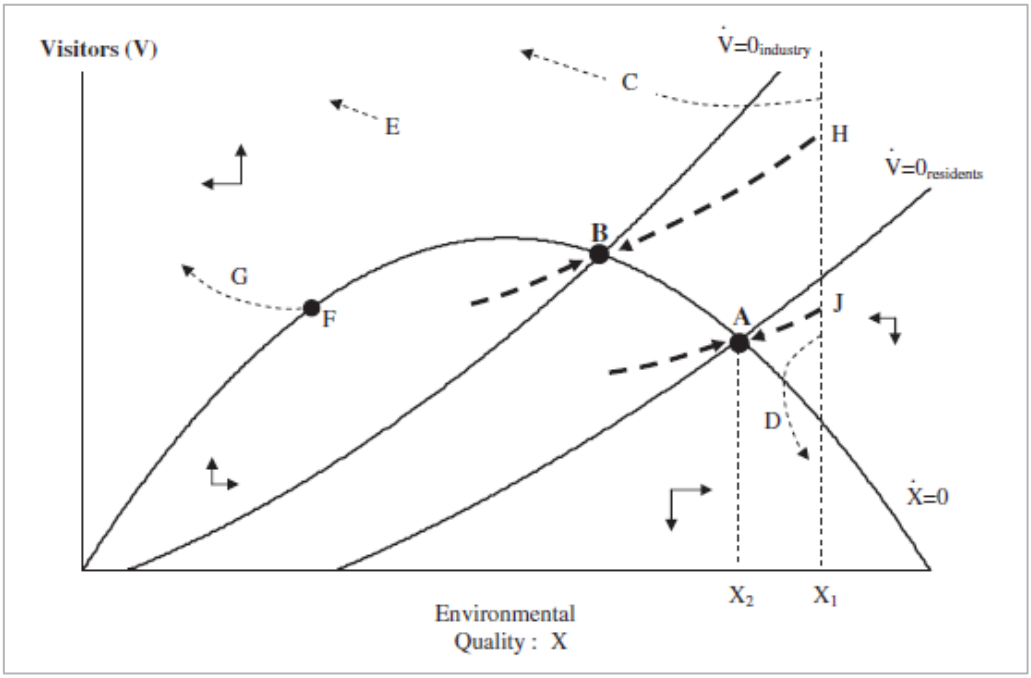


Figure A-9: Phase diagram for environmentally sustainable tourism – Steady states and optimal paths (Johnston and Tyrrell, 2005: 6).

While there are many benefits associated with sustainable tourism (Mullis *et al*., 2011), transforming the concept into development action is challenging partly because of the ambiguity and multiple interpretations of sustainable tourism (Meyer, 2007).

7.6.3 A destination capitals model of tourism development

Sharpley (2010) provides a provocative criticism of the concept of sustainable tourism, both in terms of challenging the notion of sustainable development itself and questioning whether the development of tourism can meet the fundamental principles of sustainable development. Similarly, Chok *et al*. (2007: 153) contend that "*there is a critical difference, after all, between sustaining development that contributes to (human and non-human) welfare and sustaining tourism development per se*". Sharpley (2010: 11) argues that "*the extent to which sustainability objectives are achievable within the tourism context remains questionable. As with all industries and economic sectors, resource sustainability in*

tourism is dependent upon all sectors involved directly and indirectly in the tourism industry working towards common goals…sustainability in tourism will only be achieved when the industry as a whole accepts the need for such policies…the greatest challenge to sustainability more generally remains the need to transform contemporary levels and patterns of consumption".

As an alternative, Sharpley (2010) proposes the concept of 'destination capitals' as a potential solution to ensuring that tourism development meets both destinational needs and environmental parameters. Sharpley (2010: 10) explains: "*all tourist destinations possess to a greater or lesser extent a variety of capitals, such as environmental capital, human capital, socio-cultural capital, economic capital and political capital. These capitals may be exploited by the destination in ways which meet the need for environmental sustainability (as defined by the destination), which reflect local developmental objectives and which take advantage of opportunities offered by the external market*" (Figure A-10).

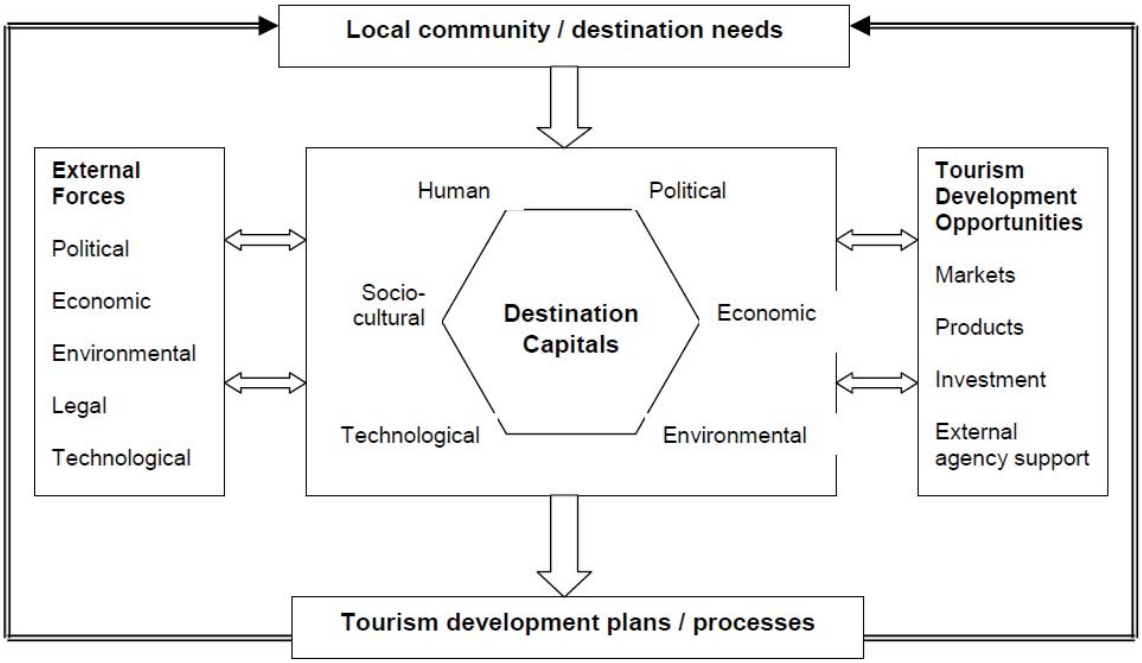


Figure A-10: A destination capitals model of tourism development (Sharpley, 2010: 12).

This model places the focus of tourism planning and environmental sustainability in the context of the individual destination, as "*destinations may exploit their capitals in ways which optimise the economic benefits of tourism according to local needs at the same time maintaining their capital base (including environmental capital) for the future*" (Sharpley, 2010: 12). While not necessarily meeting the criteria of sustainable development,

"*destinations may develop forms of tourism that…provide a more realistic, viable approach to tourism development*" (Sharpley, 2010: 13). This view accepts tourism as a primarily economic activity in the capitalist sense: A variety of capitals are employed to produce products that are sold for profit.

7.6.4 Tourism as a poverty alleviation strategy

Tourism has long been understood as a vehicle of development. However, consensus on the meaning and objectives of 'development' is less evident. Box A-2 provides a short description of three development theories relevant in the context of tourism: Modernisation, Dependency and Sustainable Development. Traditionally, development has been equated with economic growth and an increase in per capita wealth. Regional economic growth has been the target, with poverty alleviation seen as a natural outcome of regional economic growth. This assumed that "*as long as the whole region gets wealthier, the benefits brought by economic growth will eventually trickle down to the local poor*" (Zhao and Ritchie, 2008: 120). Increasing development is considered a multi-dimensional process constituted not only of economic, but also of social, political, cultural and environmental factors. The emergence of the pro-poor tourism model is seen as reflecting a change in thinking on tourism development and poverty alleviation (Zhao and Ritchie, 2008). The pro-poor tourism framework "*aims to establish a direct link between tourism and poverty alleviation and emphasise the voices and needs of the poor in tourism development*" (Zhao and Ritchie, 2008: 120) (Figure A-11).

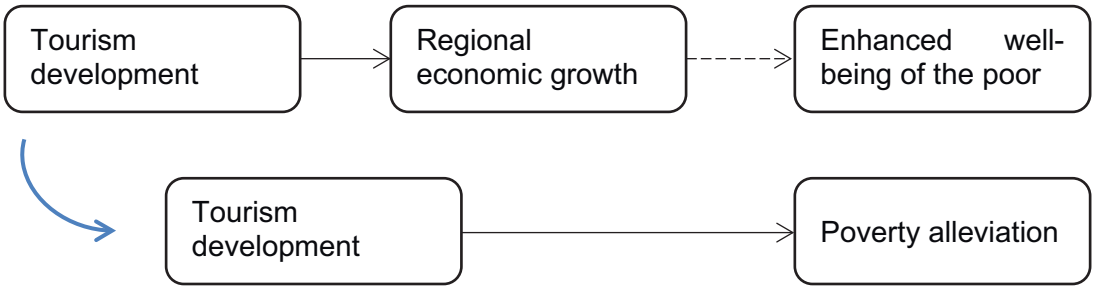


Figure A-11: A change in the philosophy regarding tourism and poverty alleviation (Zhao and Ritchie, 2008: 120).

Box A-2: Development theory: Modernisation, Dependency and Sustainable Development (Sharpley, 2003: 247-248)

Modernisation theory

The core premise of modernisation theory is that all societies follow an evolutionary path to development and that, according to their stage of development, societies can be located at different positions or stages on a path from traditional to modern. Once a particular society attains the so-called 'take-off' stage, modernisation or development can occur as a result of economic growth and diffusion – economic growth being synonymous, from the modernisation perspective, with development.

From this perspective, tourism represents an economic growth pole from which economic benefits 'trickle down' or diffuse throughout the economy through for example, the promotion of backward linkages and the income multiplier effect. Modernisation theory most closely reflects the traditional process of tourism-related development, the benefits of which are most commonly measured in economic terms.

Modernisation theory is criticised for its assumption of inevitable modernisation, its western ethnocentrism and its fundamental doctrine of economic growth, the latter frequently reliant on investment from the metropolitan centres as well as the implicit exclusion of local input into the development process.

Dependency theory

Dependency theory, or underdevelopment theory, emerged in the 1960s as a critique of the modernisation paradigm. Based upon Marxist theory, it has been defined as a conditioning situation in which the economies of one group of countries are conditioned by the development and expansion of others. In other words, within the single, capitalist world system, wealthy western nations utilise their dominant position to exploit weaker, peripheral nations, often mirroring earlier colonial ties. Thus, less developed countries display external political and economic structures that maintain their dependency on the metropolitan centre: they are unable to develop unless 'permitted' to do so by the West.

Given the inherent political economy of international tourism, it is evident that there exist parallels between tourism development and dependency theory. Tourism has evolved in a way that closely matches historical patterns of colonialism and economic dependency.

Sustainable development

In contrast to modernisation theory, sustainable development gives primacy to the satisfaction of basic needs, such as food, shelter, healthcare and education, although economic growth remains a fundamental prerequisite. Importantly, the principal focus of sustainable development is also upon a local, 'bottom-up' or grassroots approach in order to ensure both development according to local needs and the promotion of local choice and political freedom, whilst development itself must be environmentally sustainable. Thus, sustainable development proposes a long-term, holistic perspective that espouses equity, choice, political freedom (from dependency), cultural integrity and development within environmental parameters. The extent to which tourism may contribute to sustainable development remains the subject of rigorous debate

In the pro-poor tourism model, tourism is seen as a tool for development and poverty alleviation. Defined as "*tourism that generates net benefits for the poor*", pro-poor tourism is

regarded as approach to tourism development and management, rather than a niche sector or product of tourism (Ashley *et al*., 2001: 2; UNWTO, 2010). Tourism benefits may be economic, social, environmental, cultural or a combination of these. A key assumption underlying the pro-poor model of tourism, drawing from pro-poor growth theory, is that "*economic growth is beneficial for development and should be encouraged as long as the 'poor' benefit over-proportionally*" (Meyer, 2007: 558). The pro-poor tourism framework thus aims to modify growth towards pro-poor objectives (Chok *et al*., 2007).

Tourism is regarded as having better prospects for promoting pro-poor growth than many other sectors. Several characteristics inherent in tourism contribute to its pro-poor potential (Ashley *et al*., 2001:2):

- It is a diverse industry. This increases the scope for wide participation, including the participation of the informal sector:
- The customer comes to the product, providing considerable opportunities for linkages (e.g. souvenir selling):
- Tourism is highly dependent upon natural capital and culture. These are assets that some of the poor have, even if they have no financial resources;
- Tourism can be more labour intensive than manufacturing (though less labour intensive than agriculture);
- Compared to other modern sectors, a higher proportion of tourism benefits (jobs, petty trade opportunities) go to women (though it is not known whether these are necessarily the poorest women).

This approach takes the view that for tourism to provide gains for local communities, "*tourism development needs to be reoriented according to the interests of local stakeholders, in particular poor people*" (Rogerson, 2006 citing (Forstner, 2004:497). Strategies are needed in order to take advantage of the potential benefits, and to minimise the negative effects (Ashley *et al*., 2001). The aim of such strategies is to "*unlock opportunities for the poor, rather than to expand the overall size of the sector*" (Ashley *et al*., 2001:2). The pro-poor tourism approach focuses on how tourism affects the livelihoods of the poor and on how positive impacts can be enhanced through pro-poor tourism strategies.

Despite its potential as a tool for development and the widespread interest in tourism-based poverty alleviation, the relationship between tourism and poverty alleviation has not yet been rigorously established and is largely based on case studies (Zhao and Ritchie, 2008). This is partly due to the challenge of understanding poverty-related issues given its multidimensional

nature and wide range of factors (economic, socio-political, cultural) that must be considered (Zhao and Ritchie, 2008).

Much of the work on pro-poor tourism has been 'on the ground' and little has been done in situating or linking pro-poor tourism within the macro-economic context (Meyer, 2007). While frequently applied at the macro-economic level, the concepts of leakages and multipliers are less common in the field of pro-poor tourism (Box A-3). Meyer (2007) argues that the macro-level context influences micro-level linkages and stresses the inter-relationship between linkages, leakages and multiplies.

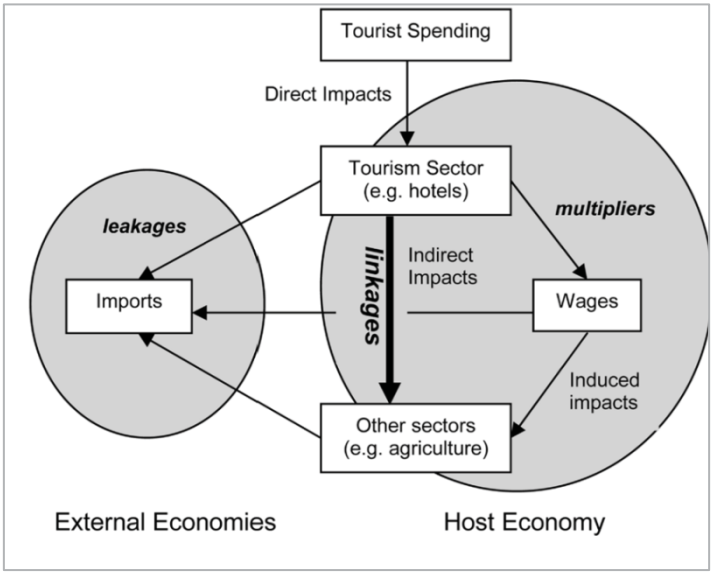
Several critics argue that because tourism is driven by foreign, private sector interests, its contribution to poverty alleviation is limited and can "*disadvantage the poor causing displacement, increased local costs, loss of access to resources and social and cultural disruption*" (Ashley *et al*., 2001:2). Ashley *et al*. (2001) argues that these 'disadvantages' are common to most types of economic development and not to tourism per se. Chok *et al*. (2007:144) warn against seeing tourism as a solution to poverty without recognizing that tourism is highly political "*as a global industry, tourism operates within a neo-liberal market economy which presents severe challenges to meeting pro-poor and sustainable development objectives*", and advocate that political commitment to address structural inequalities directly is first needed.

Drawing on the 'sustainable development spectrum' – from the very weak (a traditionally resource exploitative perspective) to the very strong (an extreme preservationist perspective), Chok *et al*. (2007:153) suggest that the pro-poor tourism approach falls within a weak sustainability position "*The focus on poor people…reflects a strong anthropocentric view. Although ecological damage is to be minimised, environmental benefits are secondary to poor peoples' benefits*". Chok *et al*. (2007:154) warm that "*placing environmental concerns as secondary has grave implications…climate change will 'exacerbate existing vulnerabilities and create new ones for the poor'…rich-poor inequalities will widen as impacts 'will fall disproportionately upon developing countries and the poor persons within all countries' (Fogarty, 2004)*". Chok *et al*. (2007:160) provide a further critique of the pro-poor tourism model, suggesting that while "*the tourism industry needs to adopt a pro-poor focus, this is different to the prescription that tourism is an appropriate poverty alleviation strategy for all countries*"… the policy focus "*should be on identifying and addressing the deep-rooted structural inequities within our global development paradigm (tourism included) which exacerbate poverty and constrain pro-poor attempts*".

Box A-3: Tourism leakages and multipliers (Meyer, 2007)

Leakage is a term used to describe the percentage of the price of the holiday paid by the tourists that leaves a destination in terms of imports or expatriated profits, or that never reaches the destination in the first instance. A number of studies warn of unnecessarily high internal leakages due to the reliance of the tourism industry on imports. Leakages tend to be highest when the local destination economy is weak and lacks the quantity and quality of inputs required by the tourism industry and thus appear to be particularly high in small developing countries and island economies, for many of which tourism is the principal export earner. Tourism, however, is also often hailed as an industry that offers particularly good potential for creating high multiplier effects.

Multipliers aim to summarise the capacity of tourism in generating economic development by examining the impacts of additional tourist spending in a destination area, which in turn serves to generate income, employment, and a range of other benefits for the host economy. Tourism multipliers often display very substantial international variations depending on, for example, the structure and size of the economy in which the tourism activity takes place or the spending patterns of visitors and how the receipts from tourism are spent by front line tourism businesses.



Linkages, multipliers and leakages (note: → indicates flow of money)

7.7 Review of the adaptive theory of change in interacting socio-economic and ecological systems

As argued by van Hes *et al*. (Hivos, 2015:12), "(*t)heories' of change are the ideas and beliefs people have – consciously or not – about why and how the world and people change. How people perceive and understand change and the world around them is infused by their underlying beliefs about life, human nature and society. They are deep drivers of people's behaviour and of the choices they make. These beliefs are formed by different aspects of people's lives:*

- *Class, gender, religion, the history of their family, the values they have been brought up with;*
- *History, culture and context of where they live;*
- *Personal life experiences and their different identities in different settings;*
- *Formal education and – where relevant – their knowledge of academic social theories*."

In other words, attempts to conceptualise, measure and value why and how global changes, including water-related changes in natural capital, influence changes in the South African tourism sector and economy will be influenced by our understanding of why and how ecological and socio-economic systems interact and change. This leads us to briefly synthetize the key concepts which are at the core of our understanding of the latter, namely system resiliency to perturbations / drivers of change, the adaptive cycle and Panarchy models, and what they mean for pathways towards sustainability.

7.7.1 Resiliency in ecological and socio-economic systems

The ecological application of the resiliency concept was introduced by Holling (1973) as the magnitude of perturbation that an ecosystem can withstand before shifting into a different stable state, while maintaining the regulating processes and overall function of the system. This definition includes both the magnitude of disturbance that can be absorbed before changes in system processes occur as well as the time required for a new equilibrium to be attained. Four general attributes of ecosystem structure and function are noted (Holling, 1996):

- Change is episodic, as natural capital accumulates slowly until an unpredictable perturbation disrupts the system and causes an abrupt release and reorganization of capital;
- Non-linear processes function across multiple scales, both large and small, and fast and slow;

- Multiple stability domains exist for a particular system, in which stabilizing forces maintain productivity and destabilizing forces maintain diversity and resilience against disturbances; and
- Uncertainty and surprise within ecosystems require flexible and adaptive management in order to maintain resiliency.

As argued by Hoffmann (2008), *"(i)n the same manner that ecosystems develop responsive mechanisms to uncertainty and unpredictable change, social groups are also able to respond and adapt to perturbations that disrupt the processes that control and maintain their structure*." Because humanity influences ecological processes at all scales (Olsson *et al*., 2004) and in turn creates social-ecological systems that develop coping mechanisms and adaptive strategies to manage uncertainty (Berkes and Jolly, 2001), the concept of resiliency can be applied to groups or communities (e.g. the tourism industry of a region) that depend on ecosystems and natural capital for their economic livelihood (e.g. Adger, 2000), creating a direct link between the functioning and well-being of ecosystems and social communities. Resiliency can thus be broadly defined as "*the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain the same function, structure, identity, and feedbacks*" (Walker *et al*., 2004: 2).

7.7.2 The Adaptive Cycle model

To understand how resiliency and change work within a system one can use the Adaptive Cycle model (Gunderson and Holling, 2002; Holling, 1986; 2001), which has traditionally been practically applied to assess transformation as ecological systems migrate between stable and unstable states. The model is characterized by four dynamic adaptive-renewal stages through which all systems are posited to cycle:

- Growth or exploitation (r);
- Conservation'(K) of established patterns and resource distribution;
- Collapse or release (Ω); and
- Reorganization (α).

Table A-3 provides the definitions of each phase of the Adaptive Cycle model while Figure A-12 illustrates how these phases interact.

Table A-3: Definitions for each phase of the Adaptive Cycle model

Phase / stage	Definition
Exploitation / Growth	The structural aspects, productivity levels, relationships, and traditional forms of capital that exist within a system
Conservation / Accumulation	Productive efficiencies, resources, and forms of capital that emerge and evolve as a system prepares for disturbance and transition
Release / Restructuring	Transition and change that occurs due to disturbance brought on by increasing connectedness, rigidity and vulnerability within a system; ability to cope, or adapt, relies on possessed resources and capital
Reorganization / Renewal	Adaptive and innovative properties that allow a system to reformulate, r reorganize, capital during transition to build adaptive capacity, hence increasing resilience and against future stressors and disturbances

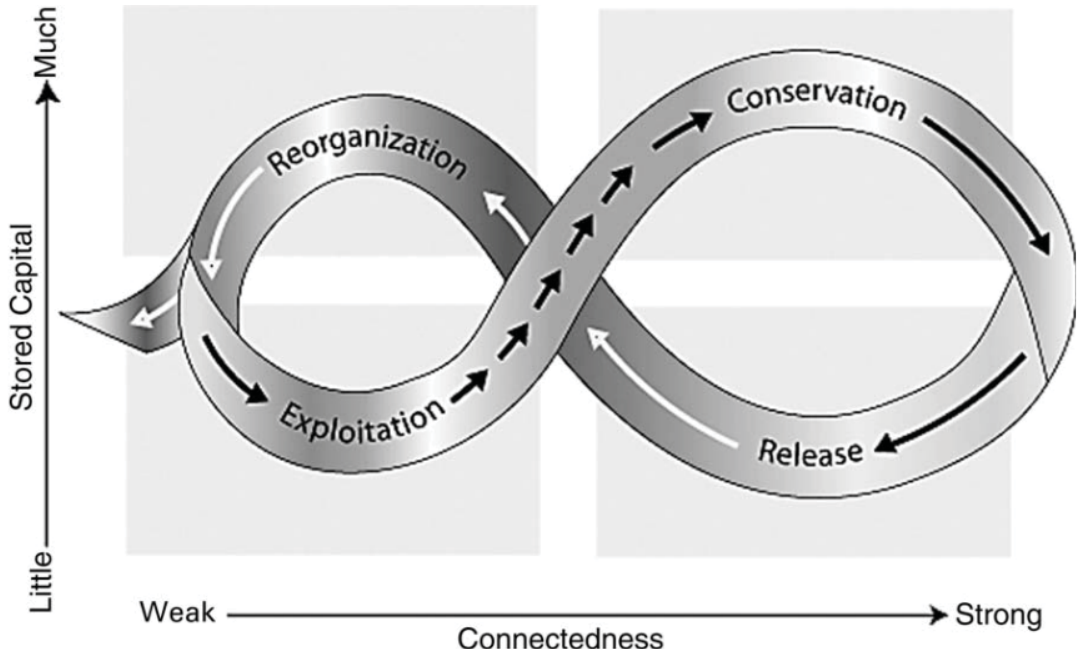


Figure A-12: Interacting stages of the Adaptive Cycle (Gunderson and Holling, 2002; Holling, 1986; 2001).

In addition, key elements of resiliency for understanding the Adaptive Cycle model include:

- Latitude, the threshold of change beyond which a system is unable to recover;
- Resistance, the “ease or difficulty” of introducing change to the system;
- Precariousness, the closeness of the system to the threshold of change; and
- Panarchy, the cross-scale influence that nested systems from above and below have on the system.

Figure A-13 further illustrates key phases of transformation in the Adaptive Cycle, namely "preparing for change" (from conservation phase to the release phase, where there is risk of the "rigidity trap"), "navigating the transition" (from the release phase to the reorganisation phase) and "building resilience of transformed system" (from the reorganization phase to the exploitation phase, where risk of "poverty trap" lies) (Olsson *et al*., 2004).

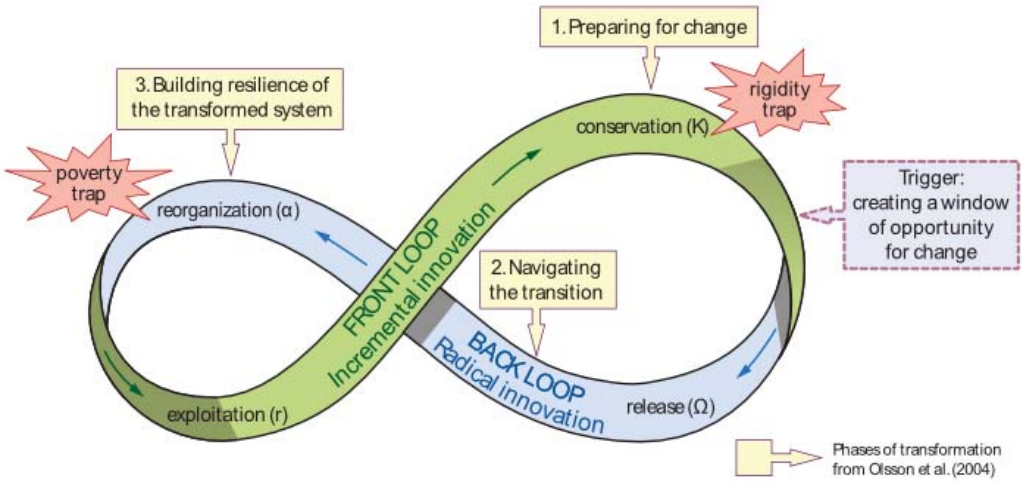


Figure A-13: Transformation phases, rigidity and poverty traps in the Adaptive Cycle (from Olsson et al., 2004).

7.7.3 Panarchy, a model for interacting ecological and socio-economic systems at multiple scales

The interactions of ecological and socio-economic variables across multiple temporal and spatial scales, their relationship to adaptability, and the evolution of adaptive systems are best articulated by Gunderson and Holling (2002) in their concept of Panarchy (Figure A-14). In a Panarchy, complex natural and human systems are composed of hierarchical levels and processes, which lie at different orders of magnitude. In an ecological system, processes may occur at the levels of individual, community, species, landscape, ecosystem, biome, and at the global scale of ecological interaction.

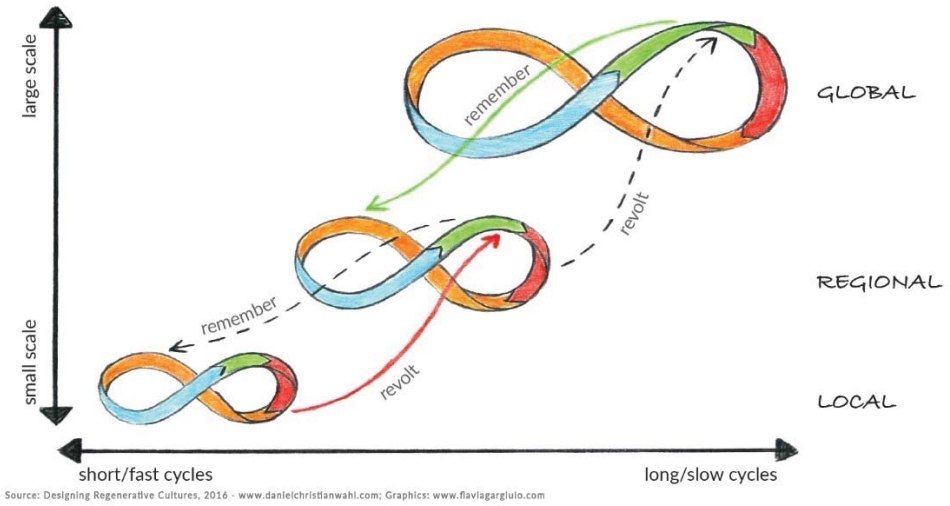


Figure A-14: Panarchy of interconnected adaptive cycles at different spatial and temporal scales (adapted from Gunderson and Holling, 2002).

For instance, Figure A-15 illustrates how the Panarchy metaphor helps us understand system dynamics and cross-scale interactions in the Upper Baiwu watershed over time (Urgenson *et al.*, 2010). In a social system, processes may occur at the individual, group, community, government, societal, cultural, and again global levels of social interaction (Gunderson and Holling, 2002), among others.

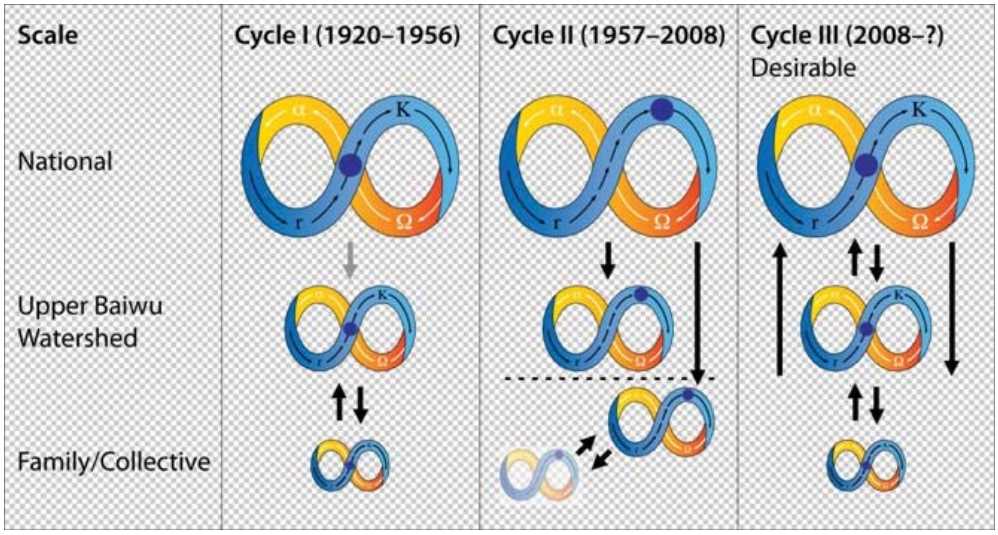


Figure A-15: The Panarchy metaphor illustrates system dynamics and cross-scale interactions in the Upper Baiwu watershed over time (Urgenson *et al*., 2010).

This illustration shows one scale above (national) and below (family or collective) the system of interest. Cycle I exhibits loose connections with national socioeconomic policy. Community traditions set norms based on strong feedbacks between local family and watershed system scales. Cycle II depicts the system after the National Democratic Reforms in 1957 and continuing to the present day. Strong national controls dictate local resource use, leading to a scale mismatch and diminished feedbacks between lower scales. After 1957, the collective replaces the family as the smallest scale within the interaction hierarchy. Cycle III begins in 2008 with the new forest use policy. The desirable scenario is characterized by greater feedbacks among all three scales of organization. National forest policies are decentralized to reflect the information and needs transmitted from lower scales. Strengthened local institutions and cooperative relationships between the state and local communities could enable communities to respond directly to changes in the watershed through the development of a monitoring system for adaptive and sustainable forest management.

Figure A-16 shows how the concept of Panarchy has been applied to an infection prevention project for the Methicillin-resistant *Staphylococcus aureus* (MRSA) bacteria. The insight offered by this model is the notion of overall system nestedness, or the interaction and influence that one hierarchical level may have on another, across scales of time and space (Gunderson and Holling, 2002). This occurs not only across hierarchies within single systems, but at scales that span natural and social systems themselves. Nestedness across such scales creates the notion of the social-ecological system, in which processes may occur across levels of individual stakeholders, communities, natural resource management agencies, governments, natural resource management and use philosophies, and regional, national, and global markets. Panarchy describes the structure by which processes that govern natural, human, and social-ecological systems are linked via "*adaptive cycles of growth, accumulation, restructuring, and renewal*" (Holling, 2001: 392). As systems evolve due to disturbance, uncertainty, and change, adaptive cycles occur at each hierarchical level of system nestedness, across scales of both time and space (Gunderson and Holling, 2002).

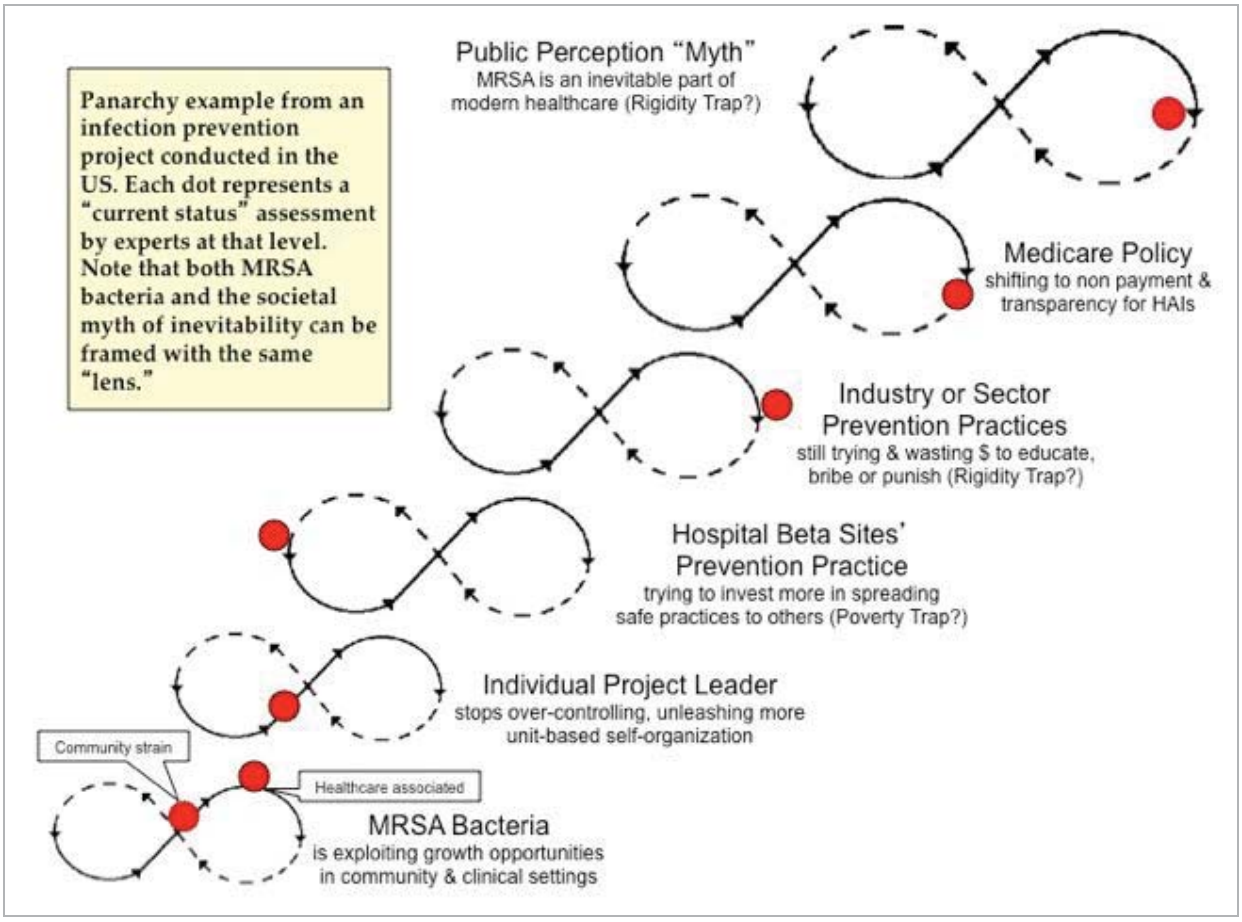


Figure A-16: The concept of Panarchy applied to an infection prevention project for the Methicillin-resistant *Staphylococcus aureus* (MRSA) bacteria (Liberating Structures, 2019).

7.7.4 Drivers of change and slow / fast variables

There are various definitions of drivers of change in the literature (e.g. Anastasopoulou *et al*., 2009). According to the MA (2005) and more precisely Nelson *et al*. (2005), drivers of ecosystem change are any natural or human-induced factors that directly or indirectly cause a change in an ecosystem. Direct drivers are the physical, biological or chemical processes that tend to directly influence changes in ecosystem services. Important direct drivers include climate change, nutrient pollution, land conversion leading to habitat change, overexploitation, and invasive species and diseases. Indirect drivers are factors that operate more diffusely than direct drivers, often by altering one of the more direct drivers. The MA categories of indirect drivers of change are demographic, economic, socio-political, scientific and technological, and cultural and religious. Changes in ecosystem services are almost always caused by multiple, interacting drivers that work over time and over level of organization and that happen intermittently. Changes in ecosystem services can also feedback to alter drivers.

All these drivers can play a role in changing socio-economic and ecological systems in interaction, including tourism systems.

For instance, excessive nutrient loading has emerged as one of the most important direct drivers of ecosystem change in terrestrial, freshwater, and marine ecosystems (MA 2005). Synthetic production of nitrogen fertilizer has been the key driver for the remarkable increase in food production that has occurred during the past 50 years. Yet, as much as 50% of the nitrogen fertilizer applied is lost to receiving ecosystems (excessive nutrient loading is largely the result of applying more nutrients than crops can use), depending on how well the application is managed.

Within a complex system, Walker *et al*. (2012) argue that it is helpful to separate “fast” and “slow” system variables. “Fast” variables are typically those that are of primary concern to ecosystem users, for example a pest species or (often) ecosystem goods and services, such as crop production, clean water or pollination. The dynamics of these fast variables are strongly shaped by other system variables that generally change much more slowly, and hence have been referred to as “slow” or (because they are not always slow) “controlling” variables. The slow variables, such as amount of soil organic matter, shape how a fast variable, such as crop production, responds to variation in an external driver, such as variation in rainfall during the growing season (Walker *et al*., 2012).

7.7.5 Framing sustainable systems: Weak vs strong sustainability and alternative competing pathways

Standard thinking and practice focusing on sustainability goals starts with a functioning or developing system, and then looks at how long that system can operate without wearing down. Essentially, this means that most people conceptualise sustainability within the scope of the two phases of the Adaptable Cycle: How can the system transition from the exploitation phase towards the conservation phase without going to into collapse? However, attempting to answer this question involves making choices among alternative pathways towards sustainable systems. As argued by Pelenc and Ballet (2015), the fundamental debate regarding sustainable development is whether we choose to adopt a strong or a weak conception of sustainability.

On the one hand, weak sustainability assumes that natural capital and manufactured capital are essentially substitutable and considers that there are no essential differences between the kinds of well-being they generate (Ekins *et al*., 2003; Neumayer, 2003; Neumayer, 2012). The

total value of the aggregate stock of capital should be at least maintained or ideally increased for the sake of future generations. In other words, this perspective supports the view that as long as tourism businesses and the associated infrastructures are built and maintained, it does not matter that tourism activities deplete water resources and generate various air, water and soil emissions. Such a position leads to maximising monetary compensations for environmental degradations. In addition, from a weak sustainability perspective, technological progress is assumed to continually generate technical solutions to the environmental problems caused by the increased production of goods and services (Ekins *et al*., 2003).

Researchers working on strong sustainability argue that natural capital cannot be viewed as a mere stock of resources. Rather natural capital is a set of complex systems consisting of evolving biotic and abiotic elements that interact in ways that determine the ecosystem's capacity to provide human society directly and / or indirectly with a wide array of functions and services (Noël and O'Connor, 1998; Ekins *et al*., 2003; De Groot *et al*., 2003; Brand, 2009). The proponents of strong sustainability invoke several reasons to demonstrate the non-substitutability of natural capital, including but not limited to:

- The qualitative difference between manufactured capital and natural capital – manufactured capital is reproducible and its destruction is rarely irreversible, whereas the consumption of natural capital is usually irreversible (for instance species extinction is irreversible, whereas the destruction of material goods or infrastructures is not) (Ekins *et al*., 2003).
- Our lack of knowledge about the functioning of ecosystem systems, so that we cannot be sure of the effects on human well-being of destroying natural capital (Dietz and Neumayer, 2007). Irreversibility and uncertainties should lead us to implementing a precautionary principle towards natural capital.
- The fact that manufactured and financial capital can never be a complete substitute for the biophysical structures of natural capital because they require natural capital for their production (Ekins *et al*., 2003).
- The fact that natural capital and ecosystem services play an important role in determining the freedom of choice and action for human beings (MA 2005). In this view, natural capital is instead seen as being complementary to manufactured capital and other forms of capital (e.g. human and social capital) in producing human well-being (Brand, 2009).

As argued by the Centre for Resilience of the Ohio State University[41], "*(s)ustainability is often misinterpreted as a goal to which we should collectively aspire. In fact, sustainability is not a reachable end state; rather, it is a fundamental characteristic of a dynamic, evolving system. Long-term sustainability will result not from movement along a smooth trajectory, but rather from continuous adaptation to changing conditions. We cannot assume that nature will be infinitely resilient, nor can we presume to foretell what cycles of change will occur in the future".* Substitutability of natural capital should thus be severely limited due to the existence of critical elements that natural capital provides for human existence and well-being. The main differences between weak and strong sustainability are summarized in Table A-4.

Table A-4: The main differences between weak and strong sustainability (Pelenc and Ballet, 2015)

	Strong sustainability	**Weak sustainability**
Key idea	The substitutability of natural capital by other types of capital is severely limited	Natural capital and other types of capitals (manufactured, etc.) are perfectly substitutable
Consequences	Certain human actions can entail irreversible consequences	Technological innovation and monetary compensation for environmental degradation
Sustainability issue	Conserving the irreplaceable "stocks" of critical natural capital for the sake of future generation	The total value of the aggregate stock of capital should be at least maintained or ideally increased for future generations
Key concept	Critical natural capital	Optimal allocation of scarce resources
Definition of thresholds and environmental norms	Scientific knowledge as input for public deliberation (procedural rationality)	Technic / scientific approach for determining thresholds and norms (instrumental rationality)

Nevertheless, strong sustainability does not state that all ecosystem services everywhere have to be sustained exactly as they are, but the uncertain state of knowledge about natural capital and ecosystem services makes it very difficult to judge which services are critical and which are not. For instance, this has lead researchers to work on co-viability models which aim to reconcile production with biodiversity / ecosystem conservation (e.g. Tichit, 2007; Mouysset *et al*., 2014).

[41] URL: http://resilience.osu.edu/CFR-site/resilienceandsustainability.htm, accessed on October 5, 2017.

Moreover, this leads us to recognise that are different pathways to system change. Pathways can be understood as ". . . *alternative possible trajectories for knowledge, interventions and change which prioritize different goals, values and functions. These pathways in turn envisage different strategies to deal with dynamics – to control or respond to shocks or stresses. And they envisage different ways of dealing with incomplete knowledge, highlighting and responding to the different aspects of risk, uncertainty, ambiguity and ignorance in radically different ways* (Leach *et al*., 2010:5)". In other words, sustainability should be recognised as a contested and flexible concept facilitating arguments about diverse pathways to different futures.

This calls for (re)instating our understanding of sustainability as an essentially political process, which involves tensions and struggles between competing pathways to sustainability (e.g. Leach *et al*., 2010, Leach and Stirling, 2011). This explains why and how contemporary responses to environmental and developmental challenges often result in policy conflicts and failures, manifested at the local level. This is why we need a theory of change model (i.e. adaptive cycle and Panarchy models) that "*embraces the dynamic interactions between social, technological and ecological processes; which takes seriously the ways in which diverse people and groups understand and value these interactions; and acknowledges the role of economic and institutional power in shaping the resulting choices*" (Lindahl *et al*., 2016).

7.8 Supporting materials: ecosystem service supply, demand and stress modelling

7.8.1 Aggregated land cover categories occurring in the greater uMngeni River and Loskop Dam catchments

Aggregated Land Cover Category	National DEA Landcover (2013/2014)
Natural	Grassland
	Indigenous Forest
	Low shrubland
	Thicket / Dense bush
	Wetlands
	Woodland / Open bush
Transformed	Bare none vegetated
	Cultivated cane commercial – crop
	Cultivated cane commercial – fallow
	Cultivated cane emerging – crop
	Cultivated cane emerging – fallow
	Cultivated cane pivot – crop
	Cultivated cane pivot – fallow
	Cultivated comm fields (high)
	Cultivated comm fields (low)
	Cultivated comm fields (med)
	Cultivated comm pivots (high)
	Cultivated comm pivots (low)
	Cultivated comm pivots (med)
	Cultivated orchards (high)
	Cultivated orchards (low)
	Cultivated orchards (med)
	Cultivated subsistence (high)
	Cultivated subsistence (low)
	Cultivated subsistence (med)
	Mines 1 bare
	Mines 2 semi-bare
	Mines water permanent
	Mines water seasonal
	Urban built-up (bare)
	Urban built-up (dense trees / bush)
	Urban built-up (low veg / grass)
	Urban built-up (open trees / bush)
	Urban commercial
	Urban industrial
	Urban informal (bare)
	Urban informal (dense trees / bush)
	Urban informal (low veg / grass)
	Urban informal (open trees / bush)
	Urban residential (bare)
	Urban residential (dense trees / bush)
	Urban residential (low veg / grass)
	Urban residential (open trees / bush)

Aggregated Land Cover Category	National DEA Landcover (2013/2014)
	Urban school and sports ground
	Urban smallholding (bare)
	Urban smallholding (dense trees / bush)
	Urban smallholding (low veg / grass)
	Urban smallholding (open trees / bush)
	Urban sports and golf (bare)
	Urban sports and golf (dense tree / bush)
	Urban sports and golf (low veg / grass)
	Urban sports and golf (open tree / bush)
	Urban township (bare)
	Urban township (dense trees / bush)
	Urban township (low veg / grass)
	Urban township (open trees / bush)
	Urban village (bare)
	Urban village (dense trees / bush)
	Urban village (low veg / grass)
	Urban village (open trees / bush)

7.8.2 Range of impact scores applied to land cover categories

2011 KZN Land cover category	In Wetland			In 200 m Buffer		
	Vegetation	Hydrology	Water Quality	Water quantity modification	Pattern: increased peak discharges	Water Quality
Plantation clearfelled	10	7	3	7	5	3
Plantation	10	7	3	7	3	3
Degraded bushland (all types)	5	2	1	2	4	1
Water dams	10	7	0	7	2	0
Annual commercial crops irrigated	10	6	6	4	4	6
Annual commercial crops dryland	10	5	5	3	3	5
Degraded grassland	5	1	1	1	4	1
KZN main & district roads	10	10	5	3	9	5
Old cultivated fields – grassland	6	3	1	0	2	1
Built up dense settlement	10	10	7	4	9	5
Subsistence (rural)	9	5	5	2	3	5
Old cultivated fields – bushland	6	3	1	0	2	1
Sugarcane – commercial	10	5	4	4	2	4
Low density settlement	8	2	4	0	4	4
KZN national roads	10	10	5	3	9	5
KZN railways	10	10	3	3	9	3
Smallholdings – grassland	6	4	2	2	3	2

2011 KZN Land cover category	Vegetation	Hydrology	Water Quality	Water quantity modification	Pattern: increased peak discharges	Water Quality
Golf courses	9	4	4	2	2	4
Mines and quarries	10	10	9	4	9	9
Permanent orchards (banana, citrus) irrigated	10	6	4	5	2	4
Degraded forest	5	2	1	2	3	1
Airfields	10	9	4	3	8	4
Erosion	8	7	3	3	7	3
Sugarcane – emerging farmer	10	4	4	3	2	4
All natural ecosystems	No score			No score		

7.8.3 The hydrological system of the uMngeni-Msunduzi River

The uMngeni River falls within the Mvoti to Mzimkhulu Water Management Area (WMA). The catchment has been largely modified by intensive agriculture, forestry and urban settlements (DWS, 2014). The catchment has four large dams, namely Midmar, Albert Falls, Nagle and Inanda that supply water to Durban and Pietermaritzburg cities, as well as to the surrounding areas. The uMngeni River catchment plays a significant socio-economic role in the growing metropolitan areas in the region (DWA, 2013).

While the water quality of the uMngeni River has been good for many years, it is showing signs of deterioration. Water quality concerns include (DWA, 2013):

- High nutrient loads from agricultural activities;
- Sewage effluents from commercial, industrial and residential (formal and informal) areas;
- Inorganic and organic pollutants from industrial discharges[42].

The water quality of the uMsunduzi, particularly the middle and lower uMsunduzi, is notably poor, with a high faecal coliform content and nutrient enrichment.

Umgeni Water (2014) reports that, over the period 2008 to 2013, nutrient levels in the catchment were, on several occasions, above the set objectives (RQOs). This non-compliance

[42] A recent example *August 2019) being a major spill of vegetable oil and caustic soda into a tributary of the uMsunduzi River (see http://www.sabcnews.com/sabcnews/umngeni-river-oil-spill-will-have-long-term-devastating-effects-environmentalist/, accessed 14 October 2019). Paddlers, among other users, were warned to avoid the area (see https://www.thesouthafrican.com/news/dusi-river-oil-spill-msunduzi/ accessed 14 October 2019).

was largely attributed to sewer problems experienced in the Pietermaritzburg region. Excessive nutrient load is reported for the Inanda system – with percentage non-compliance of nitrates having increased up to approximately 60% – attributed to catchment runoff from the Pietermaritzburg / uMsunduzi area. However, the report notes that "*due to the impoundment length, morphology, and assimilative capacity, these problems did not affect abstraction water quality*" (Umgeni Water, 2014).

Faecal coliform contamination of the uMsunduzi and some of its tributaries is an ongoing issue (Umgeni Water, 2017, pers. comm.). This is evident in an *E.coli* concentration map produced by the Duzi-uMngeni Conservation Trust (DUCT, 2017), specifically for the Duzi Canoe Marathon route, which shows a mix of largely moderate to high risk categories along the uMsunduzi River between Henley Dam and the confluence with the uMngeni for 2017 (Figure A-17). The map implies a negative impact of the uMsunduzi, in terms of pathogen contamination (indicated by *E.coli* levels), on the uMngeni River where the condition of the uMngeni deteriorates after the confluence with the uMsunduzi.

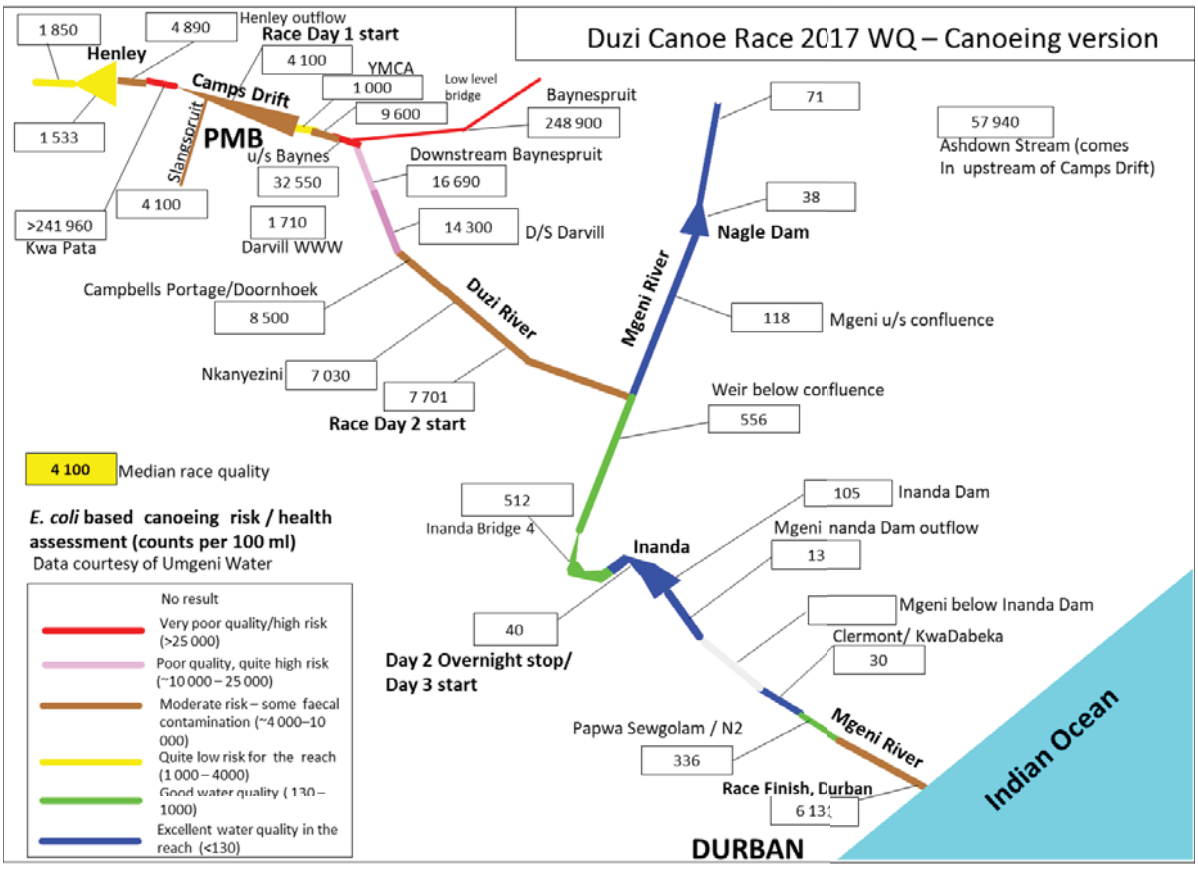


Figure A-17: *E.coli* concentration map of the Duzi Canoe Race route, 2017 (DUCT, 2017).

Water pollution has the potential to adversely affect participation in water-based events, through participant illness, perceptions of health risk and reduced aesthetic pleasure of the race route. Monitoring programmes focusing on the rivers and estuaries of the area have revealed that these ecosystems experience multiple pressures, including industrial spills and illegal discharges, solid waste dumping, sand mining, realignment of watercourses, flow reduction through dams, and infestation by exotic flora and fauna. This has major implications for communities depending directly on water from these systems: The pressures may undermine existing tourism businesses as well as new tourism opportunities (eThekwini Municipality, 2017).

7.8.4 Relative ecosystem service supply within the greater uMngeni catchment

This section presents the relative ecosystem services supply (i.e. water supply, water quality, tourism / recreation and habitat provision) of the different vegetation types / land uses in the Greater uMngeni catchment, provides a summary of relative ecosystem services supply for the Greater uMngeni catchment, shows the total relative ES supply per land use category, and summarises the ratio of total relative ecosystem service supply over surface area per land use category (Tables A-5 and Figures A-18 to A-30).

At the whole catchment level, the main findings include:

- Relative tourism / recreation supply is low compared to the relative supply of other ES, due to the low capacity scores of most land uses;
- Quaternary U20J is particularly important for the supply of ES in the greater uMngeni catchment; and
- Grasslands provide most of the ES (considered in this model) within the greater uMngeni catchment.

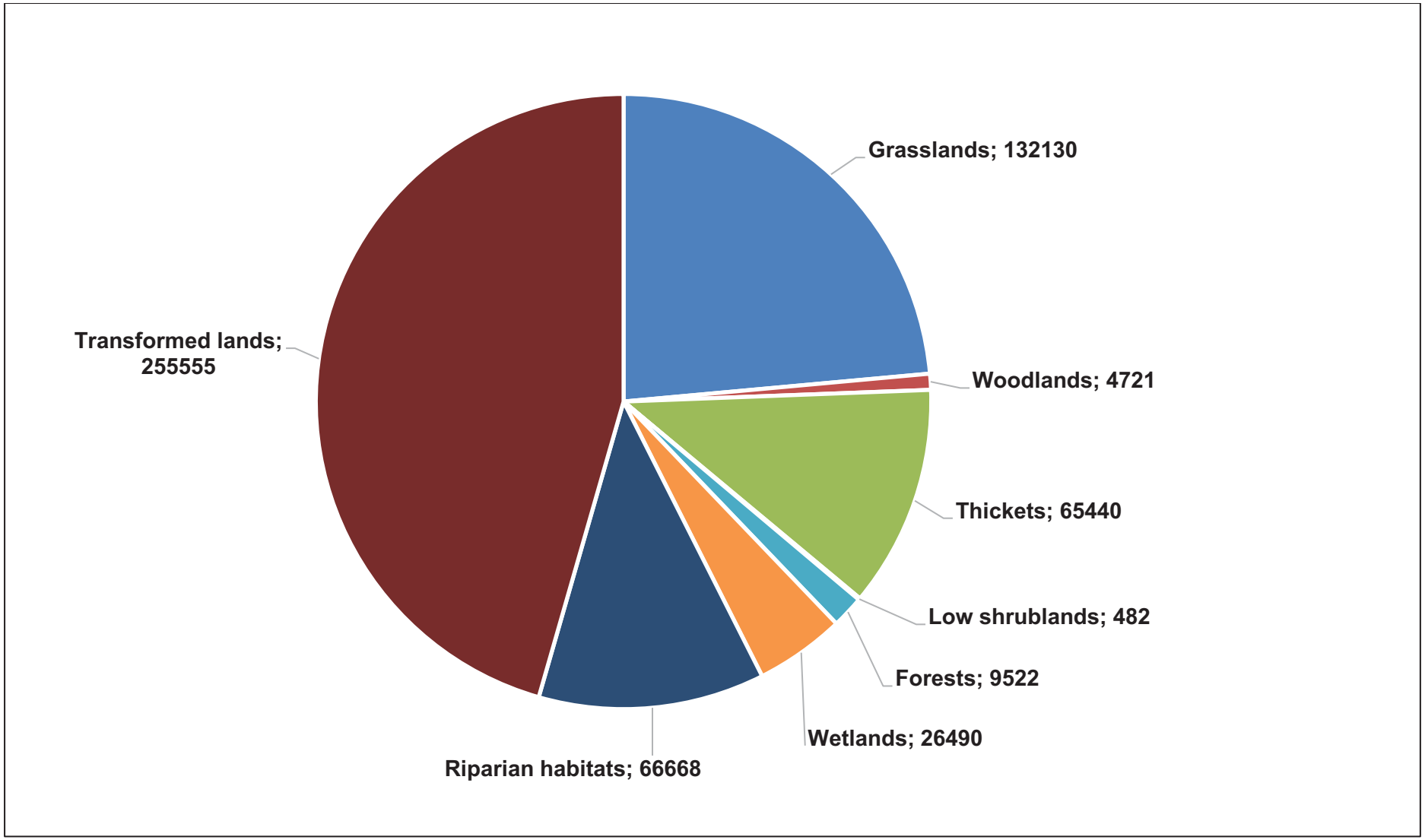


Figure A-18: Land use categories (ha) in the greater uMngeni catchment.

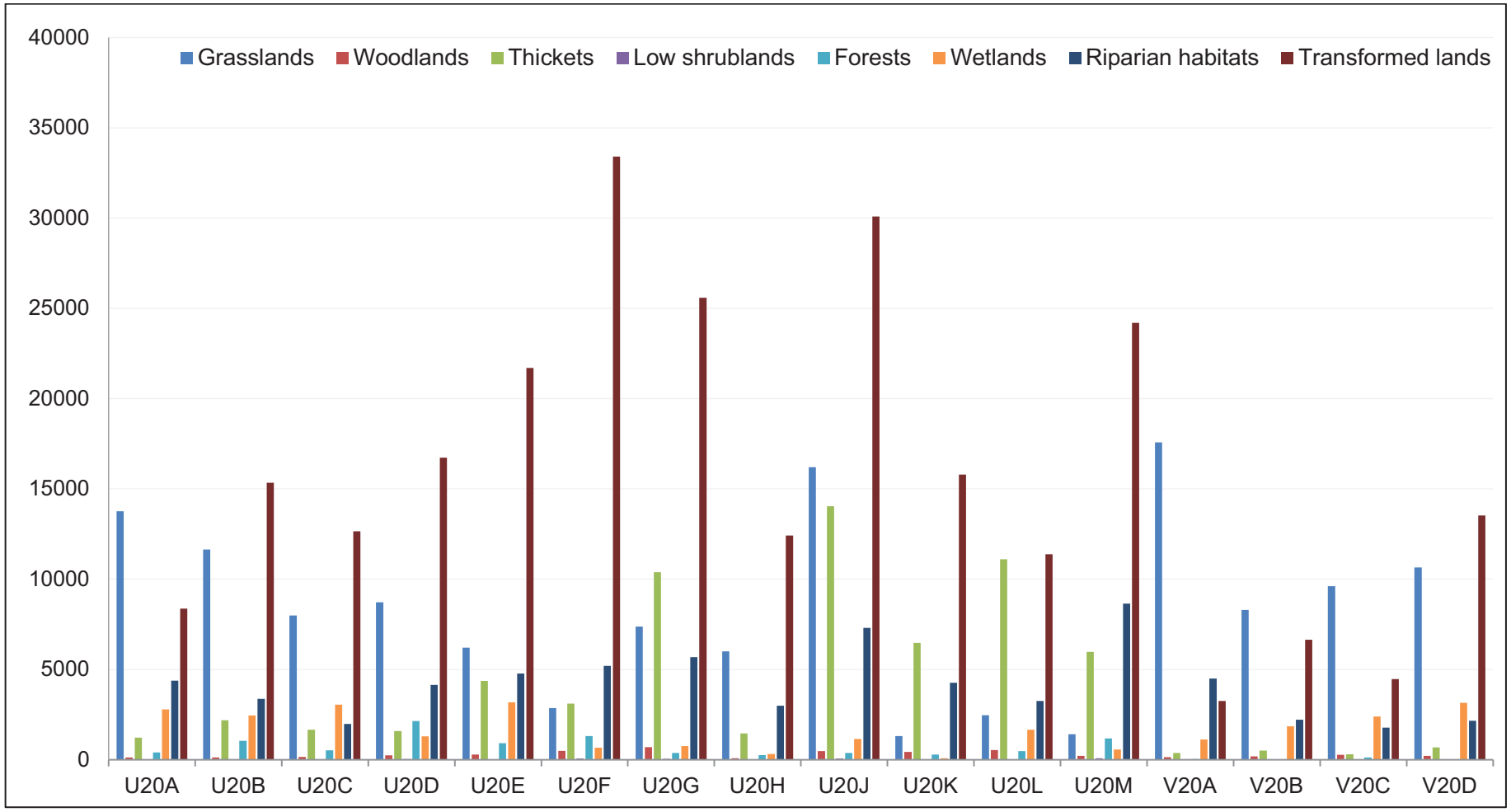


Figure A-19: Surface areas (ha) of the different land uses in the quaternary catchments of the greater uMngeni catchment.

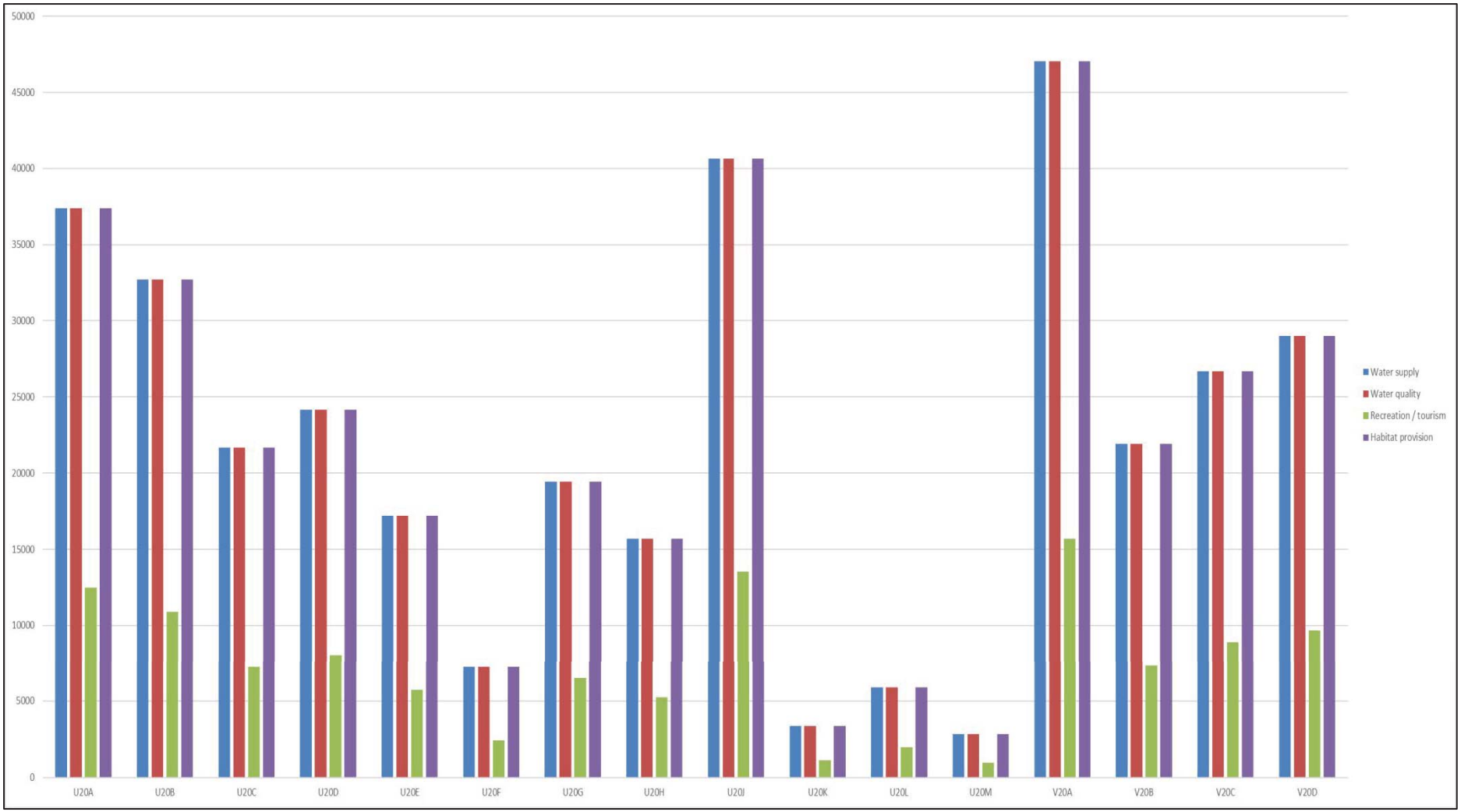


Figure A-20: Relative ecosystem services of the **grasslands** of the quaternary catchments of the greater uMngeni catchment.

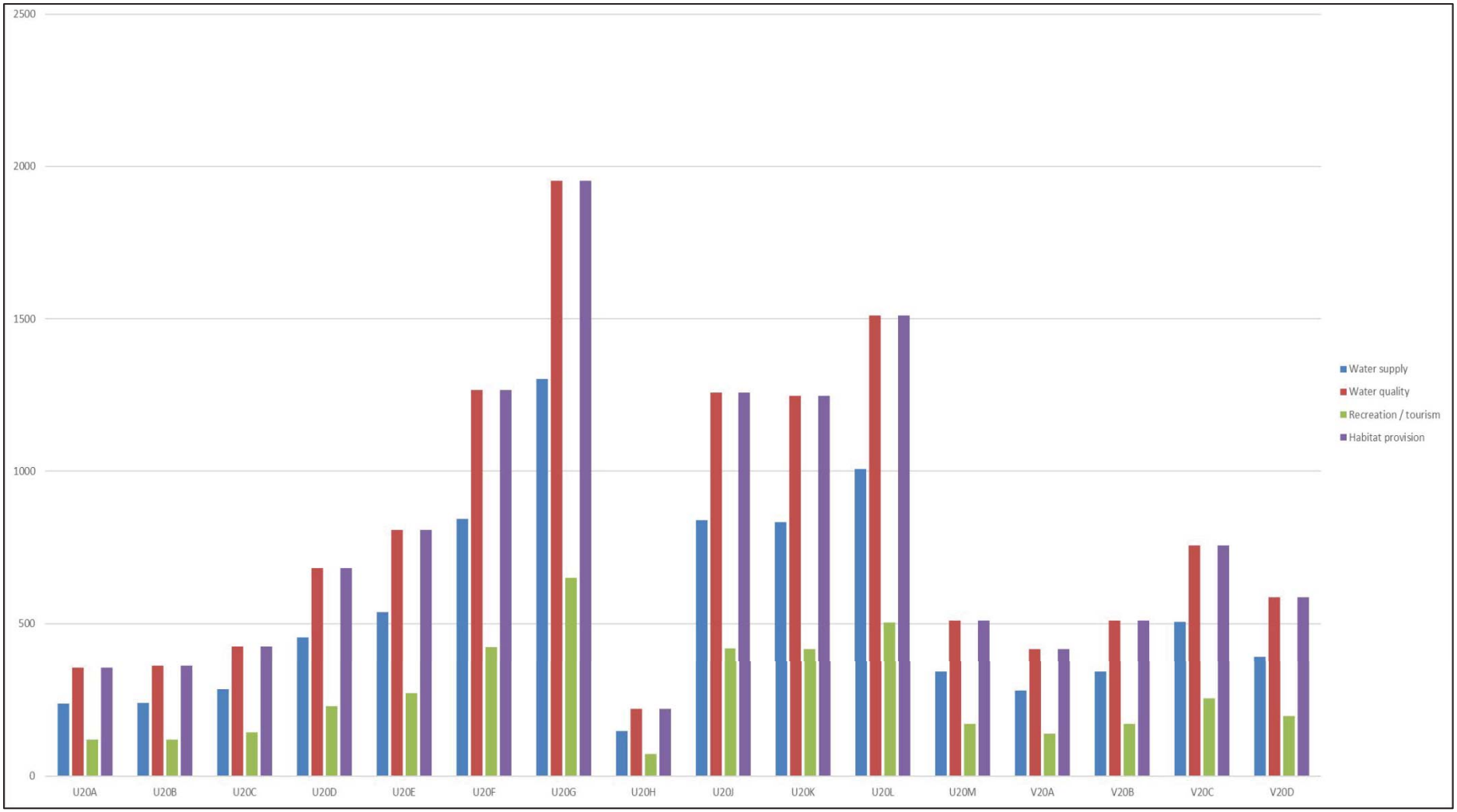


Figure A-21: Relative ecosystem services of the **woodlands** of the quaternary catchments of the greater uMngeni catchment**.**

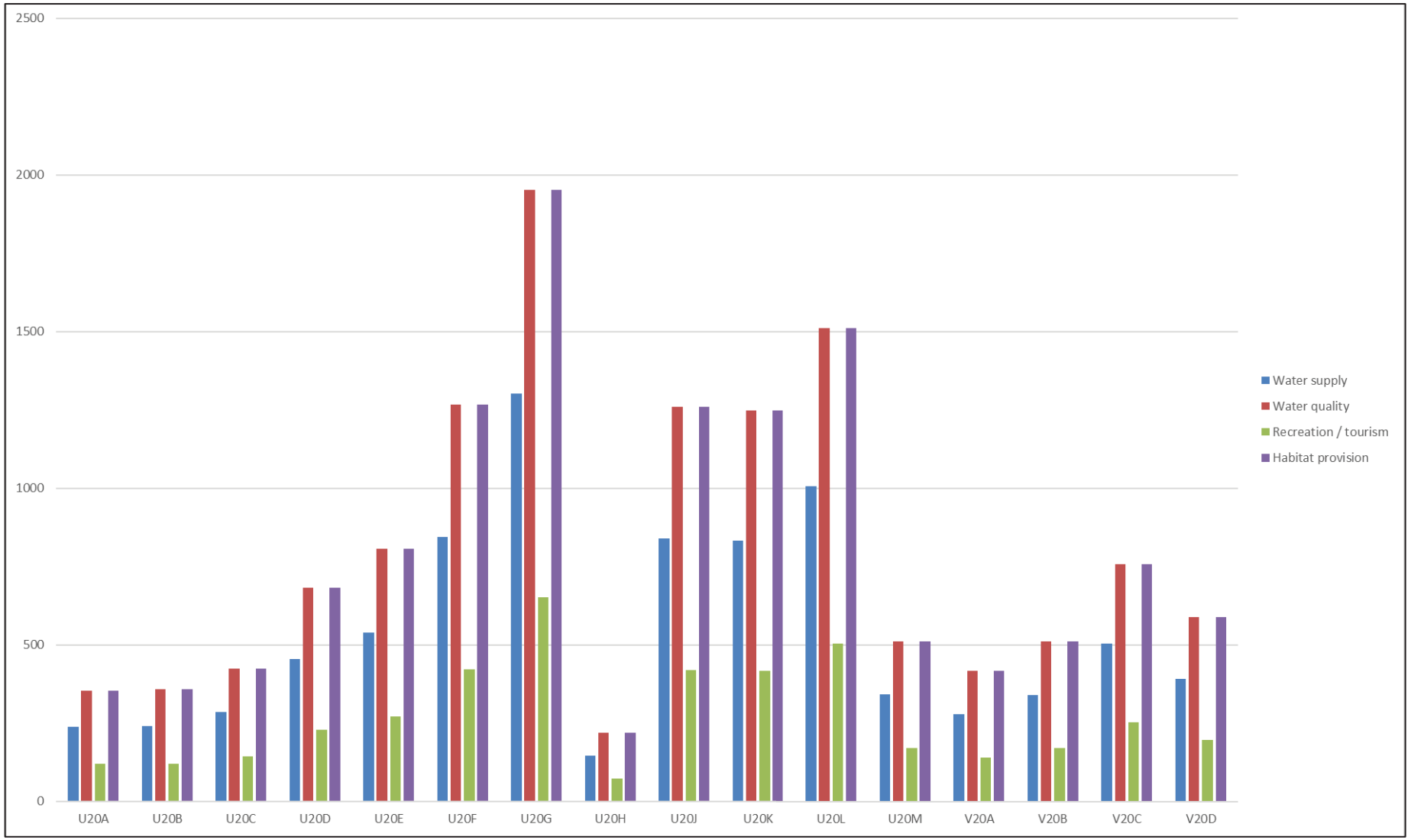


Figure A-22: Relative ecosystem services of the **thickets** of the quaternary catchments of the greater uMngeni catchment.

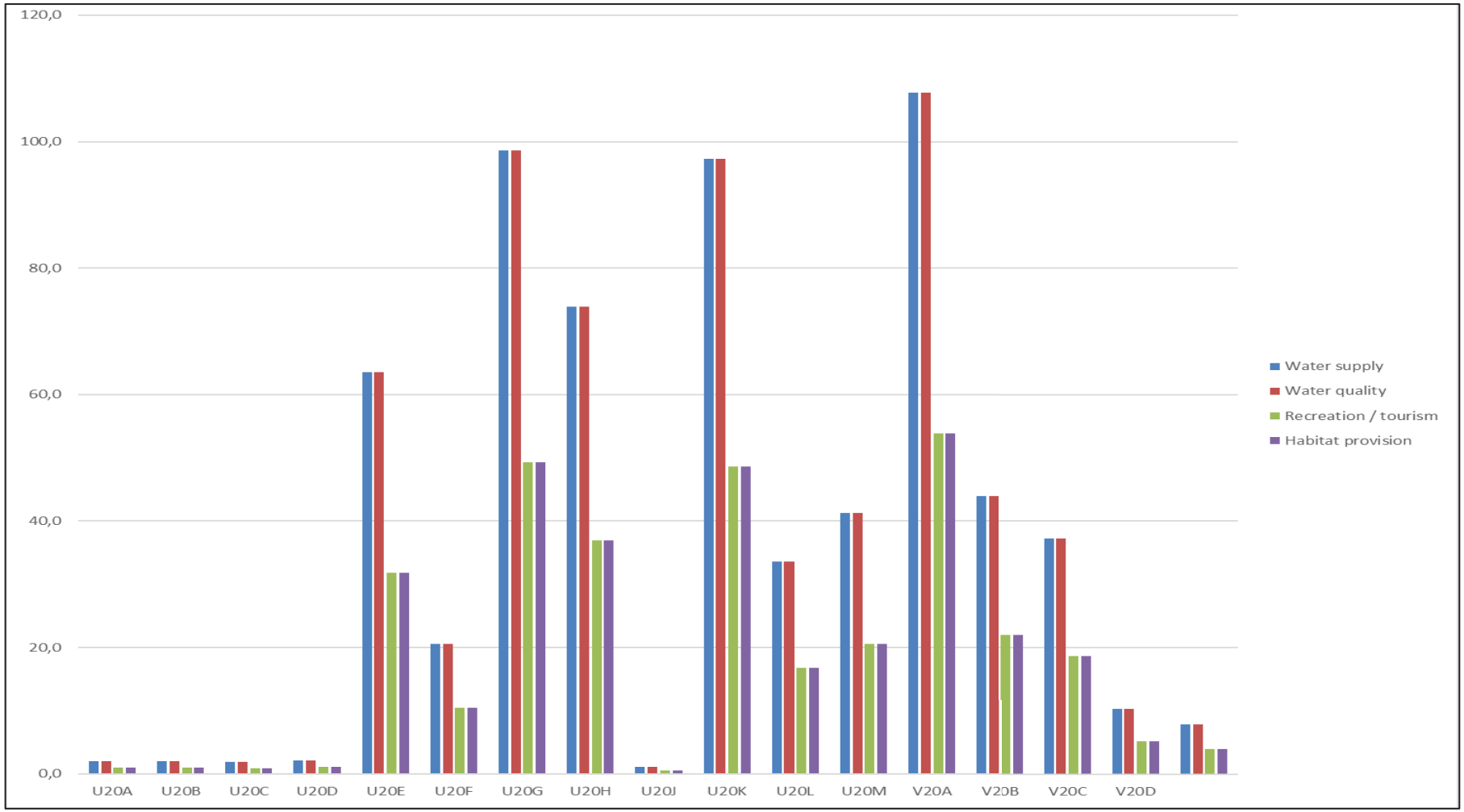


Figure A-23: Relative ecosystem services of the **low shrublands** of the quaternary catchments of the greater uMngeni catchment.

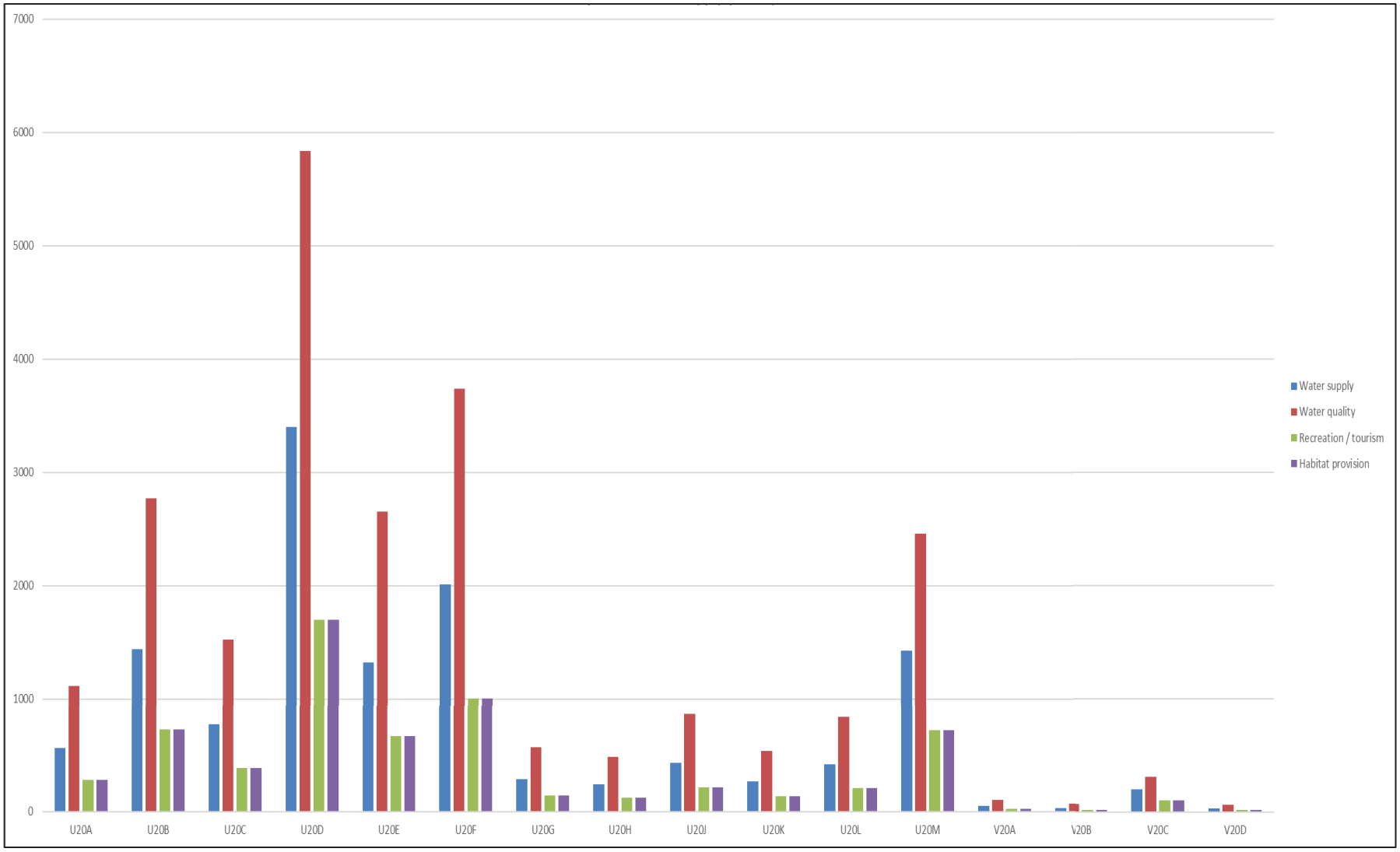


Figure A-24: Relative ecosystem services of the **forests** of the quaternary catchments of the greater uMngeni catchment.

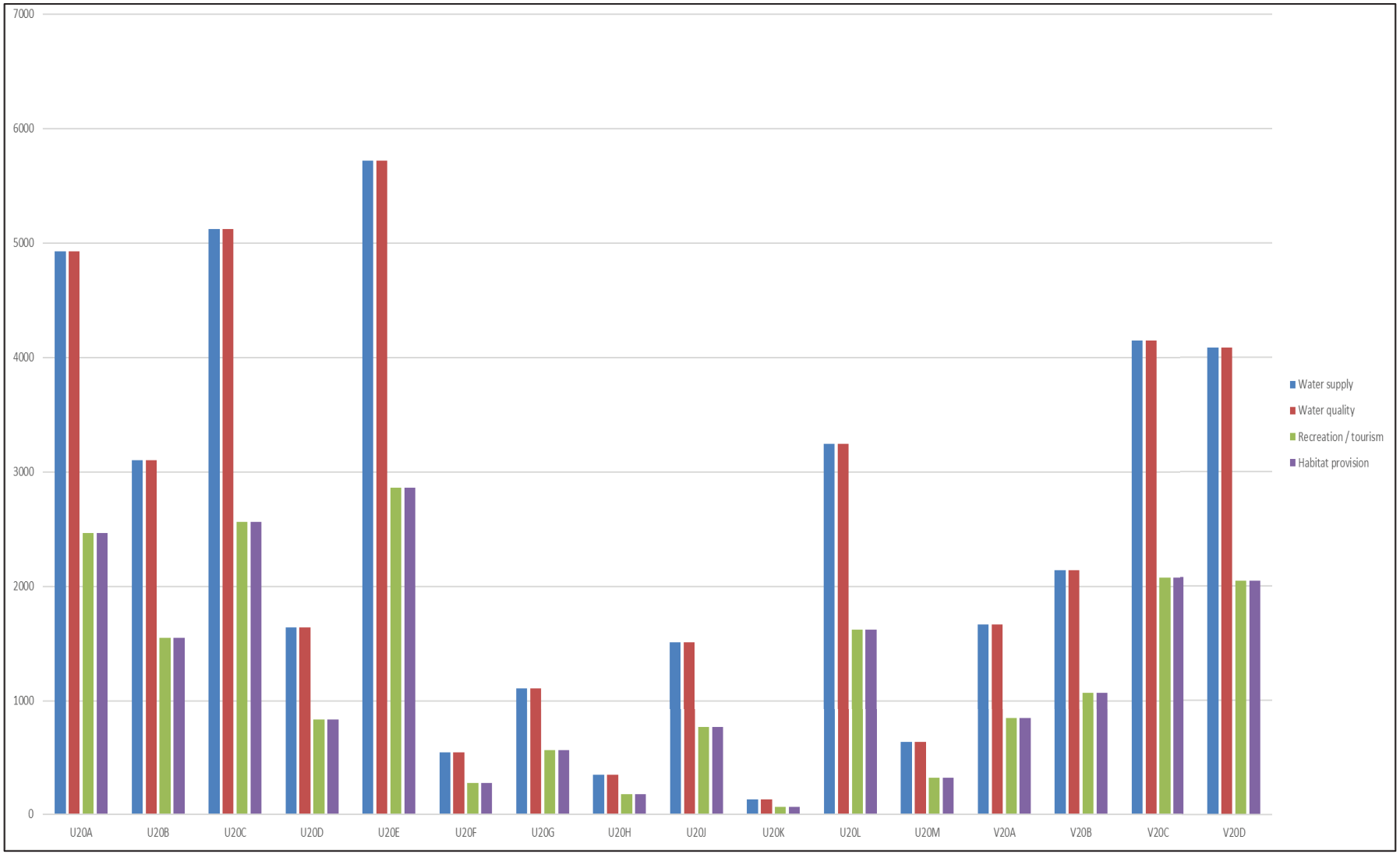


Figure A-25: Relative ecosystem services of the **wetlands** of the quaternary catchments of the greater uMngeni catchment.

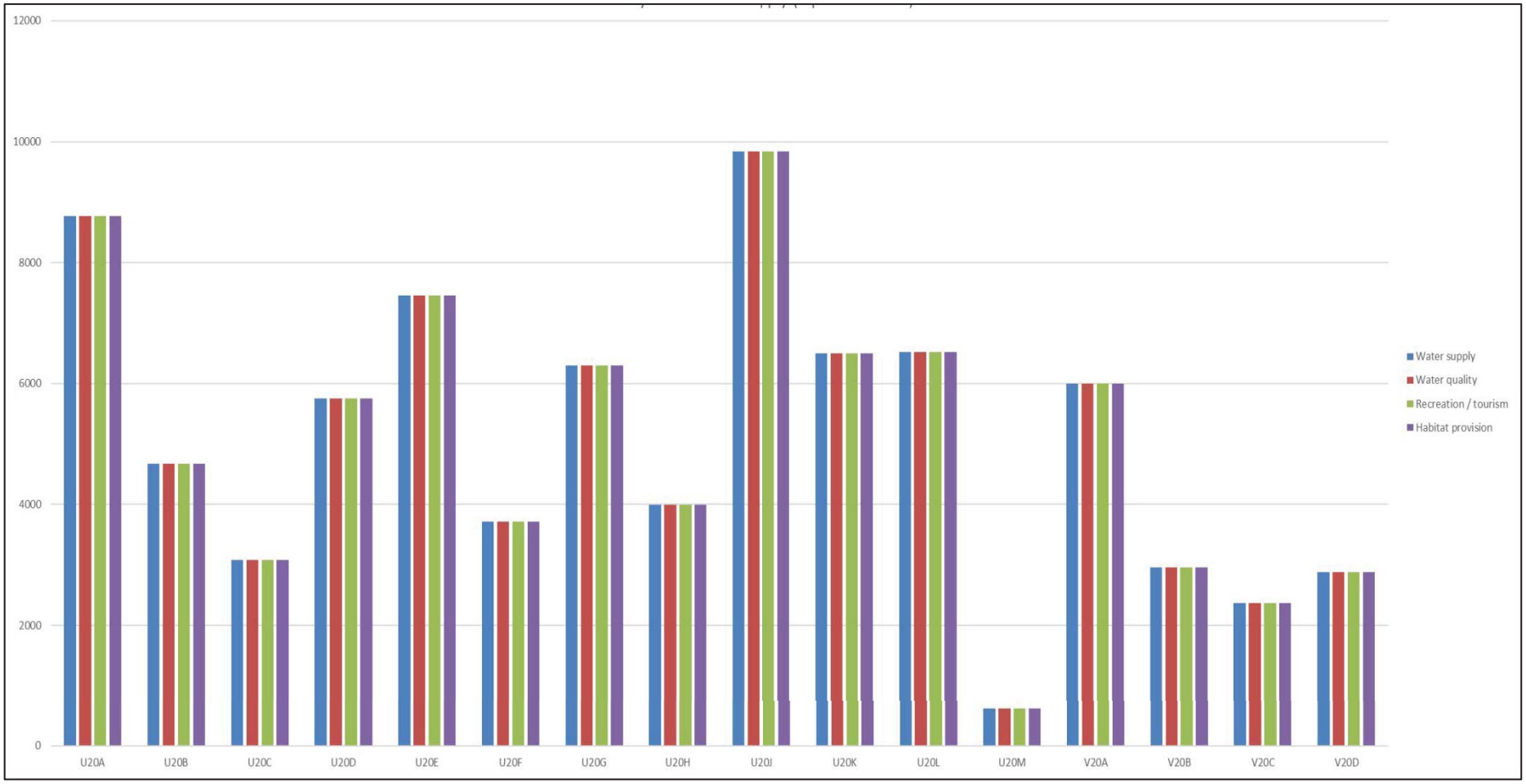


Figure A-26: Relative ecosystem services of the **riparian habitats** of the quaternary catchments of the greater uMngeni catchment**.**

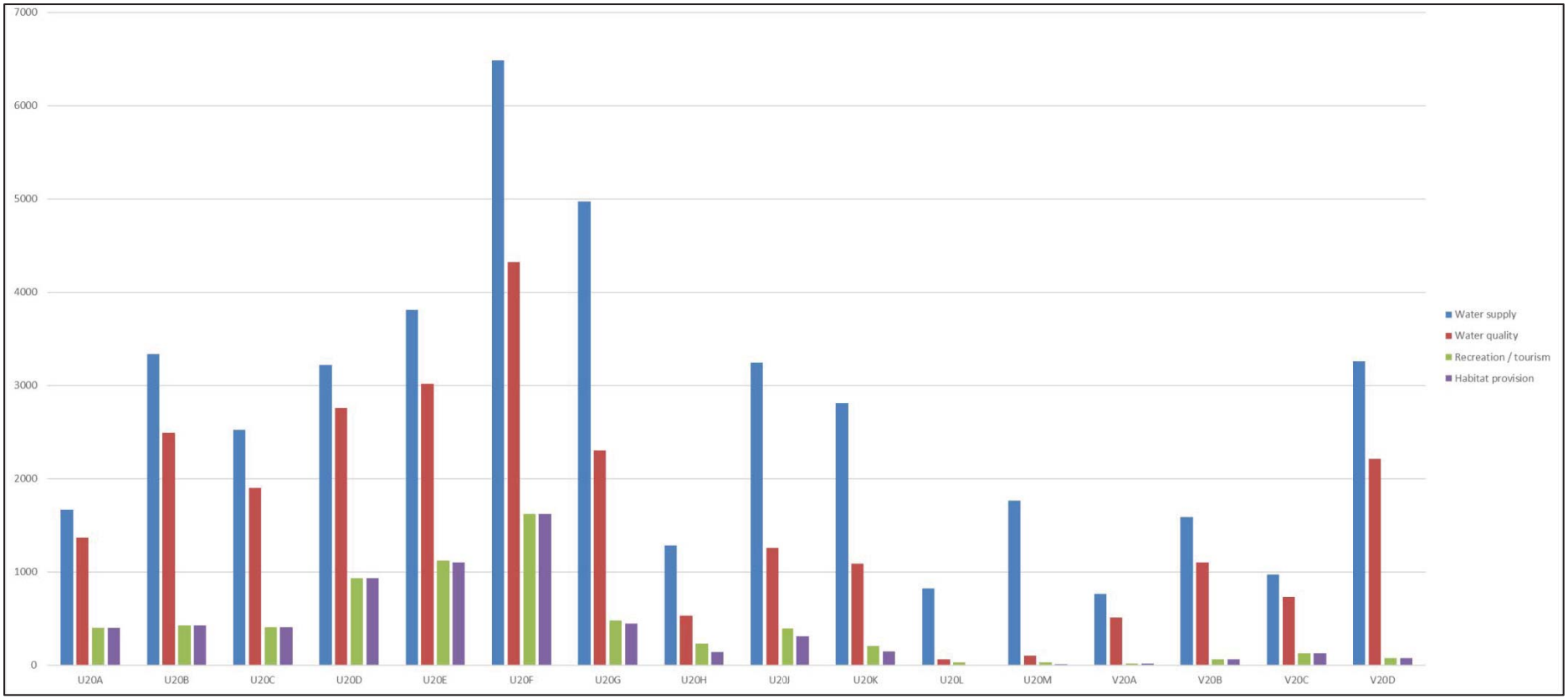


Figure A-27: Relative ecosystem services of the **transformed lands** of the quaternary catchments of the greater uMngeni catchment.

Table A-5: Total relative ecosystem services supply of the quaternaries of the greater uMngeni catchment.

Quaternary	Total relative supply per quaternary catchment			
	Water supply	Water quality	Tourism / recreation	Habitat provision
U20A	55488	56831	25465	52561
U20B	48896	51202	20091	45533
U20C	35998	37567	15077	32370
U20D	41149	44580	18750	37767
U20E	43306	47730	21730	40959
U20F	25603	27917	11832	22168
U20G	50782	57687	23289	54813
U20H	23966	24657	10955	23744
U20J	78382	88126	36105	85729
U20K	24833	29252	13905	27831
U20L	35040	43748	19415	41424
U20M	16504	20447	7230	18238
V20A	56392	56604	22993	55177
V20B	29803	29911	12002	27736
V20C	35358	35709	14054	32821
V20D	40677	40376	15395	36147
TOTAL	642178	692343	288289	635017

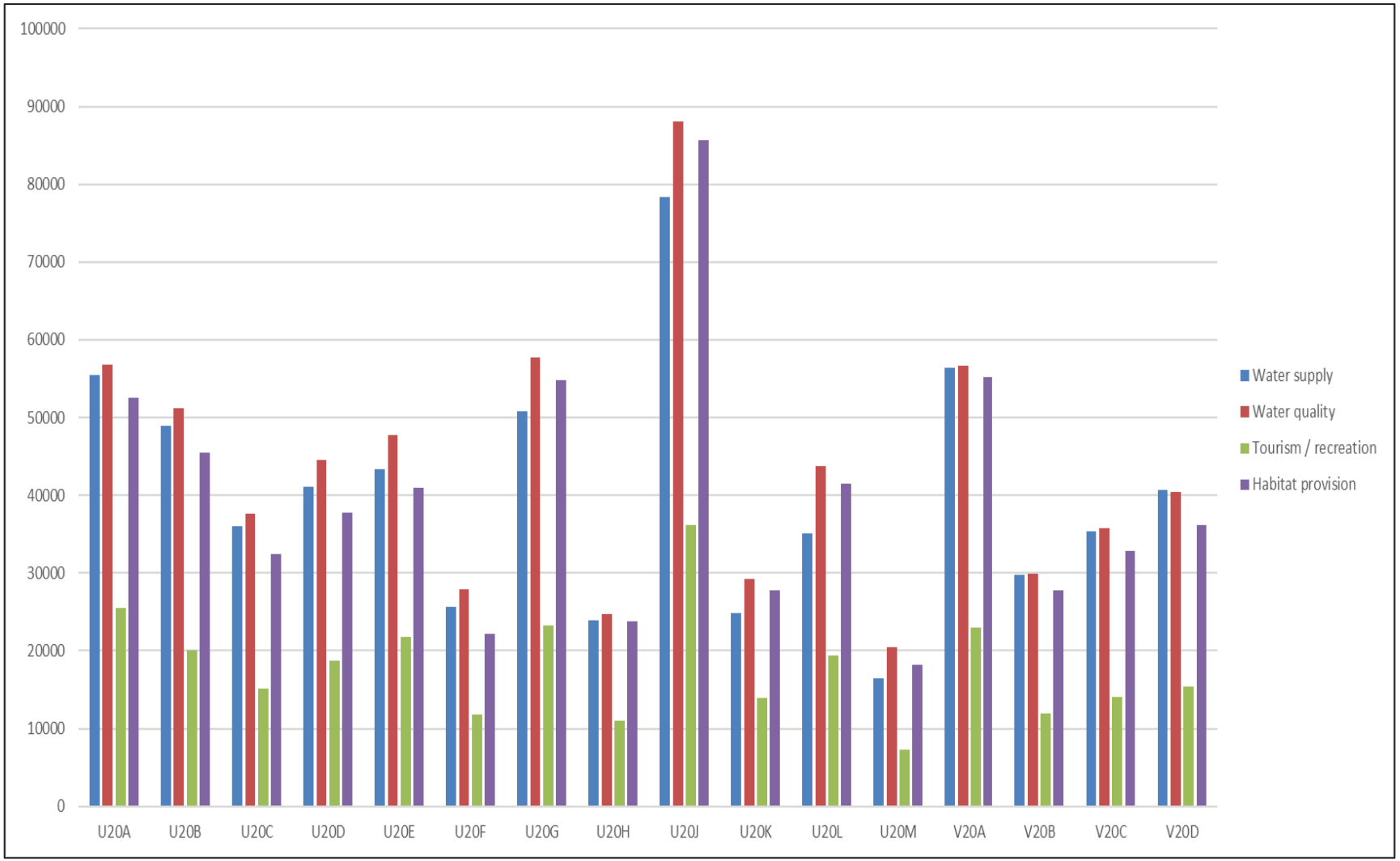


Figure A-28: Total relative ecosystem services supply of the quaternaries of the greater uMngeni catchment.

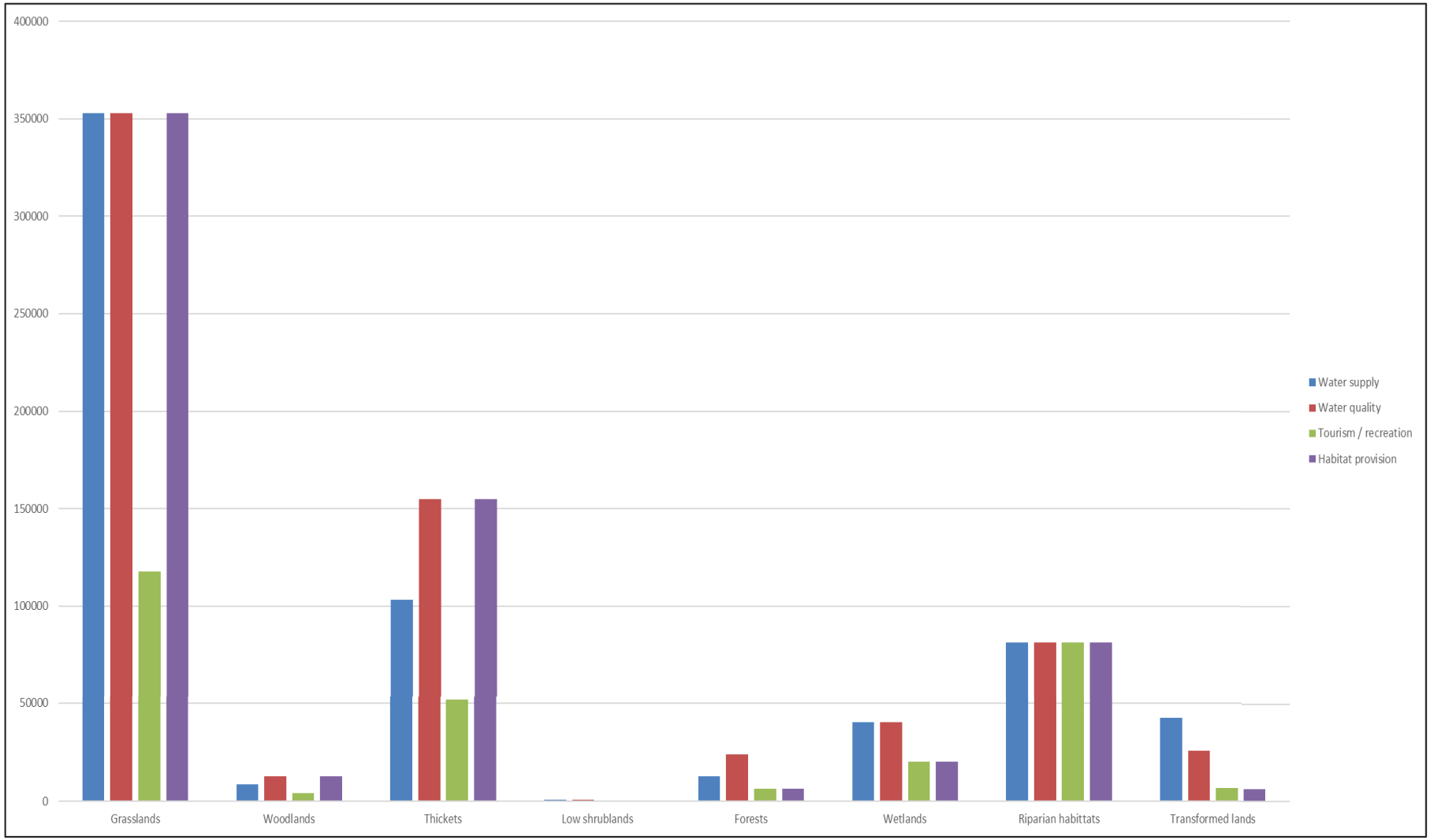


Figure A-29 Total relative ecosystem services supply per land use category for the greater uMngeni catchment.

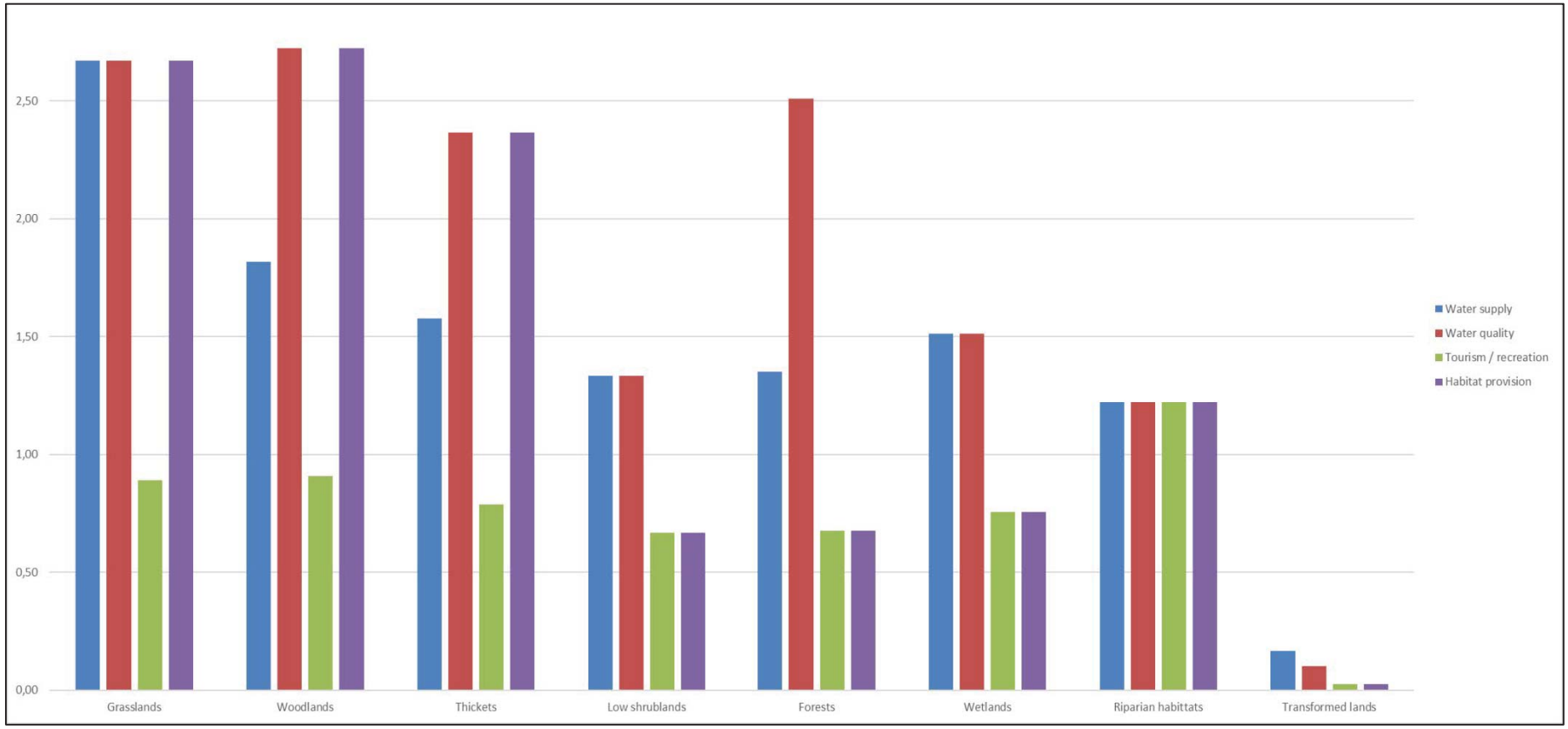


Figure A-30: Ratio of relative ecosystem services supply over surface area per land use category for the greater uMngeni catchment.

7.8.5 Assessing the relative demand for ecosystem services in the greater uMngeni catchment

The relative demand for ecosystem services in the greater uMngeni catchment was estimated following the procedure outlined in section 3.2.2.3, based on the population of the catchment and a relative demand rating. Table A-6 presents the population estimates for each quaternary catchment. Table A-7 and Figure A-31 illustrate the relative ecosystem services demand for the population of the quaternaries of the greater uMngeni catchment; water supply and water quality scored the highest importance and habitat provision the lowest (of the ES services considered in the model). Quaternaries U20J and U20M have the highest relative ES demands due to their higher populations.

Table A-6: Population of the quaternaries of the greater uMngeni catchment

Catchment	Quaternary	Total Population
Greater uMngeni	U20A	2136
Greater uMngeni	U20B	10571
Greater uMngeni	U20C	37516
Greater uMngeni	U20D	3193
Greater uMngeni	U20E	35240
Greater uMngeni	U20F	21675
Greater uMngeni	U20G	37772
Greater uMngeni	U20H	101941
Greater uMngeni	U20J	560345
Greater uMngeni	U20K	25309
Greater uMngeni	U20L	119853
Greater uMngeni	U20M	1059081
Greater uMngeni	V20A	1710
Greater uMngeni	V20B	1410
Greater uMngeni	V20C	1215
Greater uMngeni	V20D	4056
Greater uMngeni area Total		**2023023**

Table A-7: Relative ecosystem services demand for the population of the quaternaries of the greater uMngeni catchment

Quaternary	Relative demand index			
	Water supply	Water quality	Tourism / recreation	Habitat provision
U20A	2350	2350	961	427
U20B	11628	11628	4757	2114
U20C	41268	41268	16882	7503
U20D	3513	3513	1437	639
U20E	38764	38764	15858	7048
U20F	23843	23843	9754	4335
U20G	41549	41549	16997	7554
U20H	112135	112135	45873	20388
U20J	616380	616380	252155	112069
U20K	27840	27840	11389	5062
U20L	131839	131839	53934	23971
U20M	1164989	1164989	476587	211816
V20A	1881	1881	769	342
V20B	1551	1551	634	282
V20C	1336	1336	547	243
V20D	4461	4461	1825	811

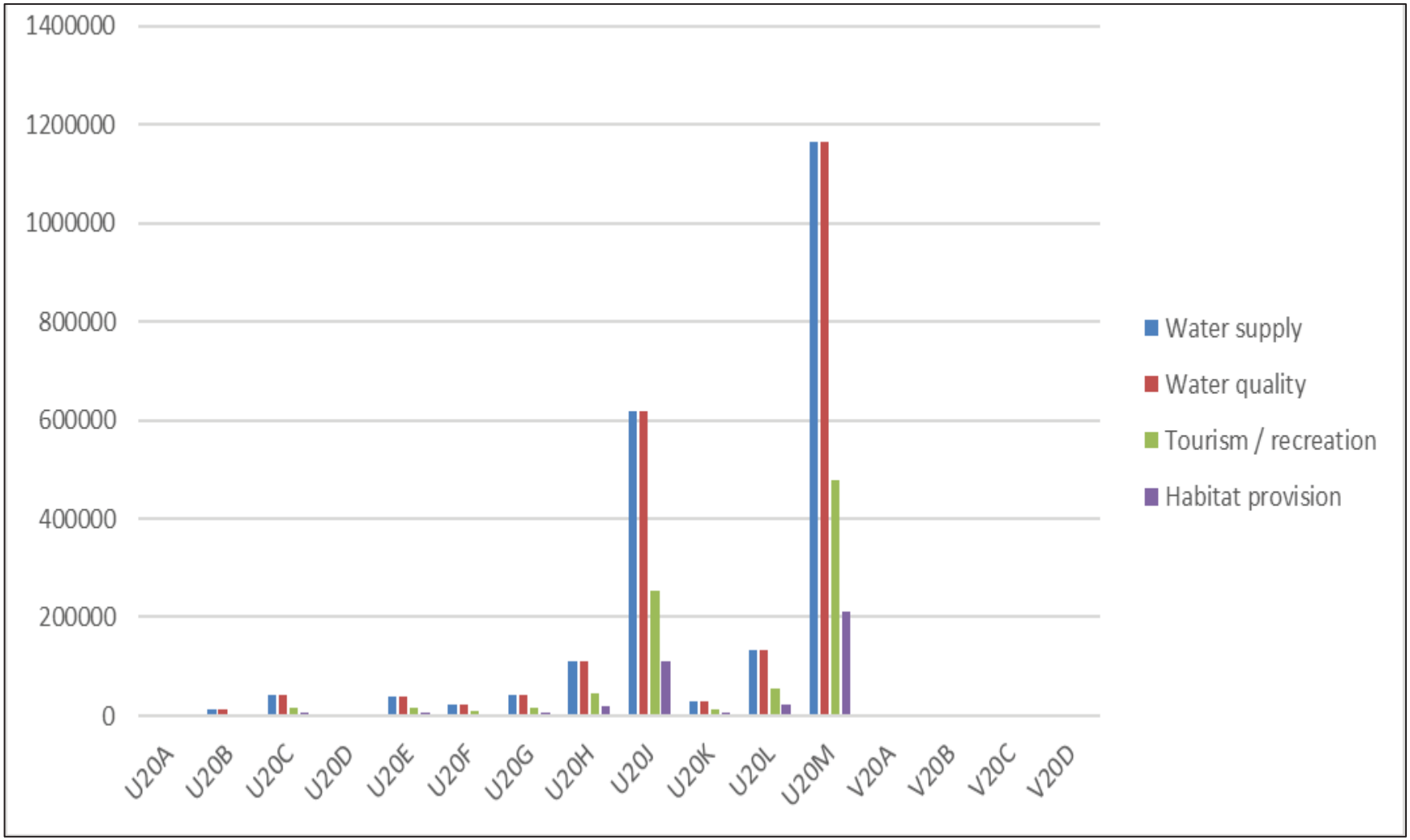


Figure A-31: Relative ecosystem services demand of the populations of the quaternaries of the greater uMngeni catchment.

7.8.6 Relative ecosystem services supply within the Loskop Dam catchment

This section presents the relative ecosystem services supply (i.e. water supply, water quality, tourism / recreation and habitat provision) of the different vegetation types / land uses in in the Loskop Dam catchment, provides a summary of relative ecosystem services supply for the Loskop Dam catchment, shows the total relative ES supply per land use category, and summarises the ratio of total relative ecosystem service supply over surface area per land use category (Tables A-8 and Figures A-32 to A-41).

At the whole catchment level, the main findings include:

- Relative tourism / recreation supply is low compared to the relative supply of other ES, due to the low capacity scores of most land uses (as for the greater uMngeni catchment);
- Quaternaries B11A and B32A are particularly important for the supply of ES in the Loskop Dam catchment;
- Grasslands also provide most of the ES (considered in this model) within the Loskop Dam catchment.

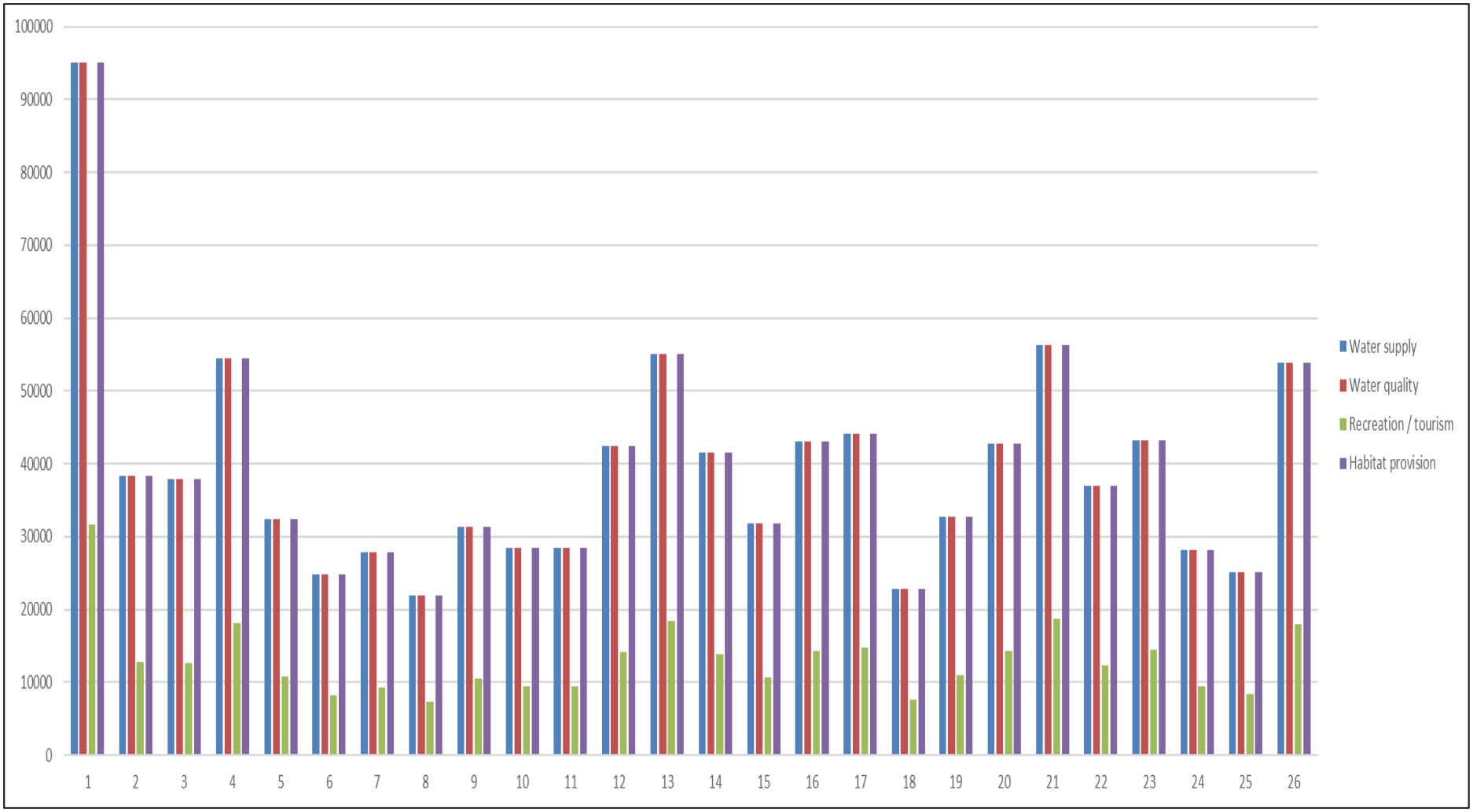


Figure A-32: Relative ecosystem services of the **grasslands** of the quaternary catchments of the Loskop Dam catchment**.**

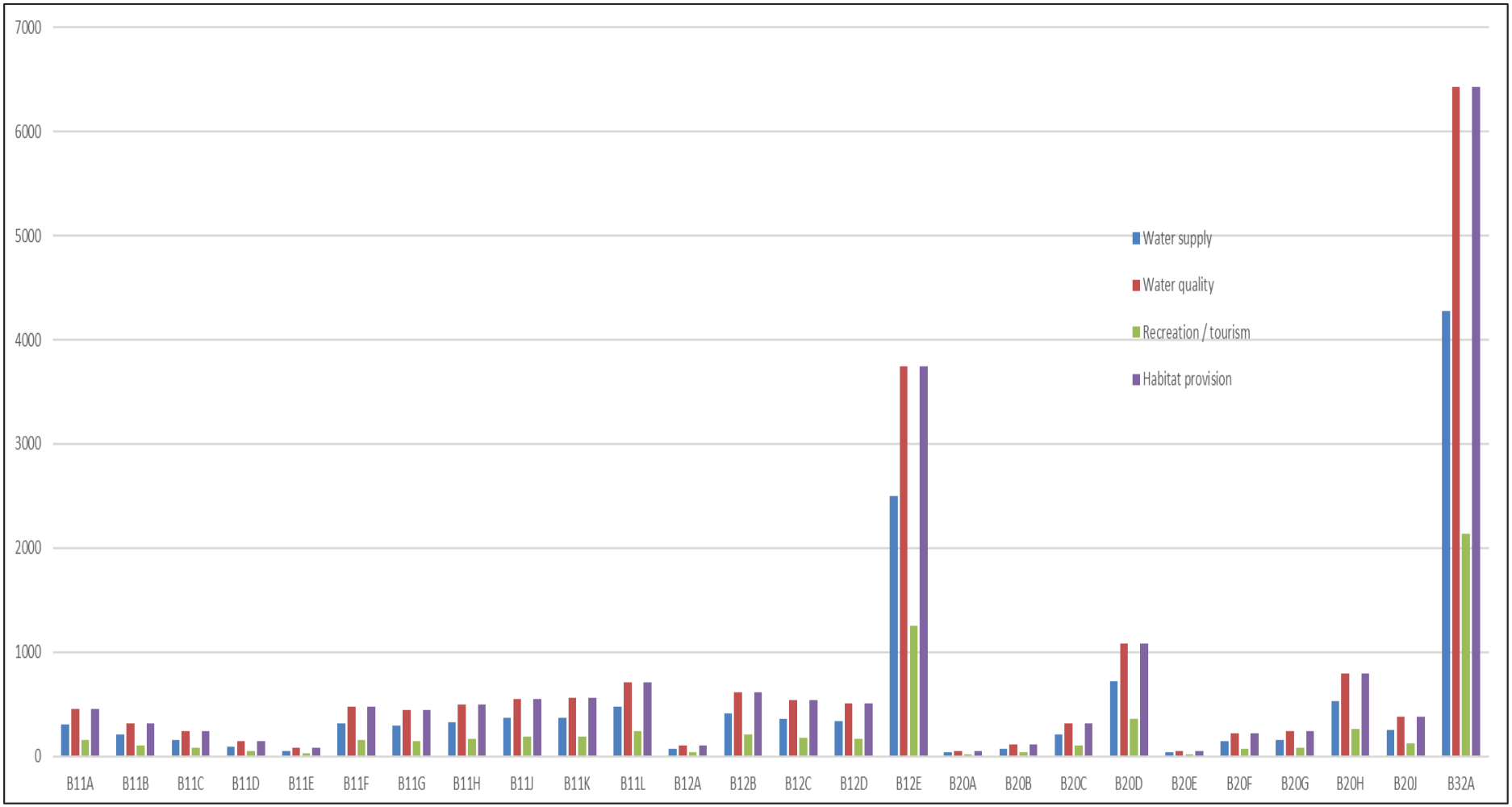


Figure A-33: Relative ecosystem services of the low **shrublands** of the quaternary catchments of the Loskop Dam catchment**.**

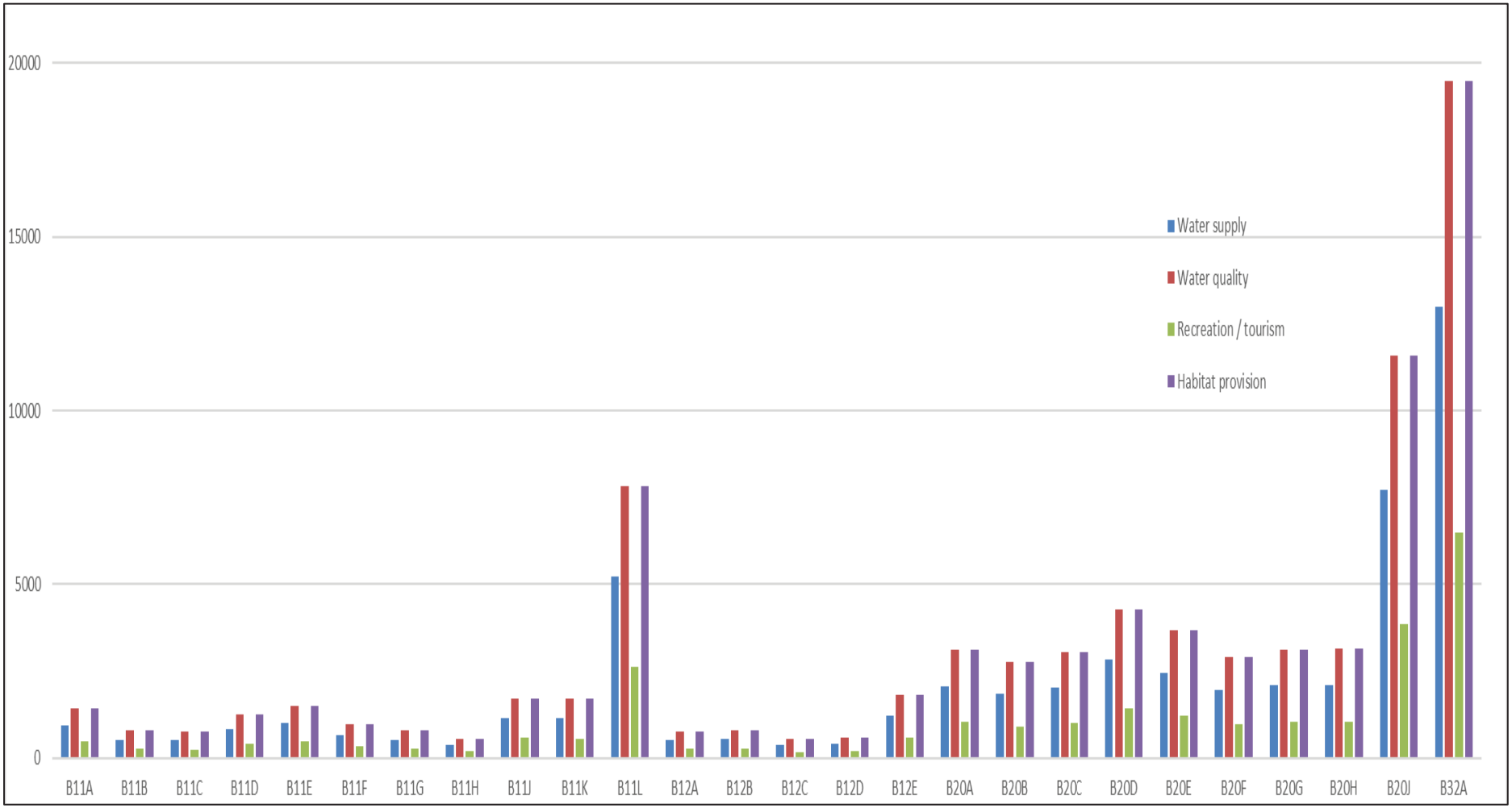


Figure A-34: Relative ecosystem services of the **thickets** of the quaternary catchments of the Loskop Dam catchment.

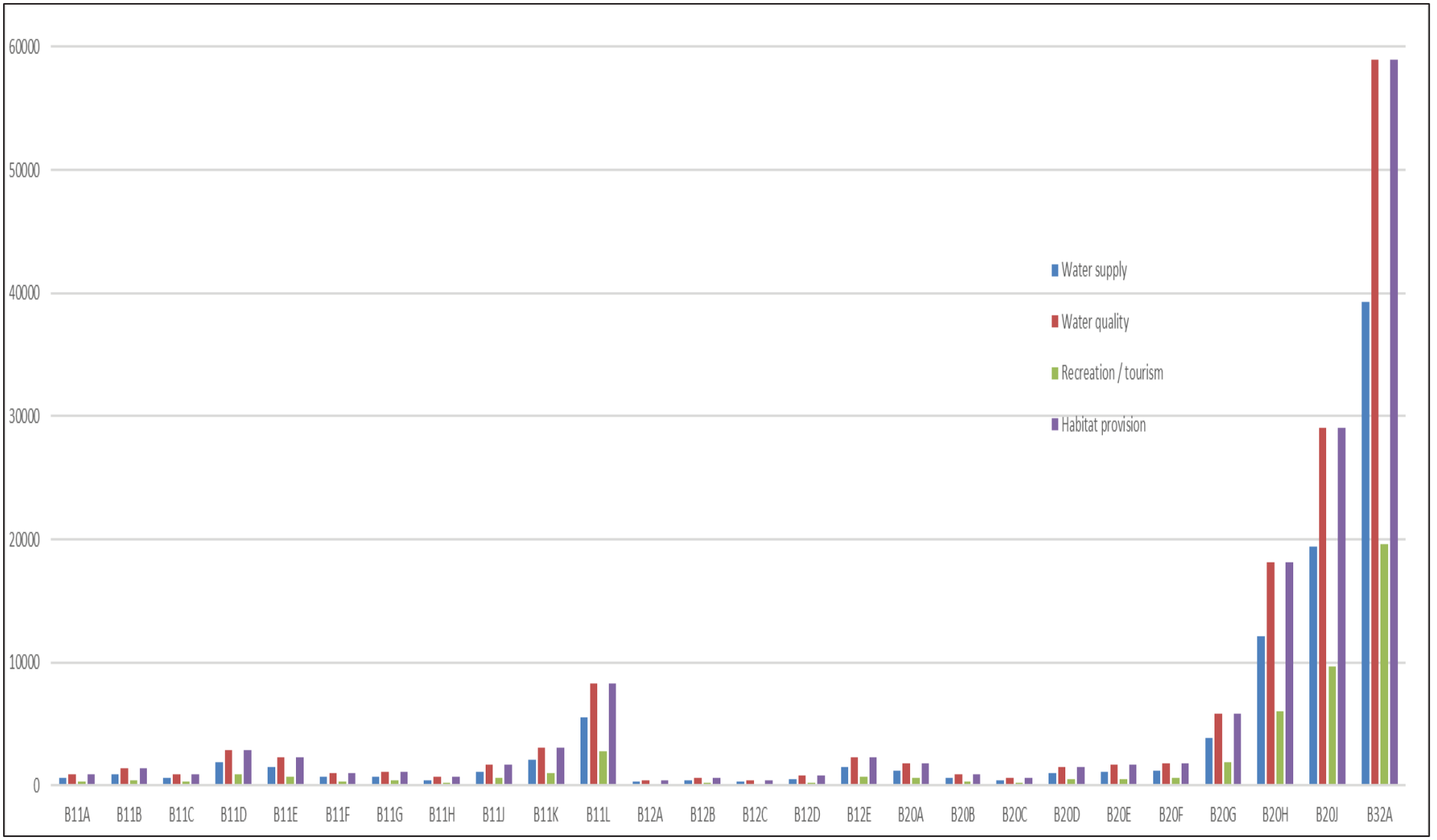


Figure A-35: Relative ecosystem services of the **woodlands** of the quaternary catchments of the Loskop Dam catchment**.**

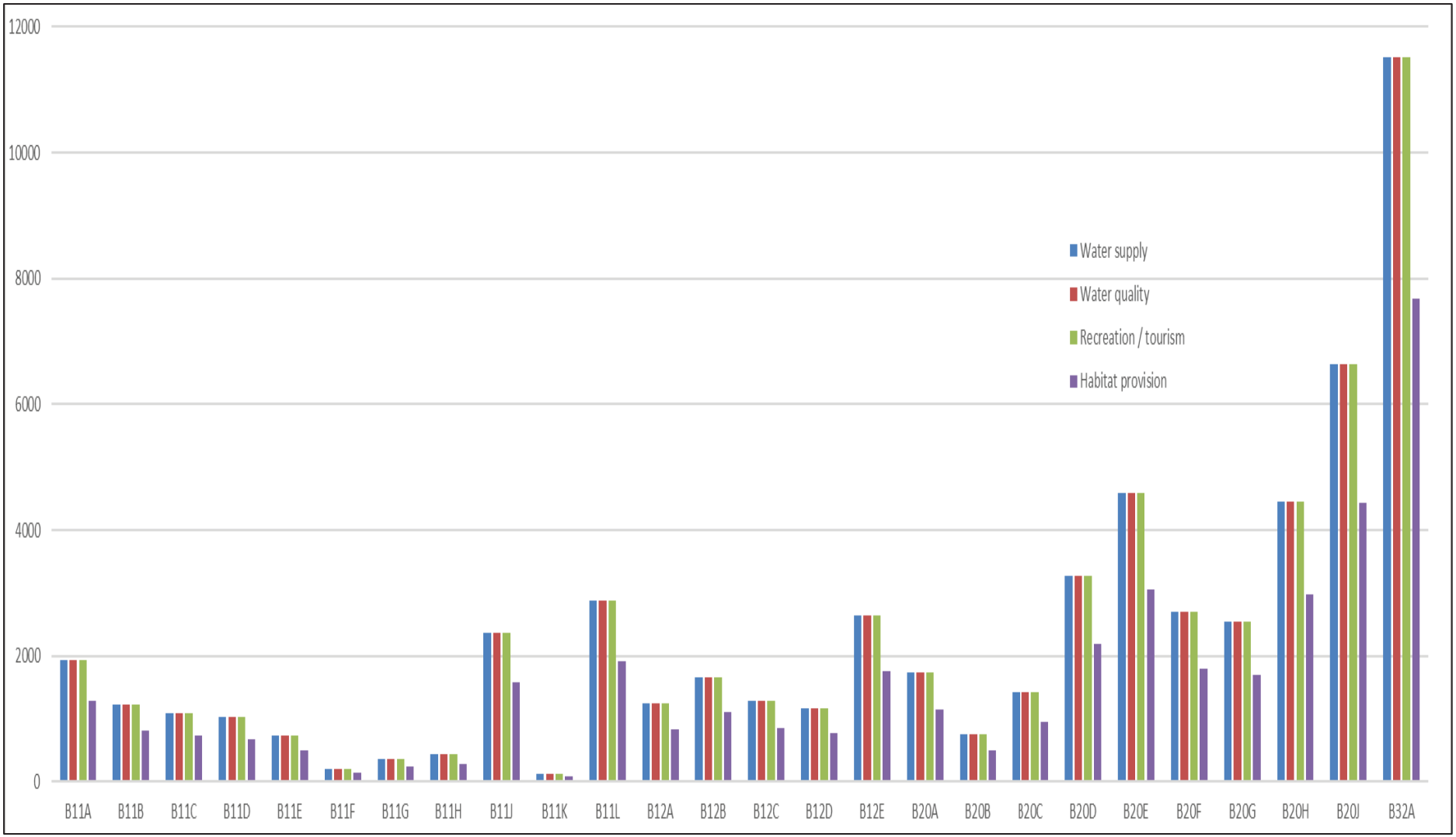


Figure A-36: Relative ecosystem services of the **riparian habitats** of the quaternary catchments of the Loskop Dam catchment.

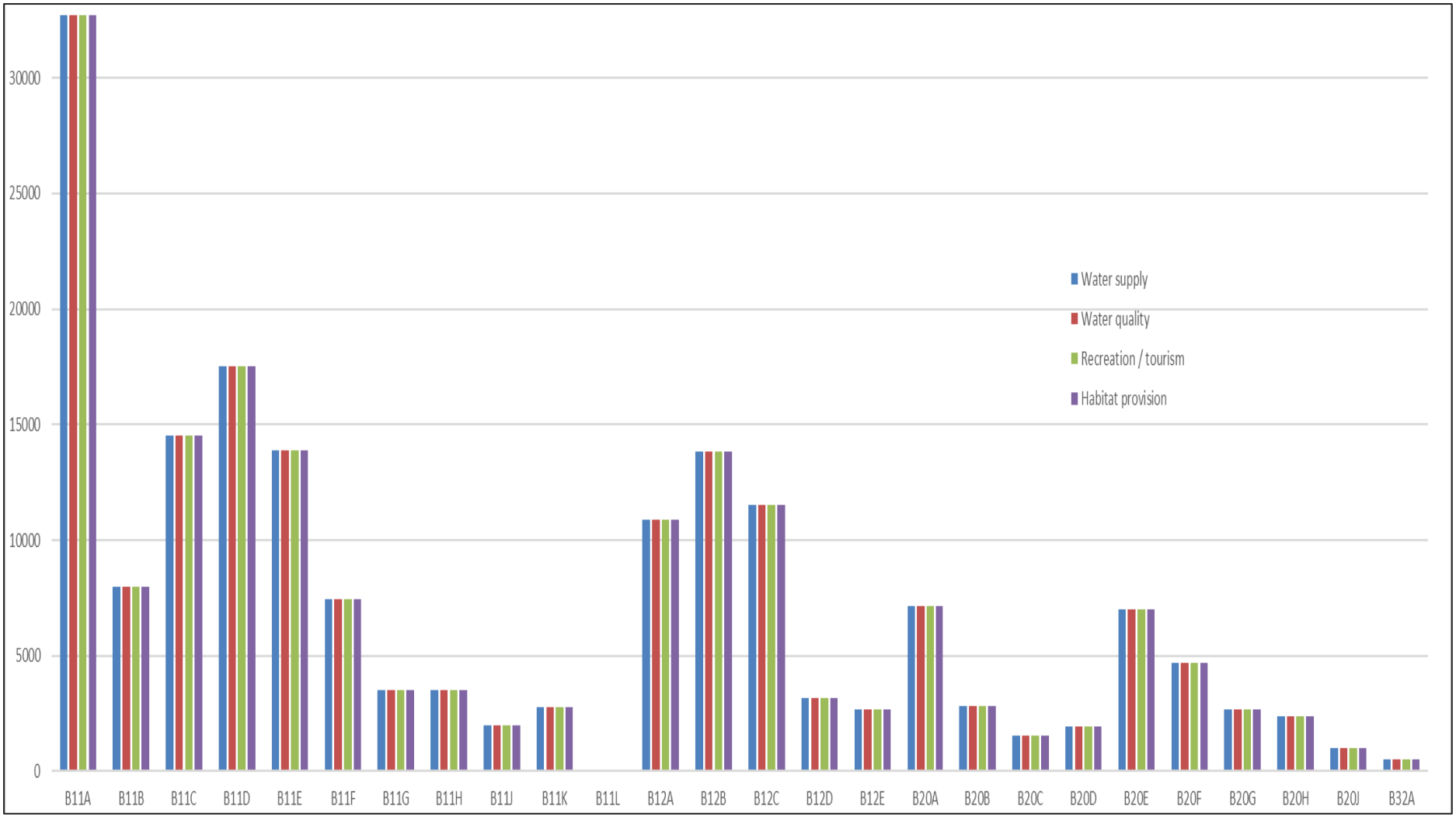


Figure A-37: Relative ecosystem services of the **wetlands** of the quaternary catchments of the Loskop Dam catchment**.**

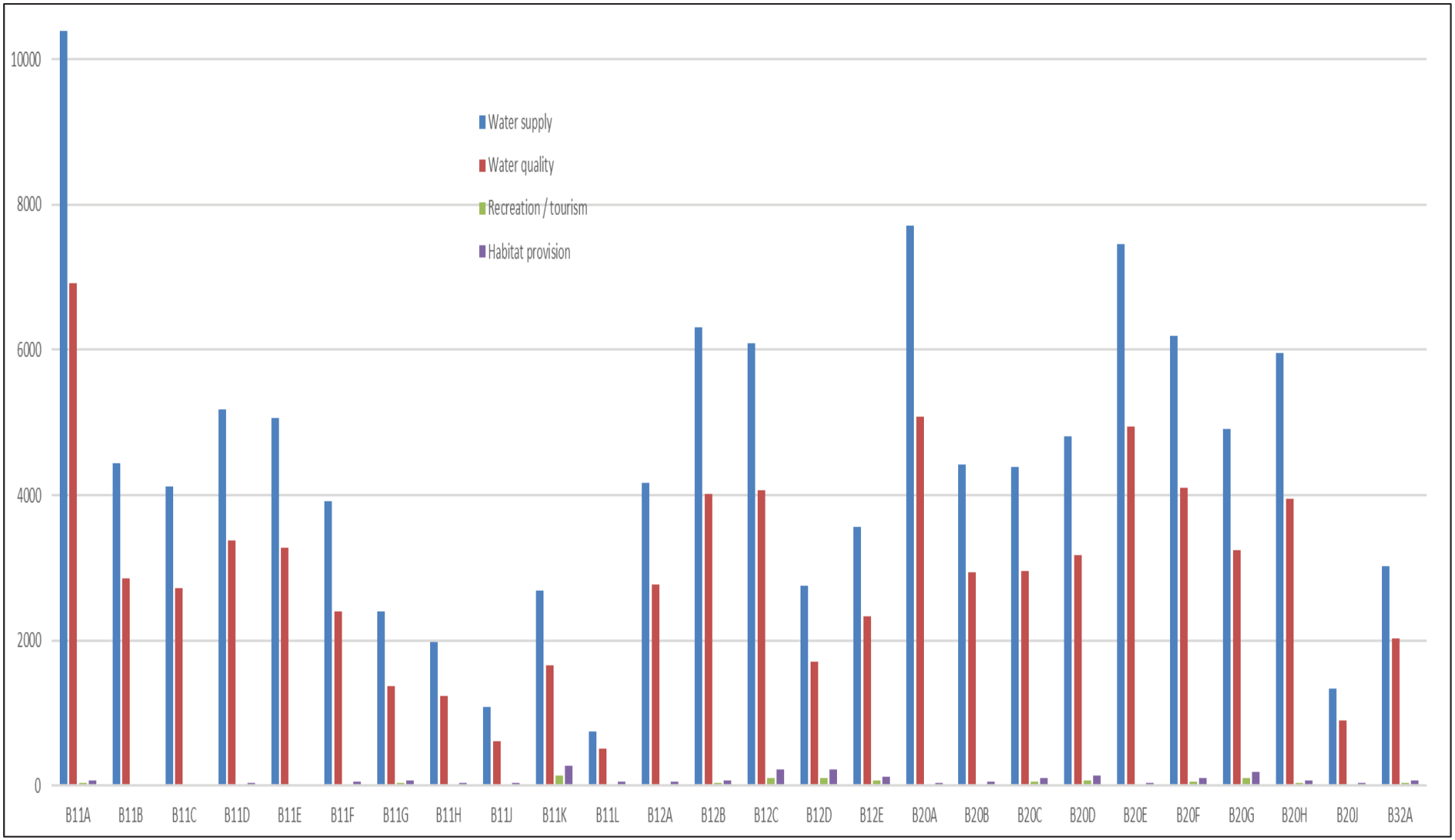


Figure A-38: Relative ecosystem services of the **transformed lands** of the quaternary catchments of the Loskop Dam catchment.

Table A-8: Total relative ecosystem services supply of the quaternaries of the Loskop Dam catchment

Quaternary	Total relative supply per quaternary catchment			
	Water supply	Water quality	Tourism / recreation	Habitat provision
B11A	141963	139440	67304	131948
B11B	53686	52945	22863	49690
B11C	58982	58242	28940	55173
B11D	80993	80607	38118	76923
B11E	54707	54210	26727	50709
B11F	38119	37433	16820	35015
B11G	35687	35451	13964	34030
B11H	29064	28920	11882	27582
B11J	39419	40274	16138	38913
B11K	37598	38358	14316	36932
B11L	43301	48687	18021	47264
B12A	59685	58741	26775	55603
B12B	78223	76625	34557	72126
B12C	61399	59883	27277	55610
B12D	40146	39734	15670	37863
B12E	57223	58622	22381	55538
B20A	64065	63080	25262	57460
B20B	33325	33085	12479	29959
B20C	42762	42649	15251	39321
B20D	57375	58046	21820	53920
B20E	78959	78240	32178	71799
B20F	53787	53350	21381	48447
B20G	59503	60911	22811	57020
B20H	55719	61084	23645	55713
B20J	61377	74611	29696	71549
B32A	125495	152766	58291	146976
TOTAL	1542562	1585993	664568	1493083

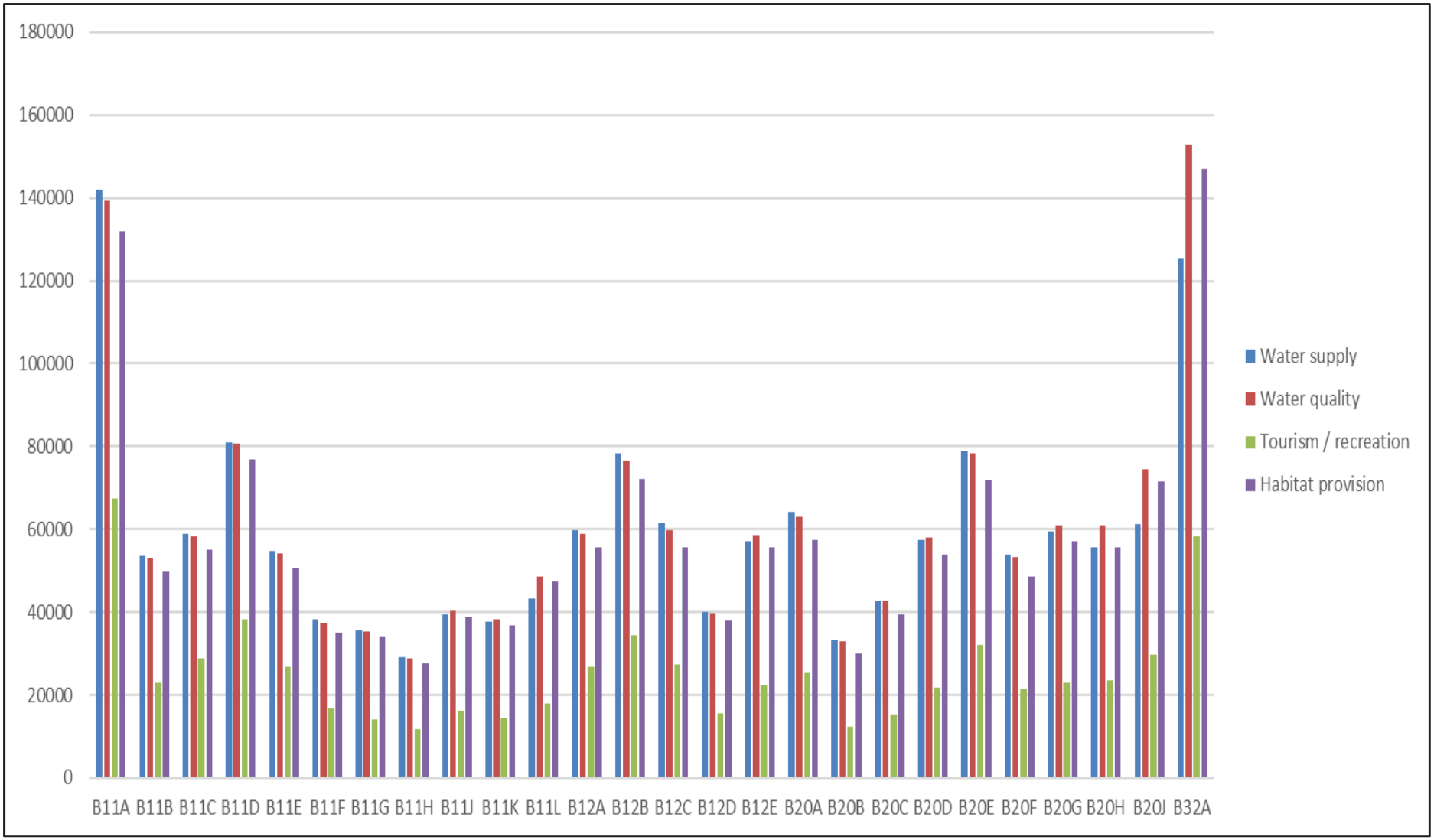


Figure A-39: Total relative ecosystem services supply of the quaternaries of the Loskop Dam catchment.

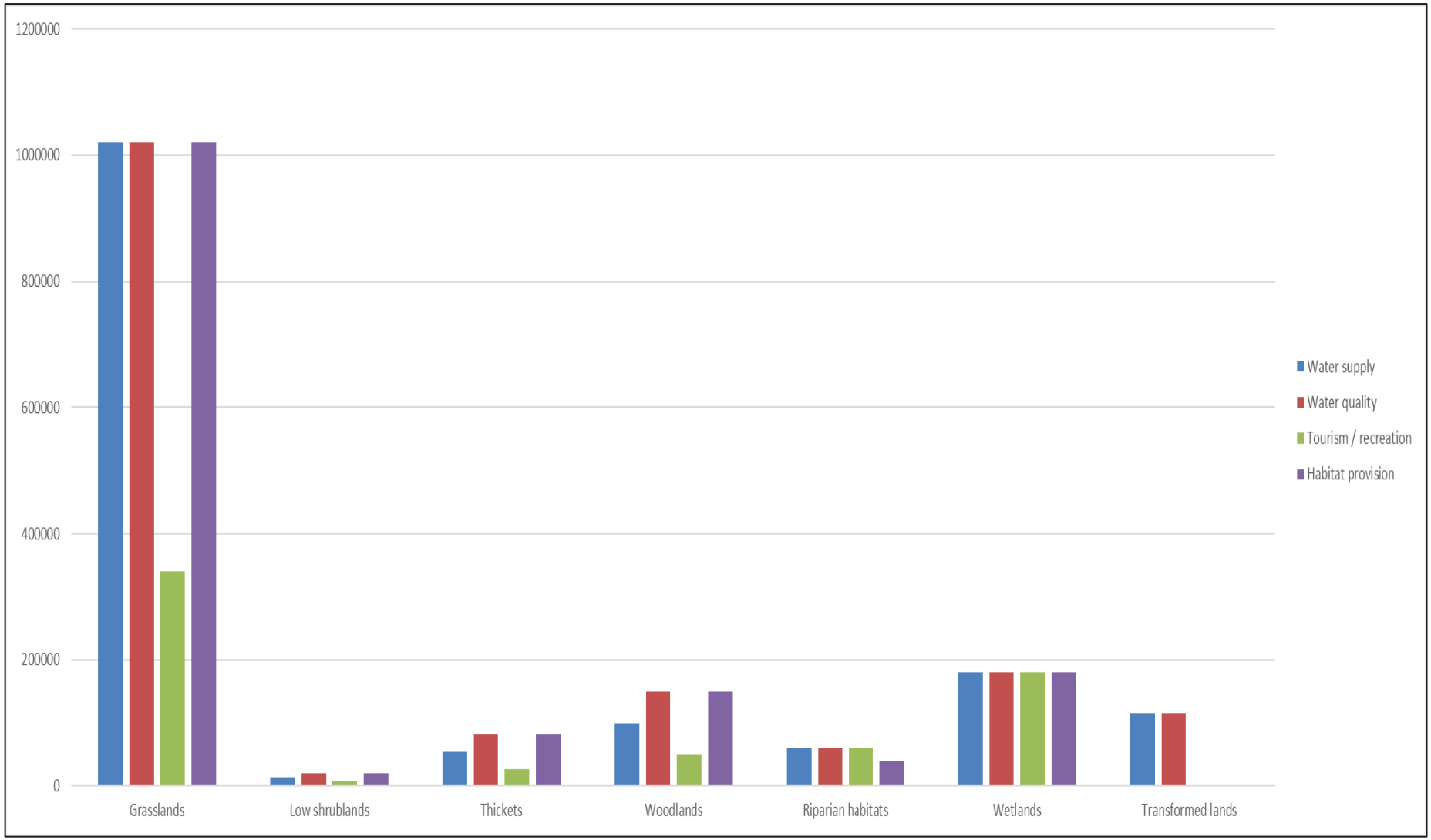


Figure A-40: Total relative ecosystem services supply per land use category for the Loskop Dam catchment.

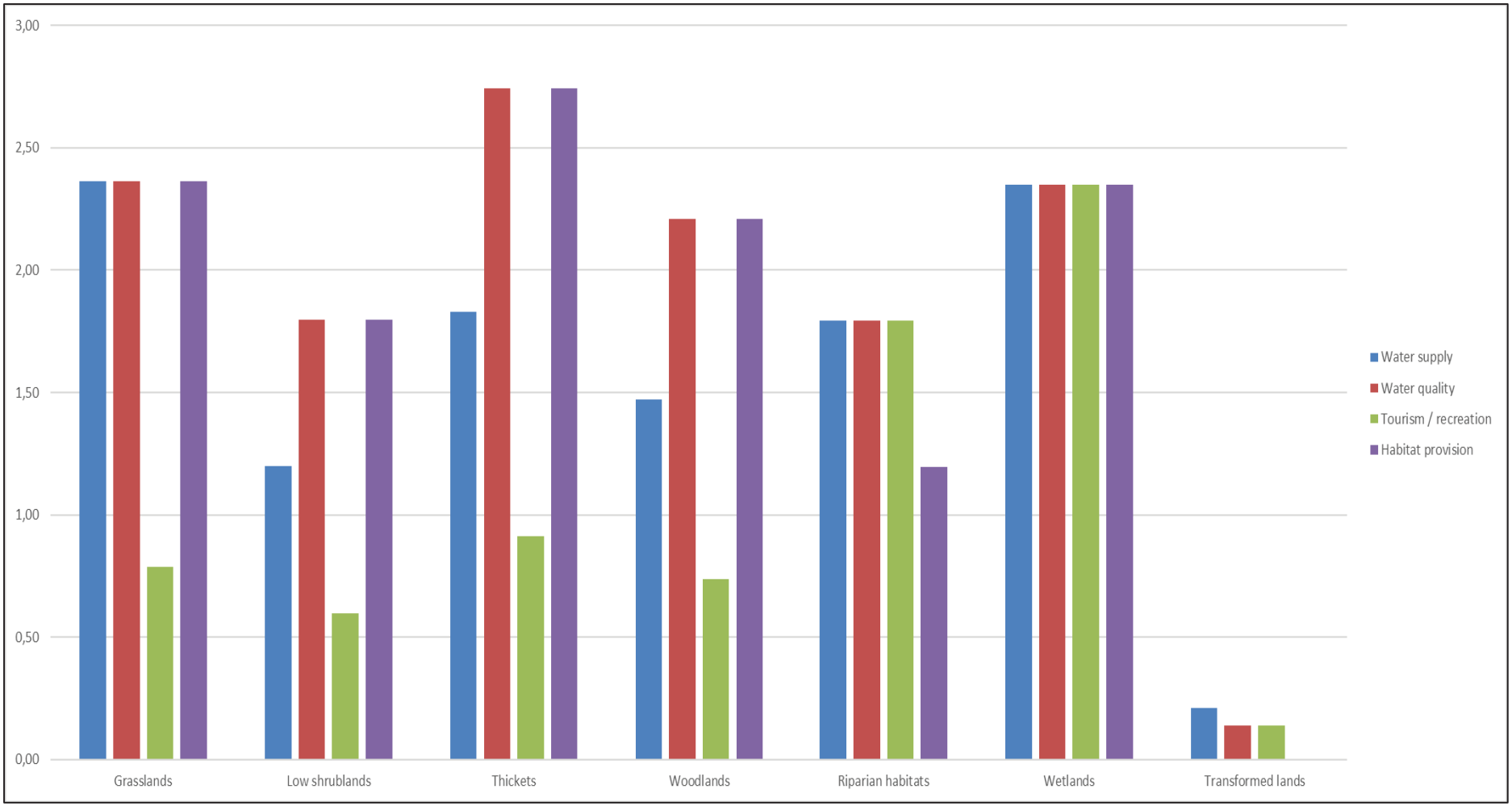


Figure A-41: Ratio of relative ecosystem services supply over surface area per land use category for the Loskop Dam catchment.

7.8.7 Assessing the relative demand for ecosystem services in the Loskop Dam catchment

The relative demand for ecosystem services in the Loskop Dam catchment was estimated following the procedure outlined in section 3.2.2.3, based on the population of the catchment and a relative demand rating. Table A-9 and Figure A-42 illustrate the relative ecosystem services demand for the population of the quaternaries of the Loskop Dam catchment. Water supply and water quality scored the highest importance and habitat provision the lowest (of the ES services considered in the model). Quaternaries B11K and B12D have the highest relative ES demands due to their higher populations.

Table A-9: Relative ecosystem services demand for the population of the quaternaries of the Loskop Dam catchment

Quaternary	Relative demand index			
	Water supply	Water quality	Tourism / recreation	Habitat provision
B11A	5475	5475	2240	995
B11B	9652	9652	3948	1755
B11C	1907	1907	780	347
B11D	55016	55016	22507	10003
B11E	10163	10163	4158	1848
B11F	4392	4392	1797	798
B11G	63358	63358	25919	11520
B11H	4145	4145	1696	754
B11J	42927	42927	17561	7805
B11K	238017	238017	97371	43276
B11L	615	615	252	112
B12A	26243	26243	10736	4771
B12B	10745	10745	4396	1954
B12C	6297	6297	2576	1145
B12D	125926	125926	51515	22896
B12E	64635	64635	26442	11752
B20A	65807	65807	26921	11965
B20B	32077	32077	13122	5832
B20C	4043	4043	1654	735
B20D	57556	57556	23546	10465
B20E	7605	7605	3111	1383
B20F	6543	6543	2677	1190
B20G	39984	39984	16357	7270
B20H	57573	57573	23553	10468
B20J	9833	9833	4023	1788
B32A	3996	3996	1635	726

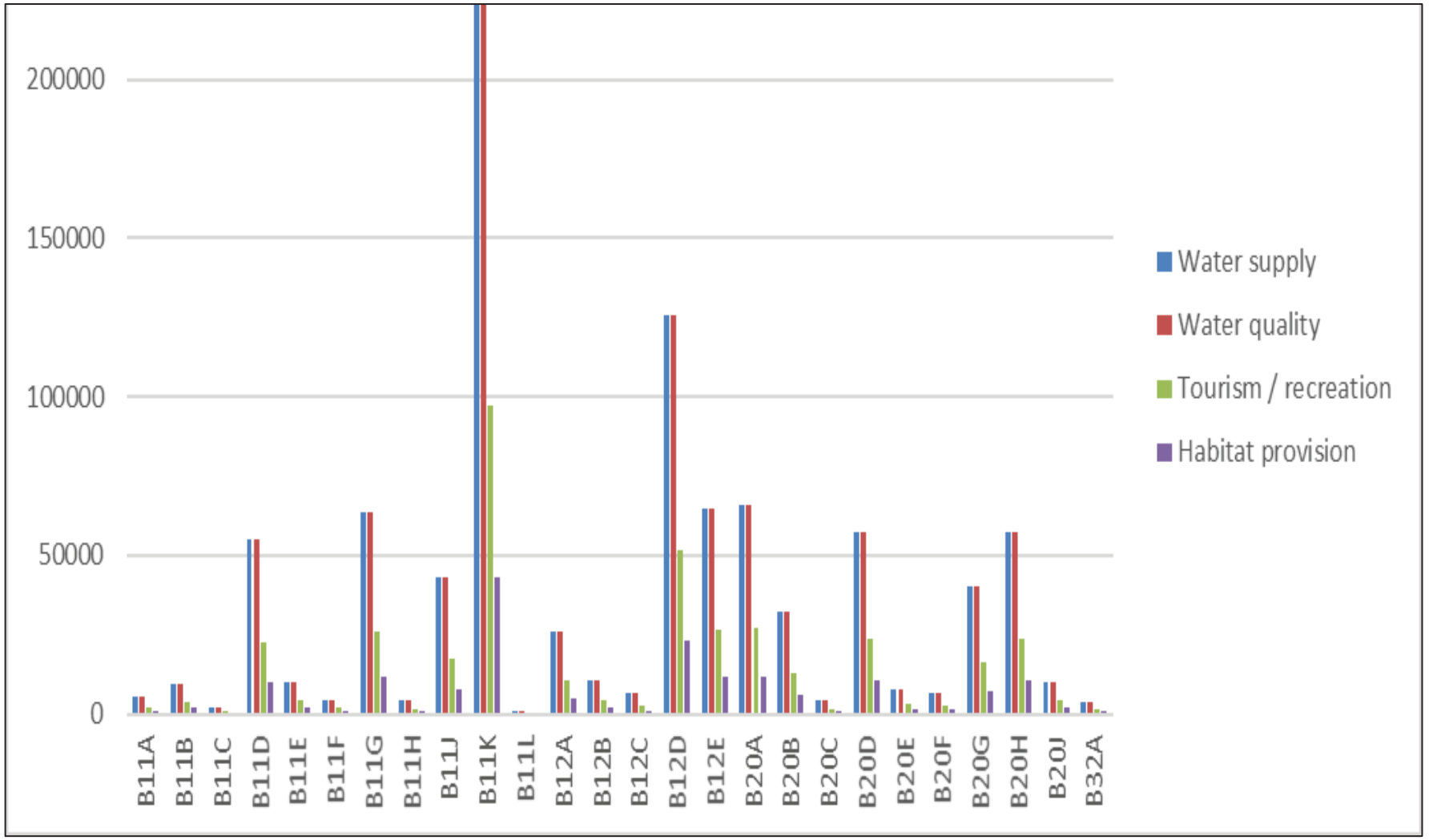


Figure A-42: Relative ecosystem services demand of the populations of the quaternaries of the Loskop Dam catchment.

7.9 High level concept for a national 2030 Tourism and Natural Capital Working Group

A multi-stakeholder private-public sector forum or working group is needed to drive an integrated socio-economic and ecological tourism / freshwater ecosystem "source-to-sea" agenda. Key stakeholders should include: NDT, DSBD, DEFF, DHET, DMR, DWS, Tourism SA, SANBI, WRC, key private sector actors and academic institutions. Stakeholders should, as soon as possible, agree on a common:

- Baseline understanding of the situation and trends;
- Position statement and goals;
- Strategy, action plan and timeframes.

A comprehensive, integrated tourism socio-economic and ecological strategy and action plan should be based on:

- Strategic investments in freshwater ecosystems following a "source-to-sea" approach: that is, water source area stewardship, sustainable water infrastructure design and management, sustainable water use / management practices in various tourism businesses (accommodation, catering, recreation, etc.) and ecological infrastructure stewardship at tourism asset / destinations.
- An extensive programme of capacity building to empower rural and marginalised communities, and particularly the youth, to recognize and harness tourism opportunities and to embed an understanding of the linkages and interdependencies between tourism and natural capital. Such a programme needs to focus not only on aspects directly regarding tourism and its value chains, but also on the issues needed to provide an enabling environment for tourism such as water and waste management, pollution reduction and crime control

To that end, the National 2030 Tourism and Natural Capital Working Group should actively explore the following activities:

- Lobbying for policy change, notably in the education, tourism, mining, water management and local government space, with an emphasis on policy integration / alignment across both the public and private sectors;
- Through the support of relevant tertiary education institutions and research organisations (e.g. SANBI, Tourism SA), funding for continuous research / evidence gathering to make / support the business case with respect to freshwater ecosystems conservation / restoration planning and prioritisation for pro-poor tourism growth (e.g. freshwater ecosystem trends; tourism value chain statistics, especially in rural areas);

- Unlocking financial and institutional support to harness tourism potential in critical "source-to-sea" pilot areas (e.g. for the iSimangaliso WHS); ideally through establishing financially independent (e.g. non-sinking, endowment / trust fund), multi-stakeholder, accountable / transparent Water Funds with broad mandates to ensure alignment in public-private sector policy-making and implementation throughout the pilot sites.

7.10 Synthesis of capacity building activities and outcomes

Empowering community youth on tourism and natural capital through social learning, simulation gaming and reflection

Overview

Capacity building workshops were conducted with youth groups as part of the case studies (at Inanda Dam (Information Box 1) and Loskop Dam (Information Box 2)) to explore communities' perceptions of tourism potential and the connections between ecosystem condition and tourism potential. The focus of the workshops was the empowerment of local youth groups as a building block to support effective involvement in sustainable tourism. In designing the workshops, we recognized the participants' current limited understanding of the complex linkages between natural capital and the tourism sector. We also recognised the reality that many people from rural or marginalised communities have little familiarity with tourism and what it means to both 'be a tourist' and to provide products and services to tourists. The workshops therefore aimed to build the youth group participants' understanding of tourism, the value of nature (biodiversity, water) and the relationship between them, to empower the youth to further explore sustainable tourism opportunities in their areas. The capacity development approach involved the active involvement of the participants using innovative participatory tools and techniques.

INFORMATION BOX 1: COMMUNITY YOUTH GROUP – INANDA DAM

- Involved members of a local youth development programme (X-Factored 101) aimed at building personal skills for success, predominantly women in their early 20s, resident in Inanda Valley area and locally schooled.
- Peri-rural residential area surrounding Inanda Dam – variable service delivery, mixed conventional and traditional homes.
- Existing eNanda Valley tourist route based on heritage (e.g. Ohlange Institute) and natural attractions (e.g. Mzinyathi Falls, Inanda Dam).

INFORMATION BOX 2: COMMUNITY YOUTH GROUP – LOSKOP DAM

- Youth group members from two CPAs representing the successful land claim beneficiary communities (Dindela and Rampolodi) on Loskop Nature Reserve. Comprised mixed ages and gender, resident in various villages around Loskop Dam.
- Peri-rural residential area.
- Existing tourism in the area largely linked to Loskop Dam (predominantly fishing), main tourism business – accommodation and restaurants, tourism is a primary source of employment in the area.

Workshop Modules

The capacity development workshops comprised of a series of modules aiming to cover a combination of issues relating to nature and natural capital, tourism and tourism enterprise development.

INFORMATION BOX 3: CAPACITY DEVELOPMENT WORKSHOPS

WHAT?

- A two-day programme about nature, tourism, and the independencies between natural capital and the tourism sector

WHO?

- Community youth groups at Inanda Dam and Loskop Dam

WHY?

- To build an understanding, with the youth groups, of tourism, the value of nature (biodiversity, water) and the relationship between them
- Inspire the youth about tourism and tourism business opportunities
- Raise awareness about the importance of nature (and clean water) in tourism
- Empower the youth to explore potential local tourism business opportunities

CAPACITY DEVELOPMENT MODULES

1. Experiential learning through a tourist excursion
2. Interactive question and discussion sessions
    - What is nature, What is tourism, and How are tourism and nature connected?
3. Participatory exercises and tasks
    - Landscape mapping activity and identification of natural and cultural attractions and infrastructure assets
4. Sustainable tourism group activity involving identifying potential tourism opportunities and the benefits of tourism for local communities
5. Nature-based tourism role-playing game
6. Starting a business group activity
7. Feedback and Evaluation

Module 1: Experiential Learning

Experiential learning was adopted in the first component of the workshops. This involved the participants being 'tourists' with an excursion to local tourist attractions. For most of the participants, this was their first experience of tourism, particularly from the perspective of being a tourist.

- At Inanda Dam the group was taken on a tour of numerous tourist attractions on the eNanda Valley Tourist Route and culminating in a boat ride on Inanda Dam and talk by environmental awareness officers from Msinsi Holdings.
- At Loskop Dam the group was taken on a game and nature drive through Loskop Dam Nature Reserve guided by Mpumalanga Parks and Tourism Authority officers from the Social Ecology Division.

Tourist Experience – *doing what tourists do!*

Module 2: Interactive question and discussion sessions to introduce core concepts

Participants were introduced to concepts of:

- Nature (water cycle, biodiversity, sustainability)
- Tourism (tourism business types, tourism value chain)
- How tourism and nature are connected (emphasizing the importance of a healthy environment to tourism).

Module 3: Participatory exercises

Participatory activities required active participation of the participants in tasks and assignments. These included a landscape mapping exercise where participants created their own maps for the local area, identifying natural and cultural attractions and assets, existing tourism enterprises and identified new tourism opportunities. Participants then mapped their own 'tourism value chains' based on their ideas for local tourism businesses / activities and developed an outline for a tourism enterprise based on a business plan approach.

Landscape mapping

Module 4: Sustainable tourism group activity

In groups, the participants 'brainstormed' possible sustainable tourism related businesses (services or products) appropriate for their local area and categorized the business ideas into a 'tourism value chain'. The groups then considered how their local communities could benefit from tourism. To gain a sense of which opportunities were most preferred, participants 'voted' individually with sticker dots to prioritize their choices.

Module 5: Simulation gaming

A simulation game specific to each of the case studies was developed (see Information Box 4). In the game, participants were divided into groups and 'role-played' owning a nature-based tourism business. Through the course of the simulation game the teams were presented with various scenarios (challenges, opportunities, changes in the natural environment). The groups had to determine if the scenario presented had an implication on their tourism business, and if so, if it was a positive or negative implication. Once decided, groups moved up or down star rating 'zones' accordingly. Other participants could weigh in on each groups' decision, which generated interesting discussion and co-learning. The game enabled the youth groups to recognize the links between natural capital (and the ecosystem services it provides), inland water ecosystems and the tourism sector

Nature-Based Tourism Role Playing Game

Module 6: Starting a business group activity

In groups, participants were tasked with unpacking a business opportunity by exploring what the opportunity is, who the potential customers are and what resources will be needed for the business. This initiated practical thinking on the initial components of business planning and

the process that one would need to go through when exploring business opportunity options. Groups presented their thinking in plenary, giving all participants the opportunity to provide constructive input and to share ideas.

Module 7: Feedback and evaluation

Participants were given a sheet of paper and asked to reflect on the workshop, noting on the one side – what they enjoyed / liked or found interesting about the workshop; and on the other side – what they would like learn more about or their plans for the future. This was a simple but effective mechanism for participants to think reflectively about of the course and about how they would like to take the learning forward.

INFORMATION BOX 4: NATURE-BASED TOURISM ROLE PLAYING GAME

The purpose of the Game is to simulate the independencies between natural capital and the tourism sector to help participants to 'see' the direct and indirect implications that threats to natural capital are likely to have on the tourism sector

a) The game starts with participants being divided into groups and each group being allocated a different type of tourism enterprise (i.e. water sports; accommodation; arts and cultural festival; cycling and hiking).

b) The room is divided in five spaces, each representing a 'star rating' which demonstrates the 'value' of a tourism enterprise.

c) One representative of each group (the player) starts the game at the '3-star rating' space. The other participants stand in their groups in the adjacent 'viewing' area where they can engage with their 'player'.

d) Groups are then posed a scenario that could have positive or negative implication on the star rating of their tourism enterprise. Scenarios included poor Dam water quality, pollution, skills development opportunities, poaching control initiatives, erosion and flooding, etc.

e) Groups debate the implications of the scenario on their enterprise and choose if they would move 'up' or 'down' a star rating, depending on whether the implication is positive or negative. If there is no perceived implication, they remain where they are.

f) Once all groups have made their decision, players are asked to justify their move, in plenary:
   - In some cases, participants agree with the groups' decision and add complimentary thoughts to their justifications, generating insightful discussion.
   - In other cases, participants erupt in disagreement, alluding to the 'unseen' implications that the scenario could have on the groups' tourism enterprise. This is where the real co-learning happens as discussion is typically in-depth and exploratory, led by the participants rather than the facilitator.
   - Participants also discuss the linkages between different enterprises, to reiterate the 'unseen' implications (i.e. if the water sports enterprise was affected by poor water quality in the dam. There would be no reason for tourists to visit the area and therefore the accommodation enterprise would be negatively affected).

g) By moving participants through a space (forwards or backwards), they 'feel' the implications that a scenario has on their enterprise and therefore become more aware and sensitive to the nature-tourism interlinkages.

h) Several rounds of the game are played with groups being faced with a range of scenarios. Groups were then asked to explore how they could potentially remedy the negative implications they have 'felt':
   - Once a few ideas are explored, the facilitator offers that groups could invest in a remedy action to improve the rating of their enterprise.
   - Group are given 5 tokens at the start of the game, which they can use to 'pay' for these actions so as to improve their enterprises' star rating.
     - For example, a player could pay 1 token to fix hiking trails that had been damaged by a sever rainfall event.
   - Some remedial actions need to be addressed at a large scale, such as rehabilitating wetlands upstream so that the water in the Dam would be cleaner. Due to the scale, several groups (enterprises) need to agree to jointly invest in the action – demonstrating the need for and value of collective intervention.
     - Again this often causes the groups to erupt into discussions about the pros and cons of collaboration and associated costs and benefits.

i) Once the last scenario has been run the groups hold a final plenary discussion on the influence that drivers, such as environmental conditions, have on the viability and sustainability of tourism enterprises.

Results

Inanda Dam

THEME	RESULTS AND INSIGHTS
Experience of tourism	eNanda route excursion (tour of local tourist attractions) • Limited experience of the participants as tourists, few had travelled as a tourist or even visited local tourist attractions. *"I really did not know that my area had so much history; it was so amazing to learn about the area that I have lived in for so many years and it was my first time going on a boat"* *"I liked the experience of being a tourist and how I got to know more about the place I live in and I liked learning about the different businesses around Inanda and how they manage their businesses".*
Familiarity with the local landscape ***As a foundation for identifying tourism attractions, gaps and competition***	Landscape mapping activity • Youth familiar with their immediate area (5-10 km) and with the help of an Inanda Valley map could identify a range of existing local tourism attractions and businesses. • Youth far less familiar with areas and tourism outside of the immediate area; most had been as far as Durban and had visited the beach (approximately 45 km away), but none indicated they had travelled any further.
Familiarity with concepts of nature, ecology, ecosystem services and sustainability	Interactive question and discussion session • Participants recognized that nature benefits humans (e.g. clean air, water) and the importance of grasslands and forests etc., but weren't familiar with concepts such as ecosystem services and biodiversity. • Participants had some awareness of the water cycle, but less so on the 'waste water cycle'. • The idea of sustainability resonated with the group, but the link with practices to ensure sustainability was tentative – litter collection was identified as a 'good' practice.
Familiarity with concepts of tourism	Interactive question and discussion session • Tourism appeared to be a fairly vague concept. • Ideas of tourism focused largely on catering, accommodation and cultural activities (likely influenced by the tourist excursion activity and their participation in the Xfactor 101 group). • Examples of tourism activities (e.g. canoeing, sports and cultural events, tour guide) and the concept of a tourism value chain (where even support services such as transport and waste management are part of tourism) appeared to be new and unfamiliar to most of the group. *"I really enjoyed the Wushwini centre as it showed me that there are so many opportunities for things I can do like a career in drama and catering"*

THEME	RESULTS AND INSIGHTS
Nature-tourism interlinkages, risks and opportunities, collective intervention, co-learning	Nature-based tourism role playing game • Participants generally recognized the threats to 'their tourism business' of various ecosystem degradation scenarios and discerned that the different business types would experience different risks / impacts (e.g. water-based sports activities vs. catering). • During the activity the groups began to realise the inter-linkages between different types of businesses (e.g. catering supports art and culture events, water-based activities attract tourists who then explore other attractions and need services such as food and transport). • Groups were also made aware that some challenges need collective action to overcome, and that addressing the problem would benefit different enterprises in different ways.
Business planning (What is the business opportunity? Who are your customers? What resources are needed for the business?)	Group activity (develop a tourism business concept) • All the groups developed a broad concept, and while they indicated 'tourists' as their customers – they weren't able to expand on who these 'tourists' would be. • The group found it challenging to link their tourism business idea with a local opportunity – why the 'idea' would work in the local context. *"I would like to learn more about how to start a business because there is a lack of job opportunities around my area especially for the youth".* *"I would like to have someone teach me more about starting my own business, what challenges can come along the way or what I should expect".*

Loskop Dam

THEME	RESULTS AND INSIGHTS
Experience of tourism	Loskop Nature Reserve excursion (nature walk, visit to the Hornbill Rehabilitation centre) • The group were largely familiar with tourism from the perspective of a job in hospitality (accommodation and food & beverage). • Participants were far less familiar with the experience of being a tourist.
Familiarity with the local landscape **As a foundation for identifying tourism attractions, gaps and competition**	Landscape mapping activity – with a focus on the Loskop Nature Reserve • At first the group struggled with locating their CPA areas within the Reserve, but once key landmarks were located (e.g. gates), the group identified a range of natural and cultural attractions with the Reserve. • The group also identified opportunities for accommodation and recreation (e.g. hiking, biking, game viewing) areas. • The group also identified existing tourism businesses near the reserve.

THEME	RESULTS AND INSIGHTS
Familiarity with concepts of nature, ecology, ecosystem services and sustainability	Interactive question and discussion session • Several of the participants were knowledgeable about the water-cycle, water pollution and the importance of clean water. • Many of the concepts introduced in the guided nature walk (alien plants, traditional uses of plants, the concept of an ecosystem) appeared to be new to many of the group. *"I enjoyed all the outdoor activities; however I really loved learning about the importance of nature".* *"The presentation about water was fascinating… what stood out for me was the group discussion".* *"I enjoyed the information that we shared together about the interaction between biotic and abiotic things".*
Familiarity with concepts of tourism	Interactive question and discussion session • The participants appeared to grasp the concept of the tourism value chain and recognized how different tourism businesses are connected and identified services such as transport, maintenance and equipment hire as supporting tourism and being part of the value chain. • Participants were less familiar with tourism opportunities not directly related to accommodation and food, such as water-based activities; sport, music and cultural events and activities related to the Nature Reserve.
Nature-tourism interlinkages, risks and opportunities, collective intervention, co-learning	Nature-based tourism role playing game • The group responded enthusiastically to the role-playing and engaged with the scenarios and challenges. • Participants recognized the threats to 'their tourism business' of various ecosystem degradation scenarios and discerned that the different business types would experience different risks / impacts (e.g. water-based activities vs. art and culture events). • The group were quickly grasped the connection between the different businesses and the need to collaborate to address particular challenges (e.g. water pollution) and debated energetically on the best course of action to take.
Business planning (What is the business opportunity? Who are your customers? What resources are needed for the business?)	Group activity (develop a tourism business concept) • All the groups developed a business concept, with several providing specific detail on their customers (e.g. fishing tourists and cultural tourists). • The groups linked their 'business idea' with the local landscape and made suggestions on 'why the customer needed the product / service).

Feedback and Evaluation from the Case Studies

While just one step in the direction of the capacity building needed to empower potential entrepreneurs to recognize and harness tourism opportunities and establish sustainable businesses, the workshops had a meaningful impact on the youth groups with participants commenting:

- *"It showed me that there are so many opportunities for things I can do"*

- *"I really did not know that my area had so much history; it was so amazing to learn about the area that I have lived in for so many years"*
- *"I liked learning about the water cycle and tourism value chain"*
- *"I enjoyed the moment I had with people from my community and the skills"*
- *"I enjoyed the information that we shared together about tourism and the interaction with nature".*

The youth groups gave feedback following the workshops on what they would like to learn more about and their plans for the future:

Feedback and reflection

- *"I would like to learn how I can teach my community more about celebrating their history and using it to revive the place"*
- *"I would like to know more about tourism"*
- *"I would like to learn more about how to start a business because there is a lack of job opportunities around my area especially for the youth"*
- *"I hope this kind of session can come back again, so that those who did not have an opportunity could grab it"*
- *"In future I want to interact with people around the globe to help them, explore the beauty of our country and tell them about our history"*
- *"I would like to go to different places in order to get ideas and come back to Inanda to make a change and bring new things".*

Conclusions

From our interactions with the case study community youth groups, discussions with individuals involved in the field of socio-economic upliftment through tourism and a review of the literature, it is clear that an extensive programme of capacity building is required to empower the youth from rural and marginalised communities to recognize and harness tourism opportunities and to embed an understanding of the linkages and interdependencies between tourism and natural capital. Ideally, this capacity building needs to start at the level of basic education and continue into post-school programmes. It also became evident how challenging it is for people to recognize tourism opportunities and manage tourism businesses when they have little experience of being a tourist and what tourism involves.

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